

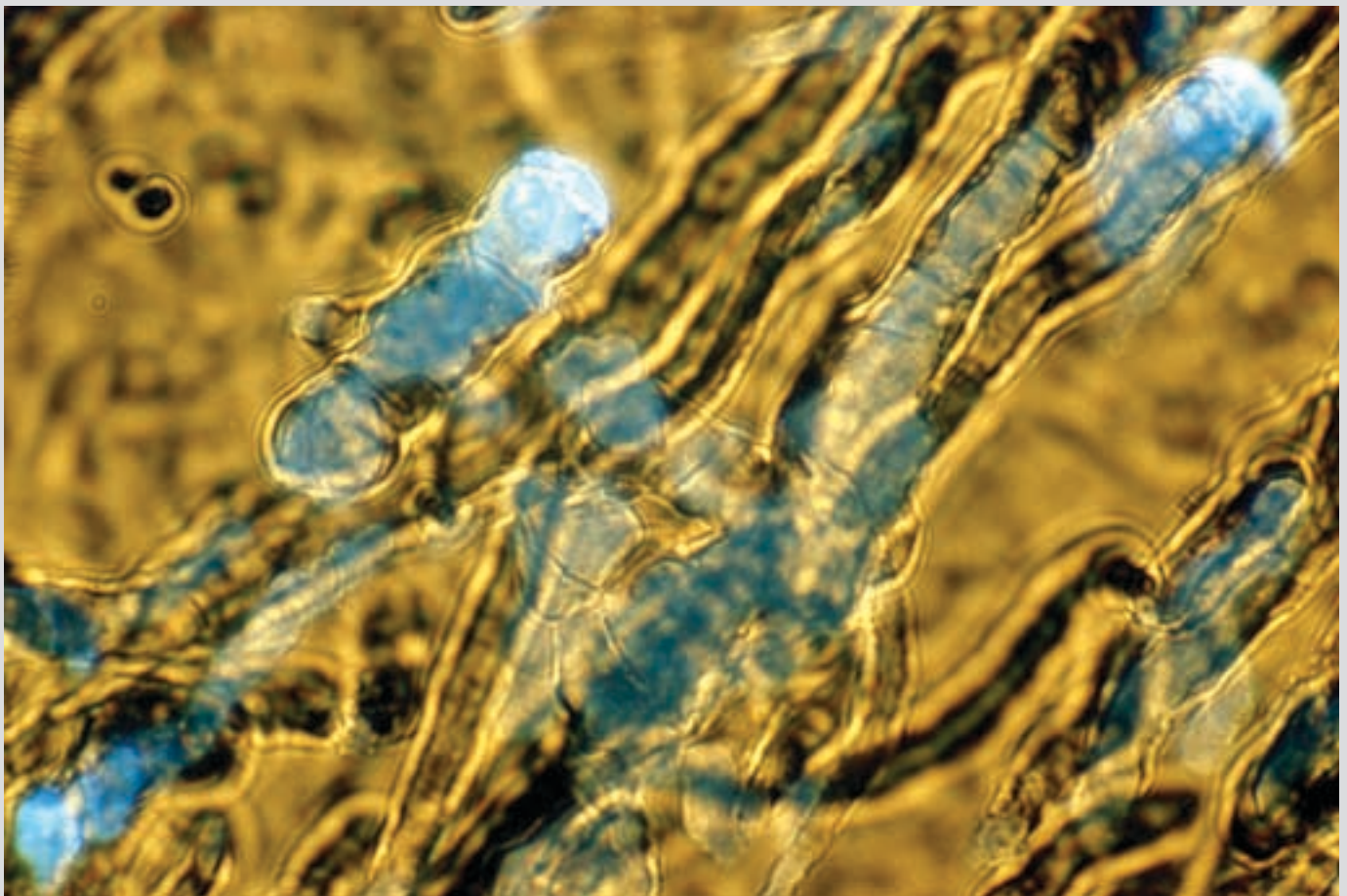
# GSA TODAY

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OCTOBER 2006

Microbes and volcanoes: A tale from the oceans,  
ophiolites, and greenstone belts



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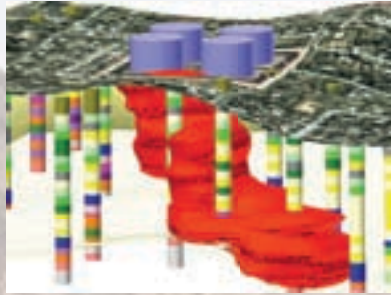
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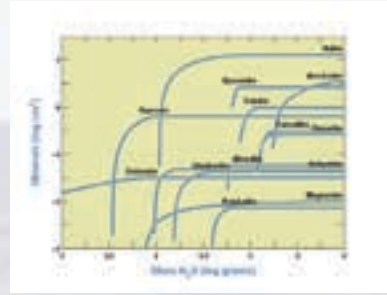


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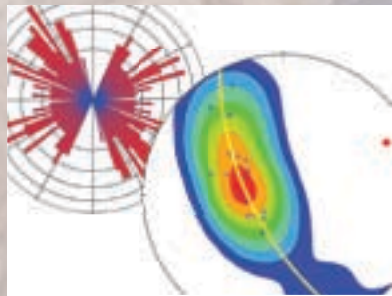


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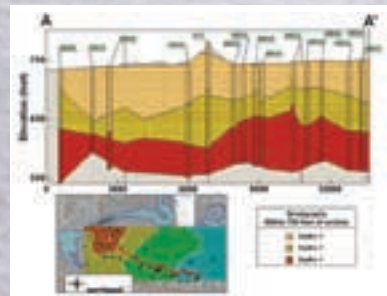


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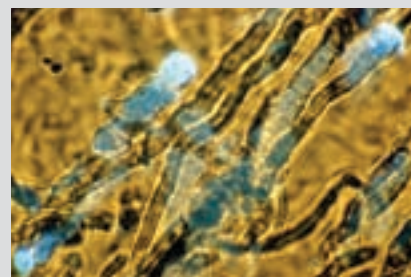
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**Cover:** Thin section microphotograph of submarine basaltic glass with vermicular-tubular bioalteration alteration cavities. A fluorescent dye indicates the presence of DNA in some of the tubular structures (tube diameter ~2 μm). The glass sample was drilled by the Ocean Drilling Program at site 896A on the Cocos Ridge, Eastern Pacific Ocean, 287 m below the seafloor, in 5.9 Ma oceanic crust. Photo by T. Torsvik and H. Furnes. See "Microbes and volcanoes: A tale from the oceans, ophiolites, and greenstone belts," by Staudigel et al., p. 4–10.



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# Microbes and volcanoes: A tale from the oceans, ophiolites, and greenstone belts

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## ABSTRACT

Submarine volcanic glass alteration displays two easily discernable types of textures, one that is best interpreted as the result of an abiotic diffusive exchange process and another that involves microbial activity. Glass bioalteration textures dominate in the upper 300 m of the oceanic crust and have been found in nearly all ocean basins and in many ophiolites and greenstone belts back to 3.5 Ga. Bioalteration may involve a globally significant biomass and may influence geochemical fluxes from seafloor alteration. Glass bioalteration creates an entirely new discipline of research that involves microbiologists and volcanologists working in active volcanic systems and in the geologic record. Submarine volcanoes exposed on the ocean floor are studied along with ophiolites and greenstone belts to understand Earth not only as a physical and chemical heat engine but also as a bioreactor.

## INTRODUCTION

Studies of modern and ancient volcanoes on the ocean floor as well as in ophiolites and greenstone belts tell important parts of the story of how Earth works as a “heat engine,” in which planetary heat loss drives mantle convection and plate motions. Recently, these studies have shown that submarine volcanoes may host substantial biological communities that create characteristic bioalteration textures in volcanic glass (Fisk et al., 1998; Furnes et al., 2001a). These processes could play a globally significant role in terms of the distribution of biomass or mediating basalt alteration and the chemical fluxes between the oceanic crust and seawater (Furnes and Staudigel, 1999). These observations add an exciting new angle to the study of submarine volcanoes on the ocean floor, in ophiolites, and in greenstone belts.

In the spirit of interdisciplinary integration, we offer a critical review and some new data for what we consider to be some of the most intriguing evidence for microbial life inside submarine volcanoes: the bioalteration of basaltic glass. This geological,

textural, and geochemical evidence for life has been found in oceanic crust of almost any age and all ocean basins and in a large number of ophiolites and greenstone belts. As for all textural evidence for life, the biogenicity of alteration textures has to be argued carefully, in the context of geochemical data and geology (Furnes et al., 2002; Staudigel and Furnes, 2004).

## MICROBIAL ALTERATION OF VOLCANIC GLASS

Volcanic glass is a common quench product of lavas in submarine volcanic oceanic crust. It breaks down easily in the presence of seawater. For these reasons, glass alteration contributes more to the chemical mass balance of seafloor alteration than any other igneous phase in the extrusive oceanic crust (Staudigel and Hart, 1983).

## Microscopic Textures

Bioalteration of basaltic glass was first described by Ross and Fisher (1986) and then explained by localized dissolution of glass from metabolic waste products of colonizing microbes (Thorseth et al., 1992). Subsequently, it was recognized that bioalteration is very common in submarine glass from any tectonic setting and geological age (see GSA Data Repository Table DR1<sup>1</sup>).

It is important to contrast abiotic from biotic alteration of glass, which display unique textural characteristics (Fig. 1). *Abiotic* alteration of basaltic volcanic glass in a hydrous environment can be recognized by the darkening of the originally light yellow to colorless isotropic and noncrystalline glass (Fig. 1A). Glass transformation into yellow or tan palagonite or into slightly birefringent fibropalagonite always proceeds from the external surfaces toward an unaltered core in progressive alteration fronts (Fig. 1A). Palagonite defines concentric fronts that migrate inward toward the fresh interior of the glassy fragments, progressively smoothing or rounding off sharp edges of individual grains. Extensive petrographic and geochemical observations have led to a broad consensus about key processes that define abiotic alteration of glass (e.g., Stronck and Schmincke, 2001): It is largely a diffusively controlled chemical exchange process, in which hydration progresses inward, removing various fractions of the mobile chemical inventory of the glass, adding some seawater components, and forming an array of alteration products, many of them resembling clays. These range in grain size from barely visible with the transmission electron microscope to clearly birefringent in a petrographic microscope. There is very little evidence in nature for wholesale (congruent) dissolution of glass under abiotic conditions except for the very earliest phases, before an immobile product layer has been established on exterior surfaces. Elements removed from glass typically crystallize as authigenic

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<sup>1</sup>GSA Data Repository Item 2006215, Table DR1: Locations and ages of submarine extrusives with bioalteration, is available on the Web at [www.geosociety.org/pubs/ft2006.htm](http://www.geosociety.org/pubs/ft2006.htm). You can also obtain a copy of this item by writing to [editing@geosociety.org](mailto:editing@geosociety.org).

## Alteration Mode

## Model

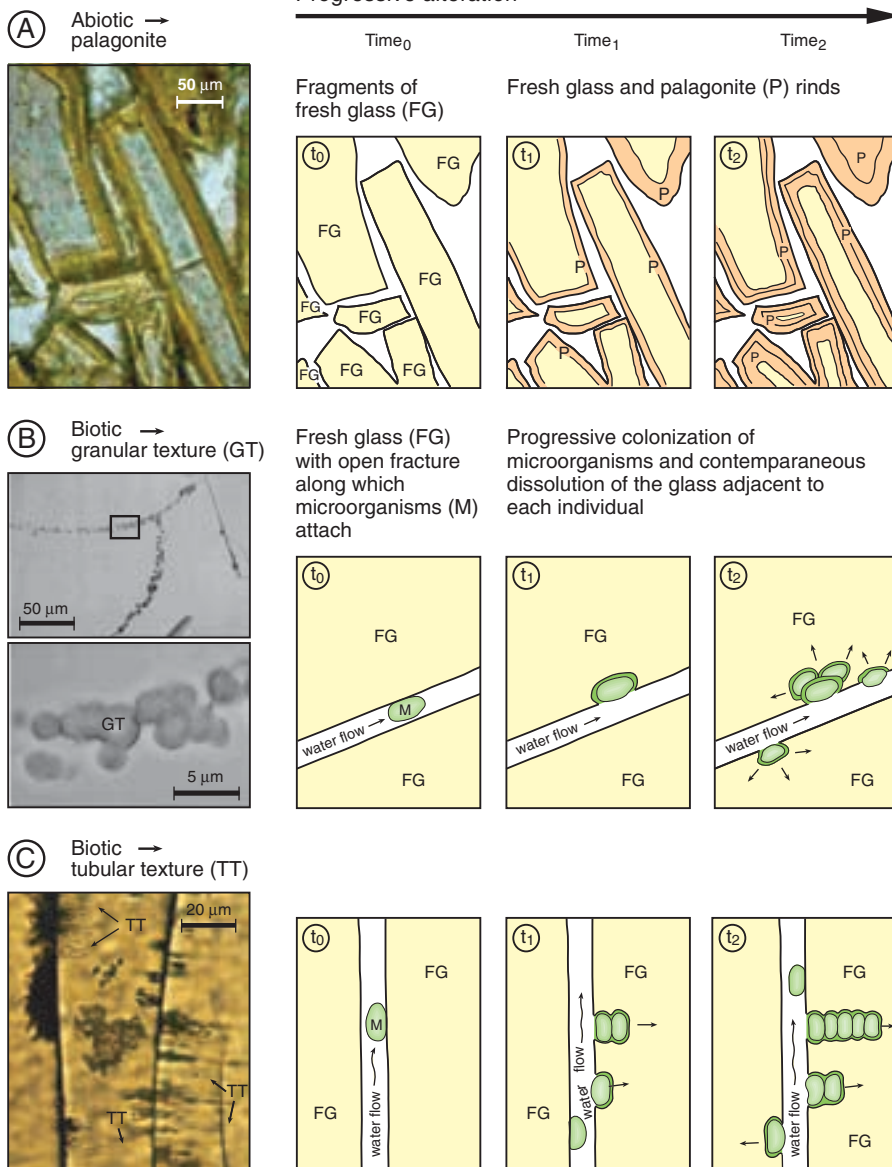


Figure 1. Thin section photomicrographs from seafloor basalts and a schematic two-step model for the development of different types of glass alteration. Unaltered fresh glass (FG) without or with microbes (green, "M") is labeled  $t_0$ ;  $t_1$  and  $t_2$  are two successive stages of alteration. (A) Abiotic alteration of glass to palagonite, with fine grained grains completely altered and big grains containing some fresh cores with rounded corners. Examples for granular and tubular bioalteration are given in (B) and (C), respectively. Note the common asymmetry of tubes with respect to opposing sides. The photomicrograph in model C also contains a crack with granular alteration.

phases in the interstices between the glass fragments using dissolved components from the glass and from seawater (Hay and Iijima, 1968; Staudigel and Hart, 1983; Stroncik and Schmincke, 2001).

The microscopic appearance of microbially mediated glass alteration textures is quite distinct from the abiotic expression, in that alteration is reflected largely

in the formation of cavities that enter the glass from exterior surfaces in granular-appearing agglomerations (Fig. 1B) or tubular (tunnel-like) morphologies (Figs. 1C and 2A–2D). In both cases, it is inferred that microbes colonize exterior surfaces or surfaces of cracks and begin to dissolve the rock through changes in pH at their contact area. The localized

dissolution then forms these two types of bioalteration (Figs. 1B, 1C, and Fig. 2).

A biological origin for these features is supported by a range of textural observations:

- Bioalteration is never found completely enclosed in glass; it is always rooted on surfaces that are exposed to external water.
  - Tubular and granular alteration locations on conjugate sides of a crack do not line up with one another (Fig. 1C), eliminating a pre-existing weakness of the glass as a cause.
  - Tube and granule diameters are of micron to submicron scale, like microbes. Tubes tend to be larger than granules, yet both display log-normal size distributions, a common attribute in biological systems (e.g., van Dover et al., 2003).
  - Tubular alteration does not show flaring at the entry point or narrowing deeper inside the glass, as would be expected from abiotic dissolution.
  - Some tubes show segmentation, in which the diameter of tubes varies regularly. This is highly suggestive of pulsed growth and/or the presence of several cells (Figs. 1C and 2C).
  - Some tubes bifurcate, which can be explained satisfactorily by cell division.
  - Some tubes show spirals (Fig. 2D) that are extremely hard to generate abiotically with the regularity observed. Spirals are common in biology and biologically produced materials (e.g., twisted stalks of the Fe-oxidizing bacterium *Gallionella*).
  - Granular alteration often forms hemispherical agglomerations of cavities, radiating out from a single point at a crack surface and producing the texture of a sponge. These agglomerations closely resemble the growth of microbial cultures on an agar dish, except that they are three-dimensional and the medium is basaltic glass.
- None of these textures can be reconciled with the diffusive model of abiotic glass alteration; a microbially mediated congruent dissolution process (Figs. 1B and 1C) is a more plausible explanation. While many details of this process remain areas of active research,

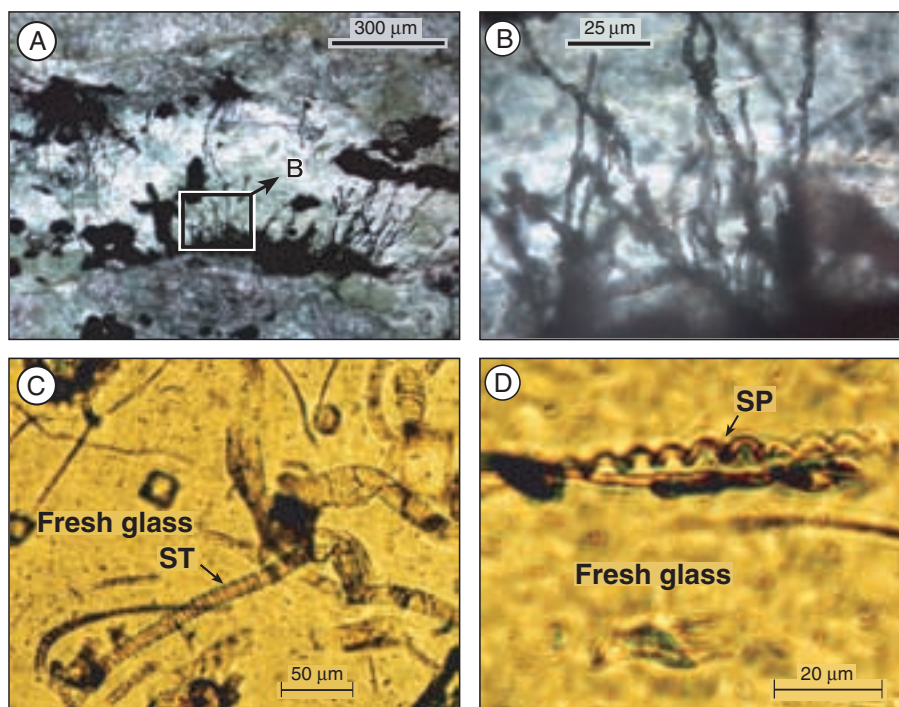


Figure 2. Tubular bioalteration textures in volcanic glass from pillow lavas and inter-pillow hyaloclastite. (A) Photomicrograph of thin section from interpillow sample from the Euro Basalt of the Warrawoona Group, Pilbara Craton. The tubular structures (filled with titanite) occur along fragment boundaries. The other minerals are chlorite—light green; quartz—white; calcite—brownish. (B) Detail of the titanite-filled bioalteration tubular structures. (C and D) Biogenerated structures in Cretaceous fresh glass from pillow rims, Troodos ophiolite, Cyprus, with a segmented tube (ST in C) and pronounced spiral structure (SP in D).

the biological mechanism for generating these void textures remains unchallenged even though it was proposed more than a decade ago.

The textures of bioalteration have important consequences for the development of surface area during alteration. Abiotic alteration progressively decreases surface area as grains and exposed edges are coated with non-reactive precipitates, decreasing the efficiency of diffusion as time proceeds. Biotic alteration, however, increases surface area through the creation of tubes and the “sponge-like” agglomeration of granular alteration. Staudigel and Furnes (2004) estimated a surface area increase of a factor of 2.5 for an average density of tubular alteration textures and a two orders-of-magnitude increase for granular alteration textures. While these estimates are likely bound by large errors, it is clear that surface area increases during biotic alteration, while abiotic alteration tends to decrease surface area. This indicates that dissolution becomes increasingly efficient as bioalteration proceeds, unless there is a (still to be determined) rate-limiting process that slows it down. Such a limitation could result from the lack of a particular nutrient for microbes or the inability of the system to remove dissolved components and metabolic waste products.

### Geochemistry

There have been some first-order geochemical investigations of glass bioalteration, in particular studying the local geochemical environment of bioalteration textures, the fractionation of carbon isotopes during bioalteration, and water-rock chemical exchange experiments with and without the presence of microbial activity.

Elemental abundances in and around biotextures offer significant support for their biogenicity. The surfaces of cavities often contain microbial DNA (Thorseth et al., 1995; Giovannoni et al., 1996) or carbon residues and show uneven distri-

butions of biologically active elements like K, Fe, P, N, and S (e.g., Furnes et al., 2001b; Banerjee and Muehlenbachs, 2003). Alt and Mata (2000) inferred an incongruent dissolution process from the major element geochemistry of bioalteration cavities, even though any of these local geochemical effects may have occurred during or after bioalteration. Storrie-Lombardi and Fisk (2003) showed through principal component analysis that the alteration products of biotic and abiotic alteration are distinct: biotic alteration produces clays with higher Fe and K, whereas abiotic alteration produces clays with higher Mg values. This work demonstrates key differences in alteration behavior for biotic and abiotic glass alteration and sets the stage for understanding the actual processes of glass bioalteration. However, it may also be pointed out here that some of the analyses of Storrie-Lombardi and Fisk (2003) may contain secondary phases from void fillings, which suggests that some of their conclusions apply to the mineral precipitates in bioalteration cavities rather than the residual altered glass.

Carbon isotopes ( $\delta^{13}\text{C}$ ) show characteristic fractionation during biological processes, offering one of the most powerful tools for understanding ancient life in the rock record. Microbially produced cellular organic carbon typically is characterized by very low (i.e., negative)  $\delta^{13}\text{C}$  values. In fact, bulk isotopic analysis of finely disseminated carbonate in glassy margins with bioalteration textures commonly records lower  $\delta^{13}\text{C}$  than for the more crystalline interiors of the same pillows ( $-23$  to  $-3$  versus  $-7$  to  $+5$ ; Furnes et al., 2001b, 2005; Banerjee and Muehlenbachs, 2003; Furnes and Muehlenbachs, 2003). An opposing trend, however, could be expected from the activity of methanogenic microbes that utilize  $\text{H}_2$  formed during serpentinization and seawater  $\text{CO}_2$  to produce methane with extremely light carbon. The methane escapes the system, leaving behind relatively heavy residual carbon contained in the microbial biomass or its oxidation products. Thus, light  $\delta^{13}\text{C}$

values in carbonates from bioaltered glassy margins rule out methanogenesis as a major process for glass bioalteration.

Microbial activity may also have a profound impact on processes and chemical fluxes during water-rock interaction; the first experimental investigations revealed some profound differences between biotic and abiotic processes. Glass alteration experiments using surface seawater including microbes and sterile controls show substantial differences (Staudigel et al., 1998, 2004): Microbial activity enhances chemical exchange in water-rock reactions (specifically for Sr) and results in higher rates of authigenic mineral production, and it increases the uptake of Ca. Abiotic alteration results in pronounced uptake of Mg and effective removal of Si. Biotic experiments with a natural seawater microbial inoculum at temperatures up to 100 °C showed significant mobility of K, Rb, Cs, Li, B, U, Th, and Pb, where U-Pb fractionation appears to be strongly temperature dependent. While more experiments are needed to explore the biotic and abiotic controls of these processes, first order results show that microbes do have a pronounced effect on glass alteration and that some elements are particularly mobile.

Finding such differences in chemical redistribution patterns from biotic or abiotic water-rock interaction suggests that hydrothermal exchange between seawater and basalt may be different for these two modes of seafloor weathering. This implies that the chemical fluxes from water-rock interaction may have systematically changed as Earth evolved from a pre-biotic state into its present state of biological diversity and total biomass.

## The Geological Context

The geological context and the associated geochemical and mineralogical boundary conditions are very important for the understanding of glass bioalteration.

Bioalteration of glass has been found in any submarine volcanic setting that preserves fresh (or minimally altered) glass, in fast- and slow-spreading crust and ophiolites, in oceanic plateaus, and in greenstone belts of nearly all ages (Table DR1; see footnote 1). In particular, seafloor spreading environments with dramatically different spreading rates offer different boundary conditions for bioalteration, especially with respect to the expected depth of water circulation and the composition of materials in the upper part of the oceanic crust (e.g., Dilek et al., 1998) (Fig. 3). Slow-spreading ridges (e.g., <2.5 cm/yr) show deep-rooted normal faulting that facilitates deep circulation of hydrothermal solutions, and they commonly show exposure of ultramafic rocks (Karson, 1998). At intermediate- to fast-spreading ridges (e.g., ~6–12 cm/yr), ocean crust is more likely to produce thick extrusive sections, without major tectonic disruption (e.g., Sinton and Detrick, 1992).

In order to explore the potential for such differences, Furnes et al. (2006) compared the  $\delta^{13}\text{C}$  variations in bioaltered pillow margins from different ocean basins. The  $\delta^{13}\text{C}$  of finely disseminated carbonates from bioaltered glassy basaltic pillow rims from slow- and intermediate-spreading oceanic crust of the central Atlantic Ocean ranges from  $-17\text{‰}$  to  $+3\text{‰}$  (PDB), whereas those from the faster spreading Costa Rica Rift define a much narrower range and cluster at lighter values between  $-17\text{‰}$  and  $-7\text{‰}$  (Fig. 3). Some ophiolites show a similar  $\delta^{13}\text{C}$  variation; the Jurassic Mirdita ophiolite (Albania) shows a structural architecture similar to that of the slow-spreading central

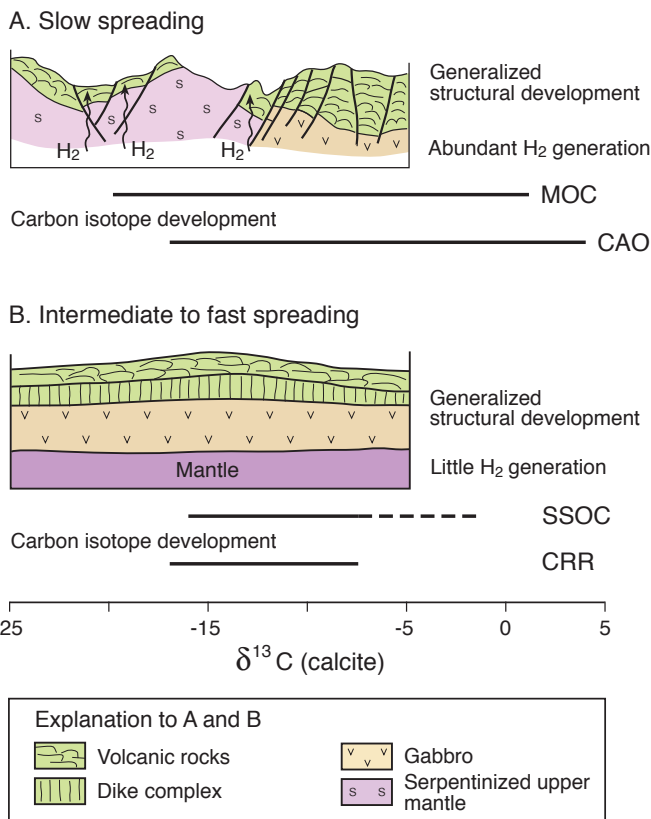


Figure 3. Inferred relationships between the structural development of oceanic crust and carbon isotope signatures. (A) Slow spreading, and (B) intermediate to fast spreading. MOC—Mirdita Ophiolite Complex, Albania; CAO—central Atlantic Ocean; SSOC—Solund-Stavfjord Ophiolite Complex, west Norway; CRR—Costa Rica Rift. Modified from Furnes et al. (2006).

Atlantic Ocean crust and a similar range in  $\delta^{13}\text{C}$  values of biogenic carbonates (Fig. 3). The Late Ordovician intermediate-spreading Solund-Stavfjord Ophiolite Complex (western Norway) also displays  $\delta^{13}\text{C}$  signatures in biogenic carbonates similar to those of the Costa Rica Rift (Furnes et al., 2001b) (Fig. 3). These initial results lead us to speculate about the involvement of H<sub>2</sub> or inorganic methane produced during the serpentinization of shallow ultramafics. This process would be particularly common at slow-spreading ridges and would ultimately lead to the relative enrichment of heavy carbon in the oceanic crust, but details of these processes remain to be explored.

The local geological and hydrological context of bioalteration can provide clues about its environmental controls, such as the exposure to circulating seawater, effective water:rock ratios, temperature, and composition and/or oxygenation of hydrothermal solutions at the time of alteration. Detailed correlations between local geology and bioalteration were made at ocean drilling sites 417 and 418 in the western Atlantic and at sites 504 and 896 at the Costa Rica Rift. Furnes and Staudigel (1999) and Furnes et al. (2001a) made quantitative estimates of bioalteration throughout these sites and compared them with a range of geological context observations. In Figure 4, we have replotted the total bioalteration estimates of Furnes and Staudigel (1999), separately for tubular and for granular alteration

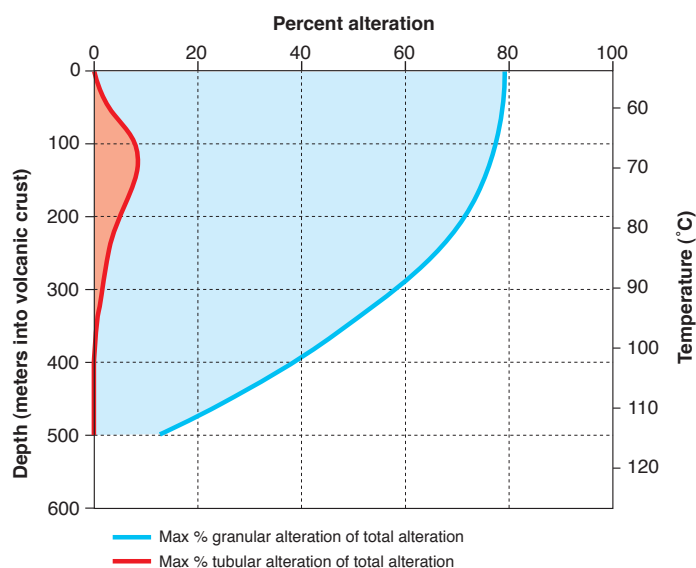


Figure 4. Depth distribution of tubular and granular microbial alteration structures (replotted from Furnes and Staudigel, 1999).

(only totals reported originally), as well as for the downhole temperature measurements at site 504. Several observations can be made in Figure 4:

- The top of the oceanic crust, an environment that is closest to the ocean biosphere, displays only minor amounts of tubular bioalteration. This trend is confirmed by studies of dredged rocks that, so far, have yielded almost no evidence of this style of bioalteration, except for some heavily Mn-encrusted pillows from old seamounts (M. Fisk, 2006, personal commun.).
- The combined tubular and granular alteration features make up ~80% of the glass alteration in the upper 300 m of the oceanic crust, suggesting that microbes are most active in this depth range.
- Overall, tubular alteration makes up a much smaller fraction of the alteration, and it shows a clear maximum at 120 m depth and the current borehole temperature of 70 °C.
- Granular alteration is the dominant form of bioalteration at all depths.

In addition, Furnes and Staudigel (1999) pointed out that the abundance of bioalteration in these sites is also correlated with the abundance of volcanoclastics, high permeability, and secondary minerals that are indicative of a relatively oxygenated environment in the upper part of the oceanic crust.

These observations suggest that optimum conditions for bio-texture formation can be found at ocean crustal depths that are intermediate between the extremely high water:rock ratios at the top of the ocean floor and the more limited water circulation at depths >500 m. Bioalteration textures on the seafloor are most abundant in a temperature range between 20 and 80 °C (Furnes and Staudigel, 1999) and in the presence of more oxygenated fluids. The high abundance of biotextures is likely to imply optimum growth conditions for the responsible microbes.

Bioalteration textures have been found in submarine volcanoes of all ages, as old as the oldest preserved fossils on Earth (Table DR1; see footnote 1). It is important to note, however, that the ages of the host rocks do not necessarily provide an age for the bioalteration because bioalteration textures are cavities that, in principle, could be formed by dissolution any time after the initial quenching of the glass. However, bioalteration cavities in fresh glass may contain mineral precipitates from microbial activity or from later diagenetic or metamorphic reactions. Such minerals offer some help in determining a minimum age for cavity formation. One such mineral, titanite, has been found to replace tubular glass alteration features in the Barberton Greenstone Belt (South Africa; Furnes et al., 2004; Banerjee et al., 2006) and in the Pilbara Craton (NW Australia; Figs. 2A and 2B). Titanite has been found in bioalteration tubes in fresh glass in minimally (zeolite facies) altered pillow basalts from the Mirdita ophiolite (Furnes and Muehlenbachs, 2003), and it is a metamorphic mineral common to greenschist and amphibolite facies in submarine basalts. Furnes et al. (2004) pointed out that the titanite in bioalteration tubes in the Barberton belt is likely to have formed during or prior to a well-dated metamorphic event. They pointed out that the uncertainties of igneous and metamorphic ages overlap and therefore demonstrate that bioalteration textures were formed within a few million years of the eruption of the pillow lavas.

## DISCUSSION

### Impact of Glass Bioalteration

From a geological perspective, the impact of glass bioalteration may be substantial. So far, almost any deep ocean crustal drill hole has yielded bioalteration features in well-preserved glassy margins, independent of the age of the crust. Optimum growth conditions for (glass-bioalteration-) microbes in submarine volcanoes appear to be within the upper 300 m of the oceanic crust and at temperatures between 20 and 80 °C (Furnes and Staudigel, 1999). Such conditions are likely to be found in a substantial depth range of ocean crust, covering ~60% of Earth's surface area and occupying a very large volume of crust.

Glass bioalteration may have substantial effects on global geochemical fluxes because bioalteration is pervasive in the upper oceanic crust throughout the oceans and throughout geological history. In well-studied examples, ~75% of glass alteration in the upper 300 m is microbially mediated (Furnes and Staudigel, 1999). We know from experiments and micro-scale chemical analyses that microbially mediated glass alteration affects the abundances of K, Rb, Cs, U, H, and C and the isotopic ratios of Sr, O, and C (Staudigel et al., 2004). Seafloor alteration has been shown to buffer the composition of many of the elements in seawater. This raises the possibility that microbial activity may also influence the geochemical mass balance between the oceans and the oceanic crust. The recycling of the bioaltered oceanic crust deep into the mantle provides for a geochemical pathway between Earth's biosphere, hydrosphere, and mantle.

The impact of bioalteration on total carbon fixation or total biomass, however, remains elusive. Bach and Edwards (2003) estimated that submarine basalt can provide enough energy to



support a primary production of  $\sim 10^{12}$  g/yr cellular C, providing an upper limit for chemosynthetic carbon fixation in the oceanic crust. However, while we can only speculate about the biomass and the primary productivity in the deep ocean crustal biosphere, the impact may be substantial in terms of its abundance in the geological record and the geochemical fluxes between seawater, the ocean crust, and Earth's mantle.

### Early Life and the Evolution of Glass Bioalteration

Glass bioalteration is among the oldest fossilized evidence for life on Earth, and its textural expressions have remained remarkably similar through geological history. The oldest evidence for glass bioalteration was found in the Pilbara (Figs. 2A and 2B) and Barberton greenstone belts (Furnes et al., 2004; Banerjee et al., 2006), next to the oldest and most primitive forms of microbial life reported from cherts in the same regions (e.g., Westall et al., 2001). Previous evidence for life around submarine volcanoes came from the 3.2 Ga filamentous microfossils in volcanogenic massive sulfide deposits (Nisbet, 2000), suggesting that life has taken a solid footing in hydrothermal vent areas. However, it is quite possible that microbial activity in the oceanic crust may have started well before 3.5 Ga, because a 300–500-m-thick deep ocean crustal biosphere may have provided some protection from early bombardment. For lack of well-preserved fossils, however, the earliest arrival of bioalteration or microbial activity in submarine volcanoes remains unknown.

The association of bioalteration with the earliest life begs the question of what role submarine volcanoes played during the origin of life itself. This role may include the interior of volcanoes as the primary environment where life originated or as a secondary environment where life found shelter or codeveloped with other settings. In either case, the study of early life in submarine volcanoes holds much promise for understanding the origin of life and its environments. Such research is aided by the fact that submarine volcanics offer a rather well-constrained setting, where the geological, chemical, and physical boundary conditions are rather obvious or at least relatively easily reconstructed with confidence.

### CONCLUSIONS

Exploring the interaction between microbes and submarine volcanoes has revealed exciting discoveries but also raised many questions. Discoveries include the depth and connectedness of biosphere, hydrosphere, and lithosphere; the abundance and pervasive nature of microbial glass alteration in submarine volcanoes; and its likely impact on global biomass and biogeochemical fluxes possibly reaching deep into Earth's mantle through subduction. At the same time, there is much uncertainty about many first-order questions about how the deep ocean crustal biosphere works and the consequences of its presence. For example, we still have not isolated any microbes that can be directly related to the formation of tubular alteration. Consequently, we do not understand the nature of these consortia and what controls their function and productivity. We need to quantify chemical fluxes involved in bioalteration and observe how these microbial communities and their geochemical impact evolved through geological time.

Much of the most urgent scientific inquiries require designated biological and geochemical work in active systems, but they also require substantial efforts in studying the geological record. Without the latter, we will never understand the evolution of microbial activity through geological time and its impacts on global geochemical fractionation. This offers powerful reasons for revisiting ophiolites and greenstone belts that have been so yielding toward the understanding of the planet as a physical and chemical heat engine. Science is now focusing on understanding Earth as a bioreactor, and once again submarine volcanoes are key players in the tale of how Earth works with an interconnected biosphere, hydrosphere, and lithosphere.

### ACKNOWLEDGMENTS

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### GENERAL INFORMATION

The Department of Geology and Geography and the Applied Coastal Research Laboratory at Georgia Southern University and GSA's Southeastern Section proudly invite you to participate in this meeting, to be held in Savannah, Georgia, on 29–30 March 2007. GSA is one of the oldest and most prestigious scientific societies in the world, and there is no better place than a GSA Section Meeting to showcase your science results, products, and services to the geoscience market. This meeting is growing in service and value to geoscientists, and we encourage you to join the many other leading academic institutions, businesses, and organizations choosing to be a part of it!

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### REGISTRATION

**Early Registration Deadline: 26 February 2007**

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Registration will be available via GSA's Web site beginning December 2006, and on-site registration will be at the Hyatt Regency during the meeting.

	Early	Standard	One-day
Professional Member	US\$180	US\$190	US\$80
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### CALL FOR PAPERS

**Abstract Deadline: 12 December 2006**

Papers are invited from students and professionals for oral and poster presentations. An individual may present only one volunteered paper; however, a person may be a co-author on other papers. Individuals invited to participate in symposia may present an additional volunteered paper. Abstracts should be submitted online at [www.geosociety.org](http://www.geosociety.org). An abstract submission fee of US\$10 will be charged. If you cannot submit your abstract electronically, please contact Nancy Carlson, +1-303-357-1061, [ncarlson@geosociety.org](mailto:ncarlson@geosociety.org).

### TECHNICAL SESSIONS

Several symposia and theme sessions have already been proposed for the meeting. Anyone interested in proposing additional symposia or theme sessions should contact the technical program chair, Michael S. Kelley, [mkelley@georgiasouthern.edu](mailto:mkelley@georgiasouthern.edu). **The deadline for new session proposals is 1 November 2006.**

### Symposia

1. **Understanding Earth's Interior: Geophysics in the Eastern United States from the Near-Surface to the Mantle.** Cosponsored by *GSA Geophysics Division*. Samuel (Sam) T. Peavy, Georgia Southwestern State University, [speavy@canes.gsw.edu](mailto:speavy@canes.gsw.edu); Rob Hawman, University of Georgia, [rob@3drock.gly.uga.edu](mailto:rob@3drock.gly.uga.edu).
2. **Coastal and Marine Sedimentary Geology in the Southeastern United States: A Session in Honor of Dr. V.J. "Jim" Henry.** Cosponsored by *Applied Coastal*

*Research Laboratory; Skidaway Institute of Oceanography.* Clark Alexander, Skidaway Institute of Oceanography, clark.alexander@skio.usg.edu.

3. **Teaching Organic Evolution for K–16 Students and Pre-Service Teachers: Viewpoints, Techniques, and Approaches.** Cosponsored by *National Association for Geoscience Teachers; Southeastern Section, Paleontological Society.* Michael A. Gibson, University of Tennessee–Martin, mgibson@utm.edu; Colin Sumrall, University of Tennessee, csumrall@utk.edu.
4. **Hydrostratigraphy and Hydrostratigraphic Nomenclatural Problems in the Southeastern U.S. Coastal Plain.** Cosponsored by *GSA Hydrogeology Division; Florida Geological Survey–Dept. of Environmental Protection.* Thomas M. Scott, Florida Geological Survey, Florida Dept. of Environmental Protection, thomas.scott@dep.state.fl.us; Rick Copeland, Florida Geological Survey, Florida Dept. of Environmental Protection, rick.copeland@dep.state.fl.us.
5. **Cenozoic Tectonics in the Southeastern United States.** Cosponsored by *GSA Structural Geology and Tectonics Division.* Kevin Stewart, University of North Carolina, kgstewar@email.unc.edu; Charles H. (Chuck) Trupe, Georgia Southern University, chtrupe@georgiasouthern.edu.

#### Theme Sessions

1. **Building Strong Geoscience Departments in the Southeast.** Dallas D. Rhodes, Georgia Southern University, drhodes@georgiasouthern.edu; Geoff Feiss, College of William and Mary, pgfeis@wm.edu.
2. **Oh! Southern Skies: Latest Results in Southeastern Planetary Science.** Cosponsored by *GSA Planetary Geology Division.* Michael S. Kelley, Georgia Southern University, mkelley@georgiasouthern.edu; Nicholas Lang, University of Tennessee at Knoxville, nlang1@utk.edu.
3. **Place-Based Case Studies in Geoscience Education (Posters).** Cosponsored by *Southeastern Section, National Association for Geoscience Teachers.* John R. Wagner, Clemson University, jrwnr@clemson.edu; Thomas Hanley, Columbus State University, hanley\_tom@yahoo.com.
4. **Geologic Maps, Digital Geologic Maps, and Derivatives from Geologic Maps (Posters).** Michael W. Higgins, The Geologic Mapping Institute, mhiggins@mindspring.com; Ralph F. Crawford, The Geologic Mapping Institute, crawford@sprintmail.com.
5. **Geology in the Public Interest.** Cosponsored by *GSA Geology and Society Division.* William E. Jones, Savannah River National Laboratory, w02.jones@srnl.doe.gov; Walter J. “Jerry” Sexton, Athena Technologies, walter\_sexton@athenatechnologies.com.
6. **Undergraduate Research (Posters).** Cosponsored by *Council for Undergraduate Research.* Brannon Anderson, Furman University, brannon.anderson@furman.edu; Jeff Ryan, University of South Florida, ryan@chuma.cas.usf.edu.
7. **Southeastern U.S. Earthquakes: Then and Now.** Norman Levine, College of Charleston, levinen@cofc.edu; Briget Doyle, College of Charleston, doyleb@cofc.edu; Steven Jaume, College of Charleston, jaumes@cofc.edu.
8. **Geospatial Technology Applications for Geologic and Environmental Mapping, Monitoring, and Risk Assessment (Posters).** Rebecca Dodge, University of West Georgia, rdodge@westga.edu.
9. **Economic Geology: Industrial and Metallic Mineral Resources.** R. Kelly Vance, Georgia Southern University, rkvance@georgiasouthern.edu; Mark G. Adams, Unimin Corporation, madams@unimin.com.
10. **Fluvial Geomorphology and Watershed Studies in the Eastern United States.** Cosponsored by *GSA Quaternary Geology and Geomorphology Division.* Suresh Muthukrishnan, Furman University, suresh.muthukrishnan@furman.edu; Ben Odhiambo Kisila, University of Mary Washington, bkisila@umw.edu.
11. **Sea Level in the Southeast: Past, Present, and Future.** Cosponsored by *Eastern Section, Society for Sedimentary Geology (SEPM).* Gale Bishop, South Dakota School of Mines and Technology, gale.bishop@sdsmt.edu.
12. **Geologic Hazards of the Southeastern U.S. Region.** Norman Levine, College of Charleston, levinen@cofc.edu; Briget Doyle, College of Charleston, doyleb@cofc.edu; Steven Jaume, College of Charleston, jaumes@cofc.edu.
13. **Igneous and Metamorphic Petrology in the Southern Appalachians.** Sam Swanson, University of Georgia, sswanson@uga.edu; Loren Raymond, Appalachian State University, raymondla@appstate.edu.
14. **Structural Geology, Metamorphism, and Geochronology of the Southern Appalachian Blue Ridge.** Charles H. Trupe, Georgia Southern University, chtrupe@georgiasouthern.edu; Mark Steltenpohl, Auburn University, steltmg@auburn.edu.
15. **Characterization of the Southeast Continental Shelf: Its Geology and Ecology.** Leslie Sautter, College of Charleston, sautterl@cofc.edu; Gorka Sancho, College of Charleston, sanhog@cofc.edu.
16. **Designing Engaging Field Experiences in the Southeast.** Cosponsored by *Southeastern Section, National Association for Geoscience Teachers.* Kent Ratajeski, University of West Georgia, kratajes@westga.edu.
17. **Integration of New Techniques and Technology to Geologic Problems in the Southeastern U.S. Region.** Norman Levine, College of Charleston, levinen@cofc.edu; Briget Doyle, College of Charleston, doyleb@cofc.edu.
18. **“Great” Unconformities in the Appalachians: Their Temporal and Tectonic Significance.** Chuck Bailey, College of William and Mary, cmbail@wm.edu.; William Thomas, University of Kentucky, geowat@uky.edu.
19. **Using Geographic Information Technology for Geoscience Education (Posters).** Cosponsored by *Southeastern Section, National Association for Geoscience Teachers.* Wei Tu, Georgia Southern University, wtu@georgiasouthern.edu.
20. **Surface and Groundwater Interactions on the Southeastern Coastal Plain (Posters).** James Reichard, Georgia Southern University, jreich@georgiasouthern.edu.
21. **Environmental Mineralogy in Coastal Plain Sediments.** Miles Denham, Savannah River National Laboratory, milesdenham@srnl.doe.gov; John Seaman, Savannah River Ecology Laboratory, seaman@srel.edu.

# Southeastern

22. **Mafic and Ultramafic Rocks of the Southern Appalachians: New Insights and Tectonic Implications.** Jeff Ryan, University of South Florida, ryan@shell.cas.usf.edu.

## FIELD TRIPS

Field trips to the Okefenokee Swamp, barrier islands, igneous and metamorphic rocks of the Blue Ridge and Piedmont, and heavy sand deposits will be part of the 2007 meeting. Anyone interested in proposing field trips should contact field trip co-chairs Fred Rich, frich@georgiasouthern.edu, or Clark Alexander, clark.alexander@skio.usg.edu.

## Premeeting

1. **Transgressive Barrier Island Features of St. Catherines Island, Georgia.** 26–28 March. Gale A. Bishop, South Dakota School of Mines and Technology, gale.bishop@sdsmt.edu; B. Rollins, University of Pittsburgh, haroldrollins@lycos.com; Fred Rich, Georgia Southern University, frich@georgiasouthern.edu; R. Kelly Vance, Georgia Southern University, rkvance@georgiasouthern.edu.
2. **Geological Transect and Structural Characteristics of the Piedmont-Coastal Plain Provinces, Augusta to Savannah.** 27–28 March. M.J. Bartholomew, University of Memphis, jbthlm1@memphis.edu; Fred Rich, Georgia Southern University, frich@georgiasouthern.edu.
3. **Mafic-Ultramafic Rock Associations of the Cullowhee-Cartoogechaye Terrane, Central Blue Ridge.** 27–28 March. Jeff Ryan, University of South Florida, ryan@chuma.cas.usf.edu; Steve Yurkovich, Western Carolina University, yurkovich@wcu.edu; Virginia Peterson, Grand Valley State University, petersvi@gvsu.edu.

## Postmeeting

4. **Pleistocene Barrier Island Deposits and Their Relationship to Heavy-Mineral Deposits.** 30 March–1 April. W. Pirkle, University of South Carolina–Aiken, billp@usca.edu; F. Pirkle, Gannet Fleming, Jacksonville, Fla.
5. **Neoproterozoic Arc Terranes of the Eastern Piedmont of South Carolina and Georgia, and Their Alleghenian Tectonothermal Overprint.** 31 March. Allen Dennis, University of South Carolina–Aiken, allend@usca.edu; Don T. Secor, Jr., University of South Carolina–Columbia.
6. **Geological and Biological Histories of the Okefenokee Basin.** 31 March. Fred Rich, Georgia Southern University, frich@georgiasouthern.edu; R. Kelly Vance, Georgia Southern University, rkvance@georgiasouthern.edu.
7. **Tybee and Wassaw Islands—Comparing Developed and Undeveloped Barrier Islands.** 31 March. Clark Alexander, Skidaway Institute of Oceanography, clark.alexander@skio.usg.edu.

## WORKSHOPS

1. **Basic HAZUS MH (multi-hazard) Overview.** Half-day, Wed., 28 March. J. Clayton Wine, Charleston Country Building Services, jcwine@charlestoncountry.org; Norman S. Levine, College of Charleston, levinen@cofc.edu.
2. **Using Environmental Observations and Earth Systems Perspectives to Enhance Standards-Based Science Education in Georgia.** Full-day, Wed., 28 March.

Rebecca L. Dodge, University of West Georgia, rdodge@westga.edu; Randa Harris, University of West Georgia.

3. **The Correlation of the Georgia Performance Standards to Topics in Paleontology.** Cosponsored by *Southeastern Section, National Association of Geoscience Teachers.* Full-day, Fri., 30 March. Gregory Bailey, Whitfield County Schools, gbailey@whitfield.k12.ga.us; Pamela Gore, Georgia Perimeter College, pgore@gpc.edu.

## GUEST PROGRAM

Several guest and spouse programs are being organized by the local committee. For more information, contact the local committee chair, Pranoti Asher, pasher@georgiasouthern.edu.

1. **Lunch at Lady and Sons Restaurant.** The Lady and Sons Restaurant is two blocks from the convention hotel and features Food Network chef Paula Deen's famous southern home-cooking: fried chicken, collard greens, and other southern delicacies.
2. **Savannah River Cruise.** Savannah is a river town, so what better way to get an overview of her harbor and port than to cruise with the River Street Riverboat Company? The 400-passenger Savannah River Queen and the 600-passenger Georgia Queen are triple-decker, red, white, and blue stern-wheel vessels that offer a variety of tours throughout the harbor. Choose the popular narrated sight-seeing cruise and/or the dinner entertainment cruise.
3. **The "Book" Tour.** Experience Savannah by deluxe minibus, where it's midnight all day long. Discover the secrets of John Berendt's *Midnight in the Garden of Good and Evil*. Be captivated by the story and the colorful characters at the center of this saga about a journalist's experience with one of Savannah's sensational murder trials. A walk through Bonaventure Cemetery, the original home of the infamous "Bird Girl" statue featured on the cover of "The Book," is included.
4. **Historic District Tour.** A walking tour of the historic district is the most delightful way to discover this oak-shaded coastal city rich with history, architecture, ironwork, and local culture and cuisine.
5. **Ghost Tour of Historic Savannah.** A walking tour with a spine-tingling presentation of stories about people, history, ghosts, and stories from Savannah's spectral past.
6. **Birding Trip to Jekyll and St. Simons Islands.** Full-day trip, Fri., 30 March. Jekyll Island and St. Simons Island are considered two of the best birding spots along the Georgia coast, worth visiting any time of the year. A number of species have been observed on these barrier islands which serve as resting places in the spring and fall for migrating species on the Atlantic Flyway. Attendees will look for waders, early migrants, herons, and storks.

## TRANSPORTATION AND DIRECTIONS

Savannah is near Interstate 95 in southeastern Georgia and has air transport through the Savannah–Hilton Head International Airport (Airport code: SAV). This airport is served by Delta–Delta Connection, United Express, AirTran, Continental Express, Northwest Airlines, and USAirways. Car rental is available through most major car rental companies. Taxies and limousines are also available. The Hyatt is ~8 miles south of the Airport.

**Directions**

**From Savannah International Airport or North of Savannah:** Take I-95 South to I-16 East. Exit at Montgomery Street. Turn right on Bay Street.

**From Florida:** Take I-95 North to I-16 East. Exit at Montgomery Street. Turn right on Bay Street.

**From West of Savannah:** Take I-16 East. Exit at Montgomery Street. Turn right on Bay Street.

**The hotel** is three blocks down on Bay Street, on the left.

**CALL FOR SPONSORS**

GSA's Southeastern Section welcomes sponsors to help defray the costs of the meeting. We are seeking partial or full support for the welcoming party (6–9 p.m. at the Hyatt, 28 March 2007) and morning and afternoon refreshments (29–30 March). When your company or organization sponsors an event, it will be prominently recognized at that event. For more information please contact Dallas Rhodes, drhodes@georgiasouthern.edu.

**EXHIBITOR INFORMATION****Exhibitor Registration Deadline: 1 February 2007.**

This meeting will attract a wide array of both applied and academic geoscientists from the southeastern region, providing exhibitors with an excellent opportunity to interact with potential customers, colleagues, and students. The exhibit area will be located in the beautiful Harborside Center at the Hyatt, overlooking the Savannah River and the historic River Street district, ensuring maximum exposure to a majority of the attendees. The fee for companies will be US\$275; for academic/non-profit organizations/geoscience associations it will be US\$100. A 6-foot table clothed and draped will be available along with two chairs per table. Electrical outlets, phone lines, and Internet access will be available at extra cost after the booth has been assigned. Please direct all your inquiries to Pranoti Asher, pasher@georgiasouthern.edu.

**STUDENT TRAVEL GRANTS**

Travel grants are available from the GSA Southeastern Section and the GSA Foundation for both undergraduate and graduate students who are presenting papers or poster sessions and are GSA Student Members. Information and applications are available at <http://core.ecu.edu/geology/neal/segga/travel.html> or via a link on the GSA Web site, [www.geosociety.org/sectdiv/southe/](http://www.geosociety.org/sectdiv/southe/).

**MENTORING PROGRAMS**

**Roy J. Shlemon Mentor Program in Applied Geoscience.** Sponsored by *GSA Foundation*. Thurs.–Fri., 29–30 March, 11:30 a.m.–1 p.m.

**The John Mann Mentors in Applied Hydrogeology Program.** Sponsored by *GSA Foundation*. Thurs., 29 March, 5–6:30 p.m.

For details, go to [www.geosociety.org/students.htm](http://www.geosociety.org/students.htm) or contact Jennifer Nocerino, [jnocerino@geosociety.org](mailto:jnocerino@geosociety.org).

**STUDENT VOLUNTEERS**

The local committee and section officers of GSA's Southeastern Section would like to extend the opportunity for free registration to a limited number of students. We rely on student volunteers to help meetings run smoothly, and, to show

our gratitude, we are pleased to offer student volunteers free registration for the meeting in return for ~6 hours of volunteer work. The deadline for volunteering for SE GSA is 1 February 2007. Contact student volunteer coordinator Chuck Trupe, [chtrupe@georgiasouthern.edu](mailto:chtrupe@georgiasouthern.edu), for more information.

**SPECIAL MEETINGS**

The following is a preliminary list of business meetings and other special events tentatively scheduled during the 2007 meeting. Please contact each representative for more information.

**SE GSA Management Board Meeting.** 4–6 p.m., Wed., 28 March, Westbrooke Room at the Hyatt. Contact Don Neal, [neald@ecu.edu](mailto:neald@ecu.edu), for more information.

**Welcoming Party.** 6–9 p.m., Wed., 28 March, Harborside East, Hyatt Regency Savannah. The welcoming reception and nearby open exhibits will help start off the meeting. Light hors d'oeuvres, one complimentary drink, and a cash bar will be available. Come visit with friends and colleagues. The registration desk will be open from 5–9 p.m. this evening.

**SE GSA Campus Liaison Breakfast.** 6:30–8:30 a.m., Thurs., 29 March. Location TBD. Contact Gary Lewis, [glewis@geosociety.org](mailto:glewis@geosociety.org), for more information.

**SE NAGT Business Meeting.** Noon, Thurs., 29 March. Meet in the lobby of the Hyatt. Contact Pamela Gore, [pgore@gpc.edu](mailto:pgore@gpc.edu), for more information.

**Eastern Section, Society for Sedimentary Geology (ES-SEPM) Reception and Business Meeting.** Keynote address by Mary J. Kraus, global SEPM president-elect. 5–6 p.m., Thurs., 29 March. Location TBD. Contact Bosiljka Glumac, [bglumac@email.smith.edu](mailto:bglumac@email.smith.edu), for more information.

**SE GSA Earth Science Department Chairs Luncheon.** Noon–1:30 p.m., Fri., 30 March. Location TBD.

**Georgia Southern University Geology and Geography Alumni Party.** 6 p.m., Fri., 30 March. Moon River Brewing Company, Bay Street, Savannah, located across from the Hyatt.

**ACCESSIBILITY**

GSA is committed to ensuring full participation for conference attendees with disabilities at all events. Every attempt is made for full compliance with the Americans with Disability Act. You may indicate special requirements on your registration form; please inform the local organizing committee of these requirements at least one month prior to the meeting. Accessible rooms are available and can be reserved.

**ADDITIONAL INFORMATION OR QUESTIONS?**

For further information, or if you have special requirements, please contact the local committee chair, Pranoti M. Asher, [pasher@georgiasouthern.edu](mailto:pasher@georgiasouthern.edu), Georgia Southern University, Department of Geology and Geography, Statesboro, Georgia 30460-8149, USA, +1-912-681-0338.



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## JOINT MEETING

41st Annual Meeting, North-Central Section, GSA  
41st Annual Meeting, South-Central Section, GSA

Lawrence, Kansas

11–13 April 2007

<http://www.kgs.ku.edu/Conferences/GSA07/index.html>

The Kansas Geological Survey and the University of Kansas departments of geology and geography will host the 2007 joint annual meetings of the South-Central and North-Central Sections of the Geological Society of America. The sections will meet Wed.–Fri., 11–13 April, at the Kansas Union on the University of Kansas campus, Lawrence, Kansas.

**Lawrence, Kansas**, with a population of 88,000, ~35 miles west of Kansas City, and is located in a terrane of gently westward-dipping Pennsylvanian strata. The intersection of the Oread Escarpment with the Kansas and Wakarusa River valleys at Lawrence highlights a cuesta landscape, featuring rolling hills and beautiful vistas. The KU central campus is on the dip slope rim of the Oread Escarpment, and can be seen for miles when approaching from the east and south. Mid-April is a delightful time to visit Lawrence and the KU campus. Beautiful and historic downtown Lawrence is located at the foot of the Oread Escarpment, just to the east of the KU campus. Lawrence has a vibrant arts community and a wonderful downtown shopping, dining, and bar district with commercial and public art galleries, the Watkins Museum, and a variety of live music venues. Other restaurants, bars, and shopping centers are spread throughout the city.

### TRAVEL AND TRANSPORTATION

Lawrence is located along the Kansas Turnpike (I-70). Air travelers to Lawrence should use Kansas City International Airport (MCI) for air transportation and rental car services. Kansas City International Airport is only a one-hour drive (49 miles) from Lawrence. Airport shuttle service to Lawrence is provided by Kansas Transportation Service Inc., +1-877-942-0544, and KCI Roadrunner, +1-800-826-8294. Contact these providers prior to traveling for times and pickup information. Amtrak offers two trains per day (one westbound and one eastbound) to Lawrence. Travelers by rail should plan ahead for taxi or other pickup at the Amtrak station, because no services are available at the station.

### ACCOMMODATIONS

Blocks of rooms have been reserved at the Best Western Lawrence, Hampton Inn, Holiday Inn Holidayhome, Holiday Inn Express, and Eldridge Inn. Details will be published in the January 2007 *GSA Today*.

### REGISTRATION

**Early Registration Deadline: 12 March 2007**

**Cancellation Deadline: 19 March 2007**

GSA Headquarters will handle meeting registration, and registration will be available online at [www.geosociety.org](http://www.geosociety.org) starting January 2007. On-site registration will be at the Kansas Union on the University of Kansas campus during the meeting.

### STUDENT AWARDS

Awards will be given for the best student presentations. To be eligible, students must be lead authors and presenters, and should be capable of answering detailed questions about their research.

### STUDENT SUPPORT

Travel grants are available from the South-Central and North-Central Sections in cooperation with the GSA Foundation for students who are presenting oral or poster papers. To be eligible, students must be GSA Members. Students from the South-Central and North-Central Sections should apply to their respective sections. Students from other sections should apply to either the South-Central or North-Central Section, whichever is geographically closer. Please visit [www.geosociety.org/sect-div/sections.htm](http://www.geosociety.org/sect-div/sections.htm) for details regarding application.

### CALL FOR PAPERS

**Abstract Deadline: 23 January 2007**

Papers are invited from students and professionals for oral and poster presentations in general discipline sessions, topical sessions, and symposia. An individual may present only one volunteered paper; however, a person may be a co-author on other papers. Individuals invited to participate in symposia may present an additional volunteered paper. Abstracts can be submitted online through GSA's Web site, [www.geosociety.org](http://www.geosociety.org). An abstract submission fee of US\$10 will be charged. If you cannot submit your abstract electronically, please contact Nancy Carlson, +1-303-357-1061, [ncarlson@geosociety.org](mailto:ncarlson@geosociety.org).

### TECHNICAL PROGRAM

#### Symposia

1. **Pander Society Symposium—Mixed-Up Conodonts: Extracting Useful Information and Solving Geologic Puzzles Using Stratigraphic Leaks and Redeposited Faunas.** Cosponsored by *Pander Society*; *Paleontological Society*. James Miller, Missouri State University, [jimmiller@missouristate.edu](mailto:jimmiller@missouristate.edu); Stephen Leslie, University of Arkansas at Little Rock, [saleslie@ualr.edu](mailto:saleslie@ualr.edu).
2. **Roger L. Kaesler—Scientist and Editor: His Contributions to Paleontology through Research and the *Treatise on Invertebrate Paleontology*.** Cosponsored by *Paleontological Society*. Bruce S. Lieberman, University of Kansas, [blieber@ku.edu](mailto:blieber@ku.edu).



## Theme Sessions

1. **Microbial Methane Energy Resources.** George W. Shurr, GeoShurr Resources, LLC, geoshurr@frontiernet.net; Fred J. Anderson, North Dakota Geological Survey, fjanderson@state.nd.us.
2. **Hydrothermal Processes in Midcontinent Sedimentary Rocks.** Cosponsored by *Great Lakes Section, Society for Sedimentary Geology (SEPM)*. John Luczaj, University of Wisconsin–Green Bay, luczajj@uwgb.edu; Robert H. Goldstein, University of Kansas, gold@ku.edu.
3. **Applications of Stable Isotopes to Modern and Quaternary Environmental Issues.** William C. Johnson, University of Kansas, wcj@ku.edu; Luis Gonzalez, University of Kansas, lgonzlez@ku.edu.
4. **Identification of Environmental Processes Using Isotopic Tracers.** Margaret Townsend, Kansas Geological Survey, townsend@kgs.ku.edu; Roy Spalding, University of Nebraska–Lincoln, rspalding1@unl.edu.
5. **Groundwater Flow and Transport Processes in Carbonate Aquifers.** Martin Appold, University of Missouri–Columbia, appoldm@missouri.edu; Carol Wicks, University of Missouri–Columbia, wicksc@missouri.edu.
6. **Early Pleistocene Glaciation of the Central Plains.** Wakefield Dort, University of Kansas.
7. **Loess and Paleoenvironments.** Randall Schaetzl, Michigan State University, soils@msu.edu.
8. **Geoarchaeological and Geomorphological Explorations in the Midcontinent: In Honor of Wakefield Dort Jr.** William I. Woods, University of Kansas, wwoods@ku.edu; Rolfe D. Mandel, Kansas Geological Survey, mandel@kgs.ku.edu; William C. Johnson, University of Kansas, wcj@ku.edu.
9. **Geophysics in the Midcontinent (Posters).** Kevin Mickus, Missouri State University, kevinmickus@missouristate.edu.
10. **Community-Based Service Learning in the Geosciences.** Cosponsored by *Central Section, National Association of Geoscience Teachers*. Kathleen Bower, Eastern Illinois University, kmbower@eiu.edu.
11. **Issues in Geoscience Education.** Cosponsored by *Central Section, National Association of Geoscience Teachers*. Annabelle Foos, University of Akron, afoos@uakron.edu.
12. **Strategies for Success in Bridging the Gap between Culture, Religion, and Science in the Geoscience Classroom.** Sadredin C. Moosavi, Walden University, smoosavi@waldenu.edu; Elizabeth Heise, University of Texas at Brownsville, eheise@utb.edu.
13. **Undergraduate Research (Posters).** Cosponsored by *Geoscience Division, Council on Undergraduate Research*. Robert Shuster, University of Nebraska–Omaha, robert\_shuster@mail.unomaha.edu.
14. **Medical Mineralogy Session and Panel Discussion.** A. Umran Dogan, Ankara University, Turkey, and University of Iowa, umran-dogan@uiowa.edu; Meral Dogan, Hacettepe University, Turkey, meralmdogan@hotmail.com.
15. **Traces of Life: Micro- to Macroscopic Evidence of Past and Present Biogenic Activity and Their Implications for Marine and Continental Settings.** Cosponsored by *Paleontological Society*. Stephen T. Hasiotis, University of Kansas, hasiotis@ku.edu; Jennifer A. Roberts, University of Kansas, jaroberts@ku.edu; David Fowle, University of Kansas, fowle@ku.edu.
16. **Fossils and Modern Analogs: Using Modern Organisms to Improve Paleontological Interpretations.** Cosponsored by *Paleontological Society*. Daniel I. Hembree, Ohio University, hembree@ohio.edu; Brian F. Platt, University of Kansas, bfplatt@ku.edu; Jon J. Smith, University of Kansas, jjsmith@ku.edu.
17. **Paleontologic Deviates: Taphonomy and Pathology.** Cosponsored by *Paleontological Society*. Bruce Rothschild, Northeastern Ohio Universities College of Medicine, bmr@ku.edu; Larry Martin, University of Kansas, ldmartin@ku.edu.
18. **Systematic Paleontology in the 21st Century: Analyzing Evolution, Diversity, and Beyond.** Cosponsored by *Paleontological Society*. Alycia L. Stigall, Ohio University, stigall@ohio.edu.
19. **Sequence Stratigraphy and Biostratigraphy of Pennsylvanian–Lower Permian Cyclothems in the North American Midcontinent.** Cosponsored by *Paleontological Society*. Gregory P. Wahlman, BP America, gregory.wahlman@bp.com; Philip H. Heckel, University of Iowa, philip-heckel@uiowa.edu.
20. **The Legacy of Raymond Cecil Moore (1892–1974): The 20th Century’s Paleontologist-Stratigrapher Laureate.** Daniel F. Merriam, University of Kansas, dmerriam@kgs.ku.edu; Paul Enos, University of Kansas, enos@ku.edu.
21. **Neogene Depositional Environments, Paleoclimatology and Stratigraphic Architecture of the Succession Forming the High Plains Aquifer.** P. Allen Macfarlane, Kansas Geological Survey, dowser@kgs.ku.edu; Greg Ludvigson, Kansas Geological Survey, gludvigson@kgs.ku.edu; Marios Sophocleous, Kansas Geological Survey, marios@kgs.ku.edu.
22. **Upper Paleozoic Depositional Systems, Cyclo- and Sequence-Stratigraphic Architecture, and their Controls on Hydrocarbon Reservoirs in the U.S. Midcontinent.** Wan Yang, Wichita State University, wan.yang@wichita.edu; Salvatore J. Mazzullo, Wichita State University, salvatore.mazzullo@wichita.edu.
23. **Insights from Cretaceous-Paleogene Paleoenvironments and Deposition: Glimpses of the Greenhouse.** Brian J. Witzke, Iowa Geological Survey, bwitzke@igsb.uiowa.edu; Greg A. Ludvigson, Kansas Geological Survey, gludvigson@kgs.ku.edu. Oral and Poster.
24. **Geologic Framework of the U.S. Continental Interior.** Mary Hubbard, Kansas State University, mhub@ksu.edu; Daniel Holm, Kent State University, dholm@kent.edu; Stephen Marshak, University of Illinois, smarthak@uiuc.edu.

## WORKSHOPS

1. **Advancing Understanding of Groundwater Concepts Using Simulation and Role-Play in the Plume Busters Software.** Sat., 14 April, 8:30 a.m.–12:30 p.m. P. Allen Macfarlane, Kansas Geological Survey, dowser@kgs.ku.edu; Margaret Townsend, Kansas Geological Survey, townsend@kgs.ku.edu; Geoff Bohling, Kansas Geological Survey, geoff@kgs.ku.edu.

## North-Central, South-Central

2. **Developing Professional Development Opportunities for K–12 Teachers in Earth Science.** Cosponsored by *Central Section, National Association of Geoscience Teachers*. Sat., 14 April, 8:30 a.m.–noon. Kathleen Bower, Eastern Illinois University, [kmbower@eiu.edu](mailto:kmbower@eiu.edu); Sallie Greenberg, Illinois State Geological Survey, [greenberg@igs.uiuc.edu](mailto:greenberg@igs.uiuc.edu).

### SHORT COURSE

1. **SEPM Short Course Number 51: Recognizing Continental Trace Fossils in Outcrop and Core.** Cosponsored by *Paleontological Society; Society for Sedimentary Geology (SEPM)*. Sat., 14 April, 8:30 a.m.–5 p.m. Stephen T. Hasiotis, University of Kansas, [hasiotis@ku.edu](mailto:hasiotis@ku.edu).

### FIELD TRIPS

1. **Sequence Stratigraphy, Biostratigraphy, and Chronostratigraphy of the Virgilian Stage, Northern Midcontinent.** Mon.–Tues., 9–10 April. Darwin Boardman, Oklahoma State University, [darwin.boardman@okstate.edu](mailto:darwin.boardman@okstate.edu).
2. **Fluvial-Estuarine Deposition in the Mid-Cretaceous Dakota Formation, Kansas and Nebraska.** Tues., 10 April. R. Matt Joeckel, University of Nebraska–Lincoln, [rjoeckel@unlnotes.unl.edu](mailto:rjoeckel@unlnotes.unl.edu); Greg Ludvigson, Kansas Geological Survey, [gludvigson@kgs.ku.edu](mailto:gludvigson@kgs.ku.edu).
3. **Geology and Industrial Use of the Lamproid Occurrences in Southeast Kansas.** Tues., 10 April. Pieter Berendsen, Kansas Geological Survey, [pieterb@kgs.ku.edu](mailto:pieterb@kgs.ku.edu).
4. **The Weaubleau and Decaturville Impact Structures in West-Central Missouri: Sorting Out Their Ages Using Redeposited Conodonts and Crinoids in Breccias.** Cosponsored by *Pander Society; Paleontological Society*. Fri. evening–Sat., 13–14 April. James Miller, Missouri State University, [jimmiller@missouristate.edu](mailto:jimmiller@missouristate.edu); Kevin Evans, Missouri State University, [kevinevans@missouristate.edu](mailto:kevinevans@missouristate.edu).
5. **Sequence Stratigraphy of Delta-Dominated, Mixed Carbonate-Siliciclastic Depositional Systems of the Upper Pennsylvanian Ochelata Group, Oklahoma and Kansas.** Fri. evening–Sun., 13–15 April. Peter Holterhoff, Texas Tech University, [peter.holterhoff@exxonmobil.com](mailto:peter.holterhoff@exxonmobil.com); Tim Demko, University of Minnesota–Duluth, [tdemko@umn.edu](mailto:tdemko@umn.edu).
6. **Geoarchaeology and Alluvial Stratigraphy of the Claussen Paleoarchaic Site.** Half-day, Sat., 14 April. Rolfe Mandel, Kansas Geological Survey, [mandel@kgs.ku.edu](mailto:mandel@kgs.ku.edu); Jack Hofman, [hofman@ku.edu](mailto:hofman@ku.edu).

### MENTORING PROGRAMS

**Roy J. Shlemon Mentor Program in Applied Geoscience.** Sponsored by *GSA Foundation*. Thurs.–Fri., 12–13 April, 11:30 a.m.–1 p.m.

**The John Mann Mentors in Applied Hydrogeology Program.** Sponsored by *GSA Foundation*. Thurs., 12 April, 5–6:30 p.m.

For details, go to [www.geosociety.org/students.htm](http://www.geosociety.org/students.htm) or contact Jennifer Nocerino, [jnocerino@geosociety.org](mailto:jnocerino@geosociety.org).

### ACTIVITIES

**Welcoming Reception.** Wed., 11 April, 5:30–7:30 p.m., Ballroom, Kansas Union, University of Kansas.

**Great Lakes SEPM and Paleontological Society Luncheon.** Thurs., 12 April, noon–1 p.m.

**Central Section, National Association for Geoscience Teachers (NAGT) Luncheon and Business Meeting.** Fri., 13 April, noon–1 p.m.

**South-Central Section GSA Management Board Meeting.** Thurs., 12 April, 4–5 p.m.

**South-Central Section GSA Business Meeting.** Thurs., 12 April, 5:30–7 p.m.

**North-Central Section GSA Management Board Meeting.** Wed., 11 April, 7–8 a.m.

**North-Central Section GSA Business Meeting.** Thurs., 12 April, 5:30–7 p.m.

### ACCESSIBILITY

GSA is committed to making its meetings accessible to all people interested in attending. Please indicate special requirements (wheelchair accessibility, etc.) on your registration form.

### EXHIBITORS

Exhibit booths will be available at this meeting for universities, government, and companies. For further information, please contact Gregory Ohlmacher, Gregory Ludvigson, Allen Macfarlane, or Matt Joeckel.

### CONTACT INFORMATION

Requests for information should be addressed to the meeting chairs, Gregory C. Ohlmacher, +1-785-864-2194, [ohlmac@kgs.ku.edu](mailto:ohlmac@kgs.ku.edu), and Gregory Ludvigson, +1-785-864-2734, [gludvigson@kgs.ku.edu](mailto:gludvigson@kgs.ku.edu), or the meeting vice-chairs, Allen Macfarlane, +1-785-864-2068, [dowser@kgs.ku.edu](mailto:dowser@kgs.ku.edu), and R. Matt Joeckel, University of Nebraska–Lincoln, +1-402-472-7520, [rjoeckel@unlnotes.unl.edu](mailto:rjoeckel@unlnotes.unl.edu). Technical program questions should be addressed to Marios Sophocleous, +1-785-864-2113, [marios@kgs.ku.edu](mailto:marios@kgs.ku.edu), or Tracy Frank, University of Nebraska–Lincoln, +1-402-472-9799, [tfrank2@unl.edu](mailto:tfrank2@unl.edu). The mailing address for Ohlmacher, Ludvigson, Macfarlane, and Sophocleous is Kansas Geological Survey, 1930 Constant Ave., Lawrence, Kansas 66047, USA.

Additional information on the technical program, including descriptions of the field trips, symposia, and theme sessions can be found at [www.kgs.ku.edu/Conferences/GSA07/index.html](http://www.kgs.ku.edu/Conferences/GSA07/index.html).



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Call for Geological Papers

# 2007 GSA Section Meetings

## Northeastern Section

12–14 March 2007

University of New Hampshire  
Durham, New Hampshire

**Abstract Deadline: 5 December 2006**

**Information:** Wally Bothner, University of New Hampshire, Dept. of Earth Sciences, James Hall, 56 College Rd., Durham, NH 03824-3578, USA, +1-603-862-3143, wally.bothner@unh.edu.

## Southeastern Section

29–30 March 2007

Hyatt Regency Savannah on the Historic Riverfront  
Savannah, Georgia

**Abstract Deadline: 12 December 2006**

**Information:** Pranoti Asher, Georgia Southern University, Dept. of Geology and Geography, Statesboro, GA 30460-8149, USA, +1-912-681-0338, pasher@georgiasouthern.edu.

## Joint Meeting North-Central and South-Central Sections

11–13 April 2007

Kansas Memorial Union, University of Kansas  
Lawrence, Kansas

**Abstract Deadline: 23 January 2007**

**Information:** Greg Ludvigson, +1-785-864-2734, gludvigson@kgs.ku.edu—or—Greg Ohlmacher, +1-785-749-4502, ohlmac@kgs.ku.edu; both at Kansas Geological Survey, University of Kansas, 1930 Constant Ave., Lawrence, Kansas 66047-5317, USA.

## Cordilleran Section

4–6 May 2007

Western Washington University  
Bellingham, Washington

**Abstract Deadline: 6 February 2007**

**Information:** Bernie Housen, Western Washington University, Dept. of Geology, MS 9080, 516 High St., Bellingham, WA 98225-5946, USA, +1-360-650-6573, bernieh@cc.wvu.edu.

## Rocky Mountain Section

7–9 May 2007

Dixie Center  
Saint George, Utah

**Abstract Deadline: 13 February 2007**

**Information:** Jerry Harris, Dixie State College, Science Building, 225 South 700 East, Saint George, UT 84770-3875, USA, +1-435-652-7758, dinogami@gmail.com.



## Temper Sands in Prehistoric Oceanian Pottery: Geotectonics, Sedimentology, Petrography, Provenance

by William R. Dickinson

Oceanian ceramic cultures making earthenware pottery spread during the past 3500 years through a dozen major island groups spanning 6000 km of the tropical Pacific Ocean from western Micronesia to western Polynesia. Island potters mixed sand as temper into clay bodies during ceramic manufacture. The nature of island sands is governed by the geotectonics of hotspot chains, island arcs, subduction zones, backarc basins, and remnant arcs as well as by sedimentology. Because small islands with bedrock exposures of restricted character are virtual point sources of sand, many tempers are diagnostic of specific islands. Petrographic study of temper sands in thin section allows distinction between indigenous pottery and exotic pottery transported from elsewhere. Study of 2223 prehistoric Oceanian potsherds from 130 islands and island clusters indicates the nature of Oceanian temper types and documents 105 cases of interisland transport of ceramics over distances typically <400 km but reaching 1000+ km.

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# CORDILLERAN

**103rd Annual Meeting  
Cordilleran Section, GSA  
Bellingham, Washington**

**4–6 May 2007**

<http://www.geosociety.org/sectdiv/cord/07cdmtg.htm>

### THEME: NORTHWEST CONVERGENCE

The 2007 annual meeting of GSA's Cordilleran Section will be held on the Western Washington University campus in Bellingham, Washington. The meeting theme represents the geological setting of the Pacific Northwest, where our converging plates will inspire the convergence of a diverse group of geologists, producing a convergence of disciplines, ideas, and discoveries.

### Setting

The city of Bellingham is located in a geological paradise, with an array of outstanding examples of geological phenomena, ranging from active volcanoes, large glaciers, active and ancient fault zones, subduction complex rocks, ophiolites, terranes, exhumed mantle massifs, migmatites, and flood basalts all close at hand. Traditionally the gateway to the San Juan Islands, Bellingham hosts an active population and an epic range of outdoor recreational pursuits. Temperatures are pleasant during early May, ranging from the low 50's to low 70's; rain, wind, and bright sunny days are typical.

Bellingham has a regional airport that is served by two airlines, with easy bus and train service from Seattle or Vancouver, British Columbia. The meeting site, the campus of Western Washington University (WWU), is one of the region's premier undergraduate institutions. WWU is located near many excellent lodging and dining establishments, which will be linked by shuttle bus during the meeting. Many shops, museums, waterfront activities, and entertainment possibilities can be found on campus or nearby in Bellingham.

We invite you to join us for this outstanding opportunity to meet with your fellow geologists and geoscience professionals in this truly exceptional corner of our nation.

### REGISTRATION

#### Early Registration Deadline: 2 April 2007

Registration begins online at [www.geosociety.org/sectdiv/cord/07cdmtg.htm](http://www.geosociety.org/sectdiv/cord/07cdmtg.htm) 1 November 2006, with a significant early registration discount. On-site registration will be available at the WWU campus during the meeting. Additional details will be posted at the GSA Web site and published in the January 2007 *GSA Today*.

### STUDENT TRAVEL

GSA's Cordilleran Section and the GSA Foundation have made travel grants available for students who are presenting oral or poster papers. Students must be currently enrolled and must be members of the relevant section to apply for support. For more information, contact the Cordilleran Section secretary, Joan Fryxell, +1-909-880-5311.

### STUDENT AWARDS

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

### CALL FOR PAPERS

#### Abstract Deadline: 6 February 2007

Papers are invited for a variety of technical sessions, with symposia and theme sessions devoted to general topics in a range of areas. Sessions will provide opportunities for either poster or oral presentations; authors interested in volunteering papers for a symposium should contact the appropriate convener prior to submitting an abstract. Oral presentations will be 15–20 minutes in length, including 3–5 minutes for questions and speaker exchanges. All oral presentations will utilize a single digital projector and standard presentation software. An overhead projector will be available in each room. Use of 35 mm slides is not encouraged, and will only be permitted by special arrangement with the technical program committee; this must be requested 30 days in advance of the meeting. Dimensions for poster space and other details can be found at [www.geosociety.org/sectdiv/cord/07cdmtg.htm](http://www.geosociety.org/sectdiv/cord/07cdmtg.htm).

Only a single volunteered paper may be submitted for presentation by any one individual; but an individual may be a co-author on several submitted presentations. Those individuals who are invited to present a paper at a symposium may present an additional paper. Abstracts for all sessions should be submitted via the GSA Web site, [www.geosociety.org/sectdiv/cord/07cdmtg.htm](http://www.geosociety.org/sectdiv/cord/07cdmtg.htm). An abstract submission fee of US\$10 will be charged. If you cannot submit your abstract electronically, please contact Nancy Carlson, +1-303-357-1061, [ncarlson@geosociety.org](mailto:ncarlson@geosociety.org).

### TECHNICAL PROGRAM

Several general sessions will run on various topics in the geosciences, along with a set of more focused symposia and theme sessions. Details of these sessions may be found on the GSA Web site or may be obtained by contacting members of the technical program committee, Sue DeBari, [debari@geol.wvu.edu](mailto:debari@geol.wvu.edu); Liz Schermer, [schermer@geol.wvu.edu](mailto:schermer@geol.wvu.edu); and Juliet Crider, [criderj@cc.wvu.edu](mailto:criderj@cc.wvu.edu), or the session conveners.

### Symposia

1. **Quaternary and Tertiary Records of Past Environments, Pacific Northwest.** Estella Leopold, University of Washington, [eleopold@u.washington.edu](mailto:eleopold@u.washington.edu).

2. **Paleogeographic Reconstructions of Circum-Pacific Terranes: Methodology, Models, and More Challenges I: In Honor of David L. Jones.** Bernie Housen, Western Washington University, bernieh@cc.wvu.edu; Clark Blake, Western Washington University, mcblake@nas.com.
3. **Holocene Volcanic and Glacial Geology at Mount Baker, Washington: Reports from On-Going Field Studies.** Dave Tucker, Western Washington University, davetucker@mtbakervo.com; Kevin Scott, U.S. Geological Survey, kscott@usgs.gov.

### Theme Sessions

1. **Influence of Natural Hazard Assessments on Land-Use Policy—Is Anybody Listening?** John N. Thompson, Whatcom County Public Works Department, jnthomps@co.whatcom.wa.us, +1-360-715-7450.
2. **The Geology of Terroir: Techniques for the Evaluation of Viticultural Sites.** Kevin Pogue, Whitman College, pogue@whitman.edu; +1-509-527-5955.
3. **Paleogeographic Reconstructions of Circum-Pacific Terranes: Methodology, Models, and More Challenges II: In Honor of David L. Jones.** Jim Wright, University of Georgia, jwright@gly.uga.edu; Sandra Wyld, University of Georgia, swyld@gly.uga.edu; Bernie Housen, Western Washington University, bernieh@cc.wvu.edu.
4. **The Little Ice Age in Western North America.** John J. Clague, Simon Fraser University, +1-604-291-4924, jclague@sfu.ca; Brian Menounos, University of Northern British Columbia; Dan Smith, University of Victoria.
5. **Pacific Northwest Paleoseismology and Neotectonics.** Brian Sherrod, U.S. Geological Survey, bsherrod@ess.washington.edu.
6. **Environmental Geology in the Pacific Northwest.** Sian Davies-Vollum, University of Washington—Tacoma, ks Davies@u.washington.edu, +1-253-692-4624.
7. **Hazards and Resources in the Portland, Tualatin, and Willamette Basins of Oregon and Washington.** Victoria E. Langenheim, U.S. Geological Survey, zulanger@usgs.gov; Ian Madin, DOGAMI; Russ Evarts, U.S. Geological Survey.
8. **Active Volcano-Glacier Interactions: Process, Products, Hazards.** Tina Neal, U.S. Geological Survey, tneal@usgs.gov; Rick Wessels, U.S. Geological Survey, rwessels@usgs.gov; Jackie Caplan-Auerbach, Western Washington University, jackie@geol.wvu.edu.
9. **Council on Undergraduate Research.** Jeff Marshall, California State University—Pomona, marshall@csupomona.edu.
10. **Neogene Orogenesis in the North American Cordillera.** Sara Gran Mitchell, College of the Holy Cross, sara.gran@alumni.carleton.edu; Owen A. Callahan, Western Washington University, callaho@cc.wvu.edu.
11. **Volcanoes of the Pacific Basin and Rim: Geological and Geophysical Observations.** Michael Poland, Hawaiian Volcano Observatory, mpoland@usgs.gov; Glyn Williams-Jones, Simon Fraser University, glymwj@sfu.ca.
12. **Petrology and Chronology of Intrusive Rocks.** Paul Hoskin, University of Calgary, hoskin@geology.cwu.edu;

- Susan DeBari, Western Washington University, debari@geol.wvu.edu.
13. **New Developments in Understanding Cretaceous Crustal Structure in the Southern Coast Mountains of British Columbia and North Cascades of Washington.** Robert Miller, San José State University, rmiller@geosun.sjsu.edu; Douglas Tinkham, Laurentian University, dtinkham@laurentian.ca; Harold Stowell, University of Alabama, hstowell@geo.ua.edu.
  14. **New Constraints on Cascadia Slow Slip Events.** Tim Melbourne, Central Washington University, tim@geology.cwu.edu.

### FIELD TRIPS

The details, schedule, and final roster of field trips are still being developed. Updated information will be posted at [www.geosociety.org/sectdiv/cord/07cdmtg.htm](http://www.geosociety.org/sectdiv/cord/07cdmtg.htm) or can be obtained from a member of the field trip committee: Pete Stelling, [pete@geol.wvu.edu](mailto:pete@geol.wvu.edu); Ned Brown, [ehbrown@cc.wvu.edu](mailto:ehbrown@cc.wvu.edu); and Dave Tucker, [tuckerd@cc.wvu.edu](mailto:tuckerd@cc.wvu.edu).

### Student Field Trip Subsidies

Owing to conservative budgeting and good attendance at the last several meetings, the Cordilleran Section is able to offer limited field trip subsidies to students in order to facilitate their gaining first-hand experience with areas of interest. Students who register for field trips can also apply for a field trip grant, which will reimburse a significant percentage of the field trip registration cost; checks will be available at the meeting. The deadline for application is 2 April 2007. Please use our secure field trip grant application form to submit this information, which is accessible by link at [www.geosociety.org/sectdiv/cord/ftSubsidies.htm](http://www.geosociety.org/sectdiv/cord/ftSubsidies.htm).

1. **Structure and Evolution of the San Juan Islands, Northwest Cascades Thrust System.** Ned Brown, Western Washington University, [ehbrown@cc.wvu.edu](mailto:ehbrown@cc.wvu.edu); Liz Shermer, Western Washington University, [schermer@geol.wvu.edu](mailto:schermer@geol.wvu.edu); Bernie Housen, Western Washington University, [bernieh@cc.wvu.edu](mailto:bernieh@cc.wvu.edu).
2. **Holocene Stratigraphy of Mount Baker Volcano in the Baker River Valley, North Cascades.** Dave Tucker, Western Washington University, [tuckerd@openaccess.org](mailto:tuckerd@openaccess.org); Kevin Scott, U.S. Geological Survey—Cascades Volcano Observatory; Dave Lewis, Mount Baker High School.
3. **Early Fraser Glacial History of the Skagit Valley.** Jon Riedel, National Park Service, [jon\\_riedel@nps.gov](mailto:jon_riedel@nps.gov).
4. **Quaternary Glaciovolcanism along the Whistler Corridor and the 2460 B.P. Plinian Eruption Deposits at Mount Meager.** Kelly Russell, University of British Columbia, [krussell@eos.ubc.ca](mailto:krussell@eos.ubc.ca).
5. **Regional Tertiary Sequence Stratigraphy and Structure on the Eastern Flank of the Central Cascade Range, Washington.** Eric Cheney, University of Washington, [vaalbara@u.washington.edu](mailto:vaalbara@u.washington.edu).
6. **Younger Dryas and Early Holocene Glaciation of the Northern Puget Lowland and North Cascades, Washington.** Don Easterbrook, Western Washington University, [dbunny@titan.cc.wvu.edu](mailto:dbunny@titan.cc.wvu.edu).

## Cordilleran

- Lively Landscapes: Major Holocene Geomorphic Events in the Nooksack-Sumas Valley.** Scott Linneman, Western Washington University, scott.linneman@wwu.edu; Paul Pittman, Whatcom County Public Works.
- Geology and Hydrology of the Hanford Nuclear Facility and the Geology of the Colombia River Basalts.** Duane Horton, Pacific Northwest National Laboratory, dg.horton@pnl.gov; Steve Reidel, Pacific Northwest National Laboratory; Evan Dressel, Pacific Northwest National Laboratory; Scott Babcock, Western Washington University.
- Murrelets and Molasse in the San Juan Islands.** Dave Engebretson, engebret@cc.wwu.edu; Clark Blake, Western Washington University, mcblake@nas.com.
- Geology and Paleobotany of the Eocene Chuckanut Formation.** Rick Dillhoff, rdillhoff@evolvingearth.org; Tad Dillhoff; George Mustoe, Western Washington University, mustoeg@cc.wwu.edu.
- The Basics of Terrestrial LiDAR Scanning, from Acquisition to Processing.** Tim F. Wawrzyniec, University of New Mexico LiDAR Lab, tfw@unm.edu.

### MEETINGS AND SPECIAL EVENTS

- Icebreaker Reception.** Thurs., 3 May, 5–7 p.m.  
**Welcoming Reception and Opening Remarks.** Fri., 4 May, 5–7 p.m.  
**Annual Business Meeting.** Cordilleran Section, GSA. TBA.

### SPOUSE AND GUEST ACTIVITIES

The city of Bellingham is one of the northernmost cities in the continental United States and is located in a wonderful coastal setting. The major metropolitan areas of Seattle and Vancouver, British Columbia, are also an easy drive from Bellingham. A variety of activities are available on the WWU campus and in the city of Bellingham. Farther afield, hiking, climbing, boating, biking, and running activities are abundant, recently making Bellingham one of *Outdoor Magazine's* top 10 best places to live. For more information about the many activities and amenities that Bellingham has to offer, please visit the Bellingham Visitor's Bureau Web site, [www.bellingham.org](http://www.bellingham.org).

### EXHIBITS

Exhibit booths will be available for commercial and nonprofit organizations. For more information or to reserve a booth, contact Karen Henriksen, [karen.henriksen@wwu.edu](mailto:karen.henriksen@wwu.edu).

### ACCOMMODATIONS

Rooms have been reserved at a number of local motels near the meeting headquarters. Special meeting rates are available for professionals as well as students. For more information and a link to make hotel reservations, go to [www.geosociety.org/sectdiv/cord/07cdmtg.htm](http://www.geosociety.org/sectdiv/cord/07cdmtg.htm).

### ACCESSIBILITY

GSA and WWU are committed to making this meeting accessible to all people interested in attending. Please indicate any special requirements on your registration form.

### ADDITIONAL INFORMATION

To obtain the most complete and up-to-date information, visit [www.geosociety.org/sectdiv/cord/07cdmtg.htm](http://www.geosociety.org/sectdiv/cord/07cdmtg.htm). If you have questions or need further clarification, contact the convention chair, Bernie Housen, +1-360-650-6573, [bernieh@cc.wwu.edu](mailto:bernieh@cc.wwu.edu).

### MENTORING PROGRAMS

**Roy J. Shlemon Mentor Program in Applied Geoscience.** Sponsored by *GSA Foundation*. Fri.–Sat., 4–5 May, 11:30 a.m.–1 p.m.

**The John Mann Mentors in Applied Hydrogeology Program.** Sponsored by *GSA Foundation*. Sat., 5 May, 5–6:30 p.m.

For details, go to [www.geosociety.org/students.htm](http://www.geosociety.org/students.htm) or contact Jennifer Nocerino, [jnocerino@geosociety.org](mailto:jnocerino@geosociety.org).

### JOB FAIR AND GRADUATE SCHOOL RECRUITMENT

We are planning a job fair to bring in a large number of geoscience, geotechnical, and other professional firms interested in hiring outstanding students. We will also have space available for regional institutions to provide information about their graduate programs.

### SHORT COURSES AND WORKSHOPS

- Exploring Earth through a Virtual Globe.** John Bailey, Alaska Volcano Observatory, [jbailey@gi.alaska.edu](mailto:jbailey@gi.alaska.edu).
- Quaternary Paleo- and Environmental Magnetism: What Can Magnetics Do for You?** Joe Stoner, Oregon State University, [jstoner@coas.oregonstate.edu](mailto:jstoner@coas.oregonstate.edu); Bernie Housen, Western Washington University, [bernieh@cc.wwu.edu](mailto:bernieh@cc.wwu.edu).

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### NORTHEASTERN SECTION MEETING

University of New Hampshire, Durham, N.H., USA

#### Shlemon Mentor Program Luncheons:

Mon.–Tues., 12–13 March, 11:30 a.m.–1 p.m.

#### Mann Mentors in Applied Hydrogeology Program:

Mon., 12 March, 5–6:30 p.m.

### SOUTHEASTERN SECTION MEETING

Hyatt Regency Savannah  
on the Historic Riverfront, Savannah, Ga., USA

#### Shlemon Mentor Program Luncheons:

Thurs.–Fri., 29–30 March, 11:30 a.m.–1 p.m.

#### Mann Mentors in Applied Hydrogeology Program:

Thurs., 29 March, 5–6:30 p.m.

### Joint Meeting

#### NORTH-CENTRAL SECTION

#### SOUTH-CENTRAL SECTION

Kansas Memorial Union,  
University of Kansas,  
Lawrence, Kans., USA

#### Shlemon Mentor Program Luncheons:

Thurs.–Fri., 12–13 April, 11:30 a.m.–1 p.m.

#### Mann Mentors in Applied Hydrogeology Program:

Thurs., 12 April, 5–6:30 p.m.

### CORDILLERAN SECTION MEETING

Western Washington University, Bellingham, Wash., USA

#### Shlemon Mentor Program Luncheons:

Fri.–Sat., 4–5 May, 11:30 a.m.–1 p.m.

#### Mann Mentors in Applied Hydrogeology Program:

Fri., 4 May, 5–6:30 p.m.

### ROCKY MOUNTAIN SECTION MEETING

Dixie Center, Saint George, Utah, USA

#### Shlemon Mentor Program Luncheons:

Mon.–Tues., 7–8 May, 11:30 a.m.–1 p.m.

#### Mann Mentors in Applied Hydrogeology Program:

Mon., 7 May, 5–6:30 p.m.



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## What Happens at the Shlemon Mentor Programs?

P.S.: Students, don't miss an opportunity to attend one

The Shlemon Programs, supported by the GSA Foundation through an endowed gift from Roy J. Shlemon, are designed to extend the mentoring reach of individual professionals from applied geology to undergraduates and graduate students attending GSA Section Meetings.

Every student registered for a GSA Section meeting receives a ticket to the Shlemon Mentor Program. Boxed lunches and soft drinks are provided and students are seated at round, banquet-sizes tables, where volunteer mentors are waiting for them. After announcements and introductions, one-on-one discussions between the students and mentors begin. The room comes alive with the buzz of conversation and laughter. The enthusiastic mentors come prepared for a variety of questions from the students—and they are never disappointed.

During the hour-and-a-half meeting, mentors rotate from table to table so that all the students get to meet all the mentors. At the end of the event, students leave with a list of contact information for each mentor—offered to them in case they want to do some follow-up with select mentors.

The 2006 season of the Roy J. Shlemon Mentor Programs in Applied Geoscience was exceptional. All six GSA Sections participated. The mentor volunteers—from private and public businesses and government agencies—represented a broad range of backgrounds, education, experience, and expertise. Program funds provided free boxed lunches to 382 students and 76 mentors in 2006; the number of students to mentors was a commendable 1:5 ratio, and connections were made that resulted in part-time or full-time positions for a number of students.

**The Roy J. Shlemon Mentor Program in Applied Geoscience** gratefully acknowledges these mentors for their individual gifts of time and for sharing their insight with GSA's student members.

#### **CORDILLERAN SECTION**

**Karen E. Blake**

Plains Exploration & Production  
Company Bakersfield, Calif.

**Phil F. Brease**

Denali National Park  
Denali Park, Alaska

**Kate Bull**

Alaska Volcano Observatory  
Alaska Division of Geological  
& Geophysical Surveys  
Fairbanks, Alaska

**Bradford R. Burton**

Shell Canada Ltd.  
Calgary, Alberta

**Ray Clanton**

Oxy Elk Hills Tupman, Calif.

**Bradley Erskine**

Kleinfelder Fairfield, Calif.

**Michael A. Fisher**

U.S. Geological Survey  
Menlo Park, Calif.

**Emily S. Finzel**

Alaska Division of Geological  
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Fairbanks, Alaska

**Chad Hults**

Center for Resources, Science,  
and Learning Denali National  
Park and Preserve  
Denali Park, Alaska

**Kelly Michael Kaleta**

Shell Exploration & Production  
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**Meg C. Kremer**

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Anchorage, Alaska

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**Liang-Biao Ouyang**

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**Derek Sjostrom**

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Anchorage, Alaska

#### **NORTH-CENTRAL SECTION**

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Illinois State Geological Survey  
Champaign, Ill.

**Thomas J. Evans**

Wisconsin Geological and Natural  
History Survey  
Madison, Wis.

**John M. Fox**

Degussa Admixtures, Inc.  
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**Joseph Hatcher**

PaleoWorld Research Foundation  
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Sandusky, Ohio

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Premier Environmental  
Services Inc.  
Medina, Ohio

**David Saja**

Cleveland Museum of  
Natural History  
Cleveland, Ohio

**Martin Shipitalo**

U.S. Department of Agriculture  
Coshocton, Ohio

**Mark D. Uhen**

Cranbrook Institute of Science  
Bloomfield Hills, Mich.

**Erik R. Venteris**

Geologic Mapping and Industrial  
Minerals Group; Ohio Division  
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Pennsylvania Geological Survey  
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Connecticut Geological Survey  
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National Science Foundation  
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**Stephen J. Urbanik**

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**James M. Wilburn**

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**Robert Paul Dickerson**

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Santa Fe, N.Mex.

**Barbara M. Hill**

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Syracuse, N.Y.

**Mark R. Hudson**

U.S. Geological Survey  
Denver, Colo.

**Vincent Matthews**

Colorado Geological Survey  
Denver, Colo.

**Robert L. Ward**

Phelps Dodge Mining Company  
Morenci, Ariz.

#### **SOUTH-CENTRAL SECTION**

**Daniel J. Brabander**

Wellesley College  
Wellesley, Mass.

**J. Michael (Mike) Howard**

Arkansas Geological Commission  
(State Geology Survey)  
Little Rock, Ark.

**Tony Kolodziej**

Integrated Oil & Gas Tech  
Amarillo, Tex.

**Chris Sumner**

Hanson Aggregates Inc.  
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**Ann Molineux**

University of Texas at Austin  
Texas Memorial Museum  
Austin, Tex.

**Laurel A. Schaider**

Harvard School of Public Health  
Boston, Mass.

#### **SOUTHEASTERN SECTION**

**William (Drew) Andrews**

Kentucky Geological Survey  
Lexington, Ky.

**Katharine Lee Avary**

West Virginia Geological and  
Economic Survey  
Morgantown, W.V.

**James Beard**

Virginia Museum of  
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**Mark Cocker**

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If you are interested in participating as a mentor at a 2007 GSA Section Meeting, please contact Jennifer Nocerino, jnocerino@geosociety.org.

Over the last few years, the GSA Mentor programs have grown considerably in impact due to the hard work and dedication of Karlon Blythe. GSA is committed to these programs, and we wish Karlon success in her future endeavors.

— *First Time in English* —

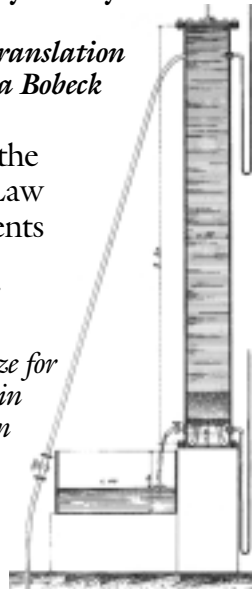
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This GSA mentor program is sponsored by the GSA Foundation. At these sessions, students and professionals network over free dinners, chatting about careers in hydrogeology and hydrology, and leave the events expressing feelings of both personal and professional growth. New friendships are made, and—to the students' great good fortune—professional contacts are established for their future.

The growing success of the John Mann Mentors in Applied Hydrogeology Program was evident in the sessions held at the 2006 Section Meetings. They were very well attended, with 109 students and 18 mentor volunteers participating.

**The John Mann Mentors in Applied Hydrogeology Programs** gratefully acknowledges these mentors for their individual gifts of time and for sharing their insight with GSA's Student Members.

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If you are interested in participating as a mentor at a GSA 2007 Section Meeting, please contact Jennifer Nocerino, [jnocerino@geosociety.org](mailto:jnocerino@geosociety.org).

# LETTERS

Send letters to *GSA Today*, P.O. Box 9140, Boulder, CO 80301-9140, USA, or e-mail them to Kristen Asmus, [kasmus@geosociety.org](mailto:kasmus@geosociety.org). Please keep your letter to 300 words or fewer. *GSA Today* reserves the right to edit letters for space and clarity. Opinions presented do not reflect official positions of the Society.

This afternoon I was thumbing through the recently arrived *GSA Today* (July 2006), and I came across the page soliciting GSA memorials (v. 16, no. 7, p. 24). I paused over this because there were some names from this year that I expected to (and did) see. I was pleased to see that there are memorials in progress for Professors Leopold and Maxwell. But then I looked a little harder.

I make it 204 GSA members since 2003 without a memorial; seems a large number to me. Then I looked yet harder and put check marks next to the names that I, a not-especially-distinguished geologist, had some direct contact with in, say, 35 years: 16 members. Perhaps a fair sampling. Some I knew quite well, while as a student or as a colleague; others I knew slightly from the occasional meeting, perhaps through some correspondence, or a name that signaled a need to read a new paper. And then I looked harder still, seeing in the list some special names, not in bold, with no asterisk: dead more than a year and no memorial in progress.

The earth sciences are, necessarily, a deeply historical study. What then does it mean if, across the whole of our Society, we cannot develop a memorial statement for scientists like Konrad Krauskopf, John Rodgers, or Tom Dibblee? Are we really so busy as that? Can their colleagues over decades in academic departments or at the Geological Survey really not find the time for a few words? Is our sense of community so fragile that people who contributed as much as they—and I use them only as examples—are no longer seen as part of our community? But what sort of community is it that sees itself only in the current moment? Krauskopf, Rodgers, and Dibblee are heroes to me, exemplars of our profession. Shall we no longer praise our famous men (and women)?

I suggest no criticism of *GSA Today*, nor of GSA as a formal organization, and not necessarily even criticism of ourselves. Rather, I wish to ask if we should consider through this matter what we think we mean when we call ourselves a “Society.” Do we believe it means, at least in part, being a commu-

nity with some continuity over time? If it does, or if it might, are there things we can and should do to preserve the historical connections with our predecessors—including, but not limited to, the giants on whose shoulders we stand in an effort to see farther?

Respectfully submitted,

Mark J. Logsdon  
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Suite 2, Aptos, CA 95003, USA  
[mark.logsdon@sbcglobal.net](mailto:mark.logsdon@sbcglobal.net)

## GSA Memorials

The first GSA memorials were published in 1890 in volume 1 of *GSA Bulletin*. They have been a part of GSA publication history ever since, printed in various forms in *Bulletin*, the *Proceedings of the Geological Society of America* volumes, and since 1973, in bound *Memorials* volumes. The 1973 *Memorials* volume included memorials to Harry Hammond Hess (1906–1969; written by A.F. Buddington), Hisashi Kuno (1910–1969; written by Helen L. Foster), and Walter Harry Newhouse (1897–1969; written by Harold W. Fairbairn).

GSA memorials are written by associates, friends, or relatives of those who have passed away. Each memorial enables us all to learn more about the fascinating individuals who have been part of GSA. Complete guidelines for compiling a memorial can be found at <http://www.geosociety.org/pubs/mmlGuid.htm>.

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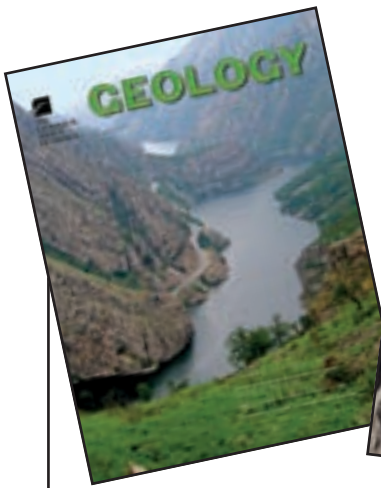
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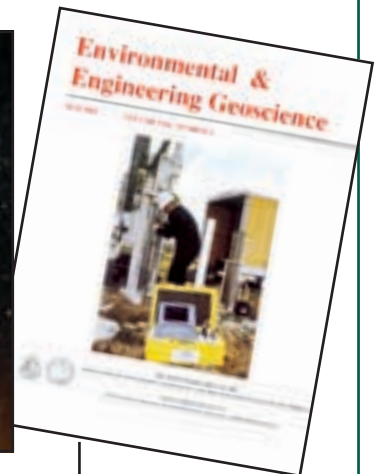
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# ROCK STARS



Thomas Chrowder Chamberlin in the 1870s (photo courtesy University of Wisconsin–Madison archive).

## Thomas Chrowder Chamberlin (1843–1928)

**Robert H. Dott, Jr.**, *Department of Geology and Geophysics,  
University of Wisconsin, Madison, WI 53706, USA*

### Introduction

“Born on a moraine,” was how America’s pioneer glacial geologist in the late nineteenth century, T.C. Chamberlin, described himself. This was the man who first demonstrated that there had been multiple Pleistocene glaciations in North America and who was the first director of the U.S. Geological Survey’s Pleistocene Division (1881–1904). He presented early analyses of moraines, drumlins, eskers, and boulder trains. From these features, he inferred regional glacial flow patterns, differentiated ice lobes, and mapped the outermost limits of the two last glacial advances. He called glacial striations “trails left by the intruder.”

Chamberlin went on to seek a theory of climate change and was one of the first to emphasize carbon dioxide as a major regulator of Earth’s temperature, thus anticipating modern global warming. TCC, as he was known to associates, is also widely remembered for his 1890 essay about geological reasoning, “The method of multiple working hypotheses” (but he failed to acknowledge that G.K. Gilbert had published on this theme two years earlier).

At the turn of the twentieth century, Chamberlin ventured into cosmology, developing with F.R. Moulton the planetesimal

theory for the origin of planets, aspects of which are still influential. Instead of the ruling hypothesis, condensation from a hot nebular cloud, gravitational accretion of cold objects (planetesimals) was proposed. Once formed, Earth was subjected to continuing, but spasmodic, radial gravitational contraction, which had overtones of isostasy. Chamberlin postulated that contractional events caused mountain building due to differential vertical movements of radial earth segments. Another byproduct of the theory was a diastrophic control of global sea level and erosional leveling of continents. This had wide impact upon American stratigraphy and geomorphology; it even anticipated modern sequence stratigraphy. Chamberlin’s commitment to vertical tectonics made him an inevitable opponent of continental drift.

In 1899, Chamberlin challenged famous physicist Lord Kelvin’s calculation of an age for Earth of only 20–30 million years when geologists were thinking of 100 million. Chamberlin disputed Kelvin’s assumption of simple cooling from a molten origin because he was already formulating his own cold, planetesimal origin. He argued that there must be some unknown source of heat energy within Earth that would alter Kelvin’s calculations substantially. Without realizing it, Chamberlin had anticipated heat from radioactive decay, which had just been recognized but was not yet widely understood.

### The Young Chamberlin

Chamberlin was born on that moraine in southeastern Illinois, but his family moved north to settle near Beloit in southern Wisconsin. Young Chamberlin helped his father, a Methodist circuit minister and farmer, and four brothers haul limestone slabs to build their farmhouse. He was fascinated and puzzled by the many fossils in that Ordovician stone. Education was prized in the family, and at the early age of eight, he announced that he “wanted to teach in the best school in the state.” With his brothers, he attended a preparatory academy and then Beloit College. Professor H.B. Nason inspired in him a deep interest in natural science. Geology had a particularly strong appeal in spite of apparent conflicts with his strong Methodist background. Chamberlin directed the church choir while attending Beloit College, where he was also an outstanding student, athlete, and debater. He learned early the art of framing a sound argument, which he practiced frequently in later life.

Chamberlin worked on the farm and taught in country schools to finance his education. Upon graduation in 1866, he became a teacher and later principal in a high school near Beloit. He gave popular evening lectures and led field trips about natural science. In 1867, he married Alma Wilson; they had one son, Rollin, who also pursued geology. In 1868–1869, Chamberlin spent a year at the University of Michigan to strengthen his overall science background and thereafter became very critical of the classical curriculum in colleges. He next taught natural science at the Whitewater, Wisconsin, Normal School, and joined the Beloit faculty in 1873, where he was professor of geology, zoology, and botany. Dana’s *Manual of Geology* was the guiding textbook, and Chamberlin introduced microscopic petrography to Beloit. He was a tall, commanding figure and a popular teacher, who always projected “moral and ethical rectitude.”

## On the Way Up

In 1873, together with several other geologists from around the state, Chamberlin was recruited to work part time on a comprehensive geological survey of Wisconsin. He was assigned the southeastern region, where bedrock is only scantily exposed. It was here that his career in glacial geology began. In 1876, the survey was reorganized, and Chamberlin was appointed chief geologist. During the next six years, with an able group of assistants, he supervised the completion of the survey and the publication of four large volumes that rivaled in quality the best survey publications in the world. Chamberlin wrote sections of most of the volumes, including material on Paleozoic and Precambrian geology, lead-zinc deposits, artesian wells, and soils, as well as glacial deposits. The results brought national attention and appointment as head of the glacial division of the national survey in 1881.

Recognizing his outstanding organizational and administrative skills, the board of regents of the University of Wisconsin in Madison invited Chamberlin to be president. Somewhat reluctantly, he left his U.S. Geological Survey (USGS) research post to serve as president from 1887 to 1892. Chamberlin introduced many reforms, including strengthening the science curriculum and recruiting outstanding faculty members. He also began the extension program, which brought new knowledge to the grass roots, especially to farmers. He introduced the seminar method of teaching and inaugurated formal post-graduate study with a Ph.D. program that gave new emphasis to research. Chamberlin tightened discipline and outlawed hazing; his moral rectitude and authoritarian demeanor rubbed some regents the wrong way and irritated students even more. Yet, when rumors circulated that he was being courted by the University of Chicago, the students petitioned him to stay.

## The Chicago Throne

Chamberlin was tiring of administration and missed research, so in 1892 he accepted the offer to organize a department of geology at the new University of Chicago, where he remained until retiring in 1918. Chamberlin created one of the nation's premier departments with a distinguished faculty and a strong research program. He also founded the *Journal of Geology* and



Chamberlin on a Pleistocene geology field trip near Peoria, Illinois, 1898. Left to right: S.W. Beyer (Iowa), J.A. Udden (Illinois), Chamberlin with hair now all white, S. Calvin (Iowa), and F. Leverett (Michigan). Leverett in particular extended Chamberlin's pioneering work in glacial geology (photo courtesy University of Iowa archive).

acted as its editor for many years. Like James D. Dana had done as long-time editor of the *American Journal of Science* at Yale, Chamberlin used his *Journal* as a podium for editorializing on many aspects of geology as well as an outlet for many of his own articles. One of his innovations was a series of "Studies for Students," in which an authority provided a valuable summary of a specialized topic.

It was at Chicago that Chamberlin fully matured as a leading scholar. He soon collaborated with Moulton to develop the planetesimal hypothesis and coauthored with Rollin Salisbury *Geology* (1904–1906), probably the most influential textbook of geology in the United States prior to World War II, imitating the precedent of Dana's nineteenth century *Manual of Geology*. Although less true today with many competing books available, a single comprehensive introductory textbook then had a profound influence upon a field. The last book of similar stature was probably Arthur Holmes' *Principles of Physical Geology*, first published in 1944.

Chamberlin's offices and honors seem countless. He was president of the Geological Society of America (1894–1895), president of the Wisconsin (1885–1886), Chicago (1897–1915), and Illinois (1907) Academies of Science, president of the American Association for the Advancement of Science (1908–1909), member of the National Academy of Sciences (1903), and the first Penrose Medalist of both the Society of Economic Geologists (1924) and Geological Society of America (1927). He was a member of the American Philosophical Society and the American Academy of Arts and Sciences and received six honorary degrees. In 1909, he spent five months traveling as a member of a commission to determine how the Rockefeller Foundation could best aid China. Chamberlin was still actively writing when he died in 1928.

## That Moral Rectitude

T.C. Chamberlin had a commanding personality and a great physical and intellectual presence, which made him an able administrator and an inspiring, though authoritarian, teacher. He had an exceptionally keen, inquiring mind and an unusual ability to present an argument. Moral rectitude characterized his entire career; he even viewed science as a moral activity. Rectitude also could make him very aggressive when challenged by others. Because of his vigorous attacks upon the views and motives of his adversaries, his USGS appointment was terminated in 1904. Although his "Method of multiple working hypotheses" seemed the ideal recommendation for reasoning in a complex science with limited available evidence so as to maintain objectivity, he did not always practice what he preached. The longer he worked on his planetesimal hypothesis, the more dogmatic he became, excluding all competing hypotheses from consideration so that it became just the kind of ruling hypothesis that he had railed against in 1890. The great T.C. Chamberlin was human after all.

## Further Reading

- Chamberlin, T.C., 1882, Preliminary paper on the terminal moraine of the second glacial epoch: Third Annual Report of the United States Geological Survey, p. 291–402.
- Chamberlin, T.C., 1890, The method of multiple working hypotheses: *Science*, v. 15, p. 92–96.
- Chamberlin, T.C. and Moulton F.R., 1909, The development of the planetesimal hypothesis: *Science*, v. 30, p. 642–645.

## Call For Proposals For Keynote Symposia And Topical Sessions

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Organized under the auspices of the International Union of Geological Sciences (IUGS), the United Nations General Assembly has proclaimed 2008 the United Nations International Year of Planet Earth. With activities spanning three years, 2007–2009, the goal of the International Year of Planet Earth is to develop and advance earth sciences initiatives with the aim of helping future generations realize a safer and more prosperous world.

This goal ties in well with GSA's mission of advancing the geosciences in the service of humankind and GSA's motto, *Science, Stewardship, Service*; therefore, GSA has coupled its 2007 Annual Meeting program to the themes of the International Year of Planet Earth. To see if you can tie a topical session proposal to one of these themes, check [www.yearofplanetearth.org/](http://www.yearofplanetearth.org/), and especially note the science themes at <http://www.yearofplanetearth.org/downloads.htm>.

Here is your chance to have real input for next year's annual meeting. You can play a key role by proposing a topical session or Pardee Symposium for the 2007 meeting. Get involved to help make the annual meeting all you desire, maximizing your meeting experience and that of others. *The GSA Annual Meeting belongs to you.*

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Have you ever been frustrated to find that none of the topical sessions at a GSA meeting represent your own current area

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#### PROGRAM OPPORTUNITIES

We welcome proposals for Pardee Keynote Symposia and topical sessions. Please submit proposals electronically on or before **9 January 2007** via the link at [www.geosociety.org](http://www.geosociety.org).

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

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

**Topical sessions** promote the exchange of timely and/or state-of-the-art information on a focused topic and allow scheduling of interdisciplinary talks that bear on that topic. Organizers (advocates) may invite specific papers to ensure the excellence and success of the session and are also encouraged to solicit volunteered contributions. Topical sessions must receive a minimum of 12 abstracts to be part of the technical



program. A maximum of four invited speakers is allowed, with the remainder consisting of volunteered abstracts. Advocates are encouraged to submit their proposals as poster sessions to accommodate the growing technical program. All session proposals are reviewed by the JTTC, and all approved topical sessions are solicited in *GSA Today*.

## ORAL AND POSTER GENERAL SESSIONS

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

## HOT TOPICS

The focus of these popular lunch-time forums, held Sunday through Wednesday during the meeting, is on discussion—with plenty of audience participation. Depending on the subject, a debate format is recommended; panels are discouraged. Each session must have a moderator. Titles should be catchy and provocative. If you are interested in organizing a Hot Topic session, contact Nancy Carlson, ncarlson@geosociety.org.

## MAKE YOURS THE SESSION EVERYONE TALKS ABOUT

Topical session organizers have the ability to ensure program success and excellence through topical sessions, with their

combination of invited speakers and volunteered papers, and through Pardee Keynote Symposia, which expand the opportunity for high-profile sessions on important developments that have an impact on our science.

When you organize a session, you ensure that your area of expertise gains multifaceted exposure through meeting attendees, the widely cited *Abstracts with Programs* volume, media attention, and possibly a consequent GSA Special Paper. Propose a session, then watch your efforts unfold as abstracts are submitted and your initiative becomes part of science history.

We look forward to working with you to make the 2007 GSA Annual Meeting dynamic and stimulating for all GSA and Associated Society members and appealing to a wide audience. If you have any questions or concerns regarding the program, please call or e-mail.

### DENVER 2007 DATES AND DEADLINES

<b>9 January</b>	Proposals due by midnight, Pacific Standard Time (PST). Electronic submission required.
<b>April</b>	Electronic abstract submission form posted at <a href="http://www.geosociety.org">www.geosociety.org</a> ; first meeting announcement in the April/May <i>GSA Today</i> .
<b>June</b>	Second announcement in the June <i>GSA Today</i> .
<b>10 July</b>	Abstracts due by midnight (PST).
<b>31 July</b>	Technical program schedule finalized.
<b>mid-August</b>	Accepted abstracts with links to speakers and titles posted at <a href="http://www.geosociety.org">www.geosociety.org</a> .

COMPREHENSIVE AND STATE-OF-THE-ART!

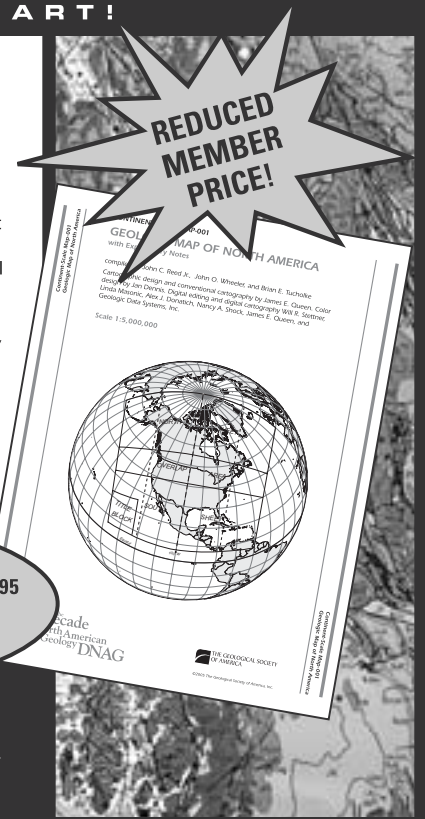
# Geologic Map of North America

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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# 2007 GSA Awards and Medals

## Penrose Medal

The Penrose Medal was established in 1927 by R.A.F. Penrose Jr. to be awarded in recognition of eminent research in pure geology, for outstanding original contributions, or for achievements that mark a major advance in the science of geology. The award is made only at the discretion of GSA Council; nominees may or may not be members of the Society. Penrose's sole objective in making the gift was to encourage original work in purely scientific geology, which is interpreted as applying to all scientific disciplines represented by the Society. Scientific achievements should be considered rather than contributions in teaching, administration, or service. Mid-career scientists who have already made exceptional contributions should be given full consideration for the award.

## Day Medal

The Day Medal was established in 1948 by Arthur L. Day to be awarded annually, or less frequently, at the discretion of GSA Council, for outstanding distinction in contributing to geologic knowledge through the application of physics and chemistry to the solution of geologic problems. Day's intent was to recognize outstanding achievement and inspire further effort rather than reward a distinguished career. Scientific achievements should be considered rather than contributions in teaching, administration, or service.

## Young Scientist Award (Donath Medal)

The Young Scientist Award was established in 1988 to be awarded to a young scientist (35 or younger during the year in which the award is to be presented) for outstanding achievement in contributing to geologic knowledge through original research that marks a major advance in the earth sciences. The award, consisting of a gold medal (the Donath Medal) and a cash prize of \$20,000, was endowed by Dr. and Mrs. Fred A. Donath. *For 2007, only those candidates born on or after 1 January 1972 are eligible for consideration.*

## Honorary Fellows

GSA Council established Honorary Fellowship in 1909, and since then, except during a few war years, one or more Honorary Fellows have been elected annually. At present, there are 73 living geologists who have received this honor.

Honorary Fellowship may be bestowed on individuals who have lived and developed their careers outside of North America and who have made outstanding and internationally recognized contributions to our science, or in rare cir-

cumstances, provided notable service to the Society. Under exceptional circumstances, North Americans have been named Honorary Fellows. This amendment to the bylaws was made in 1969 when the Apollo II astronauts who first walked on the Moon were elected.

GSA Council encourages members to submit names of qualified candidates for this honor. In preparing a nomination, it is imperative that the original research and scientific advances of the candidate be stressed. The nominator should also verify all supporting data, especially degrees received, publications, positions held, etc.

## How to Nominate

To ensure thorough consideration by the respective committees, please follow these nomination instructions carefully; additional information supplied will not enhance the nomination. Paper submissions will still be accepted; however, we encourage electronic submission.

For each candidate, please submit the following:

1. **Nomination form**, to be filled out online or on paper. Please go to <https://rock.geosociety.org/forms/Awardform.asp> to submit the form online or to download a paper version to submit via post.
2. **Supporting documents**, to be submitted as e-mail attachments or via post. Each award requires the submission of supporting documents. For the above medals and awards, the following are required:
  - i. A brief biographical sketch, such as used in *American Men and Women of Science* and *Who's Who in America*.
  - ii. A **summary** (300 words or less) of the candidate's scientific contributions to geology that qualify the individual for the award.
  - iii. A **selected** bibliography of no more than 20 titles. For the Donath Medal, only 10 titles are required.
  - iv. Signed letters from each of five (5) GSA Fellows or Members **in addition** to the person making the nomination. Required for the Day Medal only: letters from five (5) scientists with at least three (3) letters from GSA Fellows or Members, and up to two (2) from fellows or members of the Mineralogical Society of America, Geochemical Society, or American Geophysical Union.

The names of unsuccessful candidates proposed to Council by the respective committees will remain for consideration by those committees for three years. For those still under consideration, it is recommended that an updated nomination letter be sent to GSA.

**The deadline for receipt of all medal, award, and recognition nominations is 1 February 2007**



# 2007 GSA Awards and Medals

## GSA Public Service Award

GSA Council established the GSA Public Service Award in 1998 in honor of Eugene and Carolyn Shoemaker, to be awarded for contributions that have materially enhanced the public's understanding of the earth sciences or significantly served decision makers in the application of scientific and technical information in public affairs and public policy related to the earth sciences. This may be accomplished by individual achievement through:

- authorship of education materials of high scientific quality that have enjoyed widespread use and acclaim among educators or the general public;
- acclaimed presentations (books and other publications, mass and electronic media, or public presentations, including lectures) that have expanded public awareness of the earth sciences;
- authorship of technical publications that have significantly advanced scientific concepts or techniques applicable to the resolution of earth-resource or environmental issues of public concern; or,
- other individual accomplishments that have advanced the earth sciences in the public interest.

The award will normally go to a GSA Member, with exceptions approved by Council. It may be presented posthumously to a descendant of the awardee. This award is funded by GSA Foundation.

### How to Nominate

Paper submissions will still be accepted; however, we encourage electronic submission.

1. **Nomination form**, to be filled out online or on paper. Please go to <https://rock.geosociety.org/forms/Awardform.asp> to submit the form online or to download a paper version to submit in via post.
2. **Supporting documents**, to be submitted as e-mail attachments or via post.
  - i. A letter of nomination (300 words or less).
  - ii. A brief biographical sketch (clearly demonstrating applicability to the selection criteria listed above).
  - iii. A selected bibliography of no more than 10 titles.

## GSA Distinguished Service Award

GSA Council established the GSA Distinguished Service Award in 1988 to recognize individuals for their exceptional service to the Society. GSA Members, Fellows, Affiliates, and employees may be nominated for consideration. Any GSA member or employee may make a nomination for the award. The Executive Committee will select awardees, and Council must ratify all selections. Awards may be made annually, or less frequently, at the discretion of Council. This award will be presented during the Annual Meeting of the Society.

### How to Nominate

Paper submissions will still be accepted; however, we encourage electronic submission.

1. **Nomination form**, to be filled out online or on paper. Please go to <https://rock.geosociety.org/forms/Awardform.asp> to submit the form online or to download a paper version to submit via post.
2. **Supporting documents**, to be submitted as e-mail attachments or via post.
  - i. A letter of nomination summarizing the candidate's contributions to the Society (300 words or less).
  - ii. A brief biographical sketch (clearly demonstrating applicability to the selection criteria).

All nomination forms and submission instructions are available at [www.geosociety.org/aboutus/awards/](http://www.geosociety.org/aboutus/awards/). A nomination form and instructions may also be obtained from the Program Officer, Grants, Awards, and Recognition, +1-303-357-1028, [awards@geosociety.org](mailto:awards@geosociety.org). These awards will be presented at the 2007 GSA Annual Meeting in Denver, Colorado, USA.

**The deadline for receipt of all medal, award, and recognition nominations is 1 February 2007**



# 2007 GSA Awards and Medals

## Subaru Outstanding Woman in Science Award

Sponsored by Subaru of America, Inc.



The Subaru Outstanding Woman in Science Award was created to recognize a woman who has had a major impact on the field of the geosciences based on her Ph.D. research. The generous support of Subaru of America Inc. in conjunction with the Doris M. Curtis Fund makes this award possible. Doris Curtis was GSA's 103rd president. Her popularity was widespread, and she pioneered many new directions for geology, not the least of which was her tenure as GSA president after an unbroken chain of 102 men. Causes dear to her were women, public awareness, minorities, and education. Women are eligible for the first three years following their degree.

### How to Nominate

Paper submissions will still be accepted, however, we encourage electronic submission.

1. **Nomination form**, to be filled out online or on paper. Please go to <https://rock.geosociety.org/forms/Awardform.asp> to submit the form online or to download a paper version to be sent via post.
2. **Supporting documents**, to be submitted as e-mail attachments or via post.
  - i. A letter of nomination that clearly states how the Ph.D. research has impacted the geosciences in a major way (300 words or less).
  - ii. A brief biographical sketch (clearly demonstrating applicability to the selection criteria).
  - iii. A selected bibliography of no more than 10 titles.
  - iv. Dissertation title and abstract.

## GSA Fellowship

Fellowship is an honor that is bestowed on the best of our profession once per year at the spring GSA Council meeting. If you are a GSA Fellow, please review the following for updated instructions: A **GSA Fellow** may only support two nominees per election cycle, only *one* as a primary nominator. A **GSA Member** may not be a primary nominator, but may be a secondary nominator for no more than *two* nominees per election cycle. The primary nominator must collect the entire nomination packet (including letters of support) and submit it as one e-mail (with supporting documents as attachments) or as one package via post.

### How to Nominate

Paper submissions will still be accepted; however, we encourage electronic submission.

1. **Nomination form**, to be filled out online or on paper. Please go to [www.geosociety.org/members/fellow.htm](http://www.geosociety.org/members/fellow.htm) to submit the form online or to download a paper version to submit via post.
2. The following **supporting documents** are required from the **primary nominator** (in addition to the nomination form):
  - i. A letter of nomination including a summary of the nominee's significant contributions supporting the selected criteria for election (up to one page).
  - ii. A curriculum vitae of the nominee.
  - iii. A paragraph stating the total number of publications and a selected bibliography of the nominee (up to four pages).
3. The following supporting documents will be required from each of the secondary nominators:
  - i. One supporting letter of nomination.

## AGI Medal in Memory of Ian Campbell

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. To make a nomination, please go to [www.agiweb.org/direct/awards.html](http://www.agiweb.org/direct/awards.html).

The deadline for receipt of all medal, award, and recognition nominations is 1 February 2007



# John C. Frye Environmental Geology Award

**Deadline: 31 March 2007**

In cooperation with the Association of American State Geologists (AASG), GSA presents an annual award for the best paper on environmental geology published either by GSA or by one of the state geological surveys. The award is a US\$1,000 cash prize from the endowment income of GSA Foundation's John C. Frye Memorial Fund.

## Criteria for Nomination

Nominations can be made by anyone, on the basis of the following criteria: (1) the paper must be selected from GSA or state geological survey publications, (2) the paper must be selected from those published during the preceding three full calendar years, (3) the nomination must include a paragraph stating the pertinence of the paper, and (4) nominations must be sent to Program Officer, Grants, Awards, and Recognition, GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA.

## Basis for Selection

Each nominated paper will be judged on its uniqueness or significance as a model of its type of work and report and

its overall worthiness for the award. In addition, nominated papers must establish an environmental problem or need, provide substantive information on the basic geology or geologic process pertinent to the problem, relate the geology to the problem or need, suggest solutions or provide appropriate land use recommendations based on the geology, present the information in a manner that is understandable and directly usable by geologists, and address the environmental need or resolve the problem. It is preferred that the paper be directly applicable to informed laypersons (e.g., planners, engineers).

## 2006 Award Recipients Named

The 2006 John C. Frye Environmental Geology Award will be presented at the October 2006 GSA Annual Meeting in Philadelphia to Ralf Topper, Peter E. Barkmann, William H. Bellis, Judith L. Hamilton, and Karen L. Spray for *Ground Water Atlas of Colorado*, Colorado Geological Survey Special Publication 53, 2003.

# National Awards for 2007

**Deadline: 1 February 2007**

Nominations for the national awards described below are solicited for 2007. GSA members are invited to nominate colleagues by sending background information and vitae, specifying the award for which the candidate is being submitted, to Program Officer, Grants, Awards, and Recognition, GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA, +1-303-357-1028, fax +1-303-357-1070, or by e-mail to [awards@geosociety.org](mailto:awards@geosociety.org). On behalf of its member societies, the American Geological Institute (AGI) coordinates the nomination process. The AGI Member Society Council will finalize a roster of candidates at its spring 2007 meeting for nomination to the respective offices sponsoring the national awards.

The **William T. Pecora Award**, sponsored jointly by the National Aeronautics and Space Administration and the U.S. Department of the Interior, is presented annually in recognition of outstanding contributions by individuals or groups toward the understanding of Earth by means of remote sensing. The award recognizes the contributions of those in the scientific and technical community as well as those involved in the practical application of remote sensing. Consideration will be given to sustained or single contributions of major importance to the art or science of understanding Earth through observations made from space.

The president of the United States awards the **National Medal of Science** to individuals "deserving of special recognition by reason of their outstanding contributions to knowledge in the physical, biological, mathematical, engineering, or social and behavioral sciences." There are now many younger American scientists and engineers who may be reaching a point at

which their contributions are worthy of recognition. The committee is giving increasing attention to these individuals as well as to those outstanding women and minority scientists who deserve recognition.

The **Vannevar Bush Award** is presented from time to time to a person who, through public service activities in science and technology, has made an outstanding contribution toward the welfare of mankind and the nation. The award is given to a senior statesman of science and technology and complements the National Science Foundation's Alan T. Waterman Award, which is given to a promising young scientist. The two awards are designed to encourage individuals to seek the highest levels of achievement in science, engineering, and service to humanity. The nomination should be accompanied by a complete biography and a brief citation summarizing the nominee's scientific or technological contributions to our national welfare in promotion of the progress of science.

The **Alan T. Waterman Award** is presented annually by the National Science Foundation (NSF) and National Science Board to an outstanding young researcher in any field of science or engineering supported by the NSF. Candidates must be U.S. citizens or permanent residents and must be 35 years of age or younger OR not more than five years beyond receipt of the Ph.D. degree by 31 December of the year in which they are nominated. Candidates should have completed sufficient scientific or engineering research to have demonstrated, through personal accomplishments, outstanding capability and exceptional promise for significant future achievement.

# HISTORY GROUPS CELEBRATE ANNIVERSARIES AT PHILADELPHIA GSA MEETING—OCTOBER 2006

**William R. Brice**, Secretary-Treasurer-Editor, *GSA History of Geology Division*; Past-President, *HESS*

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2006 marks the 30th anniversary of the GSA History of Geology Division (HoG) and the 25th anniversary of the History of Earth Sciences Society (HESS). Although the formal founding of HESS was in 1982, the organization really started with gatherings at the 1981 GSA Annual Meeting, and it is that beginning that we will celebrate at the HoG-HESS Reception on Tuesday, 24 October 2006, at the GSA Annual Meeting in Philadelphia. **Please join us at our reception and be part of the celebration.**

## GSA HISTORY OF GEOLOGY DIVISION

In the mid-1970s, George W. White of the University of Illinois, who had played a significant role in establishing the International Union of Geological Sciences' International Commission on the History of Geological Sciences (IHIGEO), was interested in getting a similar group started within the Geological Society of America. White was joined in this effort by Cecil J. Sneer of the University of New Hampshire. The Division was approved by GSA Council in November 1976, and its first slate of officers, along with White and Sneer, are representative of the forces behind the creation of the Division: Claude C. Albritton, Jr., chair; C. Gordon Winder, first vice-chair; Robert H. Dott, Jr., second vice-chair; and Clifford M. Nelson, secretary-treasurer-editor.

The purpose of the Division has changed little over the past 30 years: "to provide a suitable forum for presentation of papers on history of geology and discussion of problems of interest in the study of the history of geology and the development of the geological sciences, and to act as an organized group in promoting these objectives within the framework of the Geological Society of America" (Division By-Laws, February 1977).

Since its founding, the History of Geology Division has held at least one session, and often several sessions, devoted to the history of our science at each of the annual GSA meetings and at many GSA Section meetings as well. A History of Geology Division session at a Northeastern Section meeting in 1980 ultimately led to the creation of the History of Earth Sciences Society (HESS), which is now an Affiliated Society of GSA. The first publication of the *Decade of North American Geology* series was devoted to the history of geology in North America and was edited by Division members (1985, Centennial Special Volume No. 1, *Geologists and Ideas: A History of North American Geology*, Ellen T. Drake and William M. Jordan, eds.).

One highlight of Division activity was the 19–21 March 1994 GSA Penrose Conference, "From the inside and the outside: Inter-disciplinary perspectives on the history of the earth sciences." The idea of the conference was "to bring together

people who write on the history of the earth sciences in order to discuss key methodological issues arising out of the different approaches taken in this field. A basic premise of the conference is that a deep schism separates the *insider* and *outsider* perspectives in the history of earth sciences" (emphases in the original; HoG Division Newsletter, v. 16, no. 2 [June 1993], p. 1). In other words, the scientist-historian and the historian of science did not always understand each other's points of view, and the conveners hoped that this GSA Penrose Conference would bring people from these two worlds together for a few days to bridge this schism.

In 1982, the Division awarded its first History of Geology Award, which was "created to recognize individual contributions of fundamental importance to the understanding of the history of the geological sciences." In 2002, after the passing of a dear and long-time member, Mary C. Rabbitt, the Division received a bequest from her estate, and in 2005 the award was renamed the Mary C. Rabbitt History of Geology Award. Over the years, 25 honorees have been named; Rabbitt was the third recipient, in 1984. This year, Sandra Herbert of the University of Maryland–Baltimore County, a Darwin scholar, will receive the Rabbitt Award.

The Rabbitt bequest also provided the Division with the resources to create the Student Award in the History of Geology. The student awardee is invited to present his or her winning paper at the GSA Annual Meeting and also receives a cash award of US\$500.00 to assist with meeting expenses. Michael C. Rygel (2004), Lee J. Florea (2005), and Alistair Sponson (2006) have been so honored.

Because so many dedicated people work behind the scenes to further the cause of the history of geology, in 2005 the Division also created its Distinguished Service Award, which recognizes "exceptional service in the advancement of our knowledge of the history of geological sciences." Robert N. Ginsburg, University of Miami, is the first recipient of this award, which will be presented at the October 2006 GSA Annual Meeting in Philadelphia.

## HISTORY OF EARTH SCIENCES SOCIETY

At the 1980 GSA Northeastern Section Meeting, William M. Jordan of Millersville University organized and chaired a symposium on the history of geology in the northeast. In 1981, many of the papers from that session were published in *Northeastern Geology* (v. 3, no. 1). This proved to be a very popular issue, and all copies were sold before the end of that year. The heightened interest and enthusiasm led to discussion about a separate journal devoted exclusively to the history of the earth sciences, an idea championed by Gerald M. Friedman (HoG Rabbitt Awardee, 2005).

At the 1981 GSA Annual Meeting, a group of interested persons (Ellis L. Yochelson [HoG Award 2003], Claude C. Albritton Jr. [HoG Award 1983], Michele L. Aldrich [HoG Award 1992], Douglas A. Bassett, and Walter O. Kupsch [HoG Award 2001], led by Gerald Friedman and Sue Friedman) sought input from

various friends of the history of geology. Claude C. Albritton Jr. presided over a small meeting in which the first constitution of the History of Earth Sciences Society (HESS) was drafted, and 1982 marked the formal founding of HESS, with its primary function that of publishing *Earth Sciences History*. Due to its small membership at that time, there was some reluctance to even sponsor meetings. But with the assistance of the Northeastern Science Foundation in Troy, New York, occasional HESS meetings and field trips were held, and the papers from the symposia were published in the journal.

HESS members were also at first reluctant to affiliate with a larger organization, such as the Geological Society of America, for fear this would weaken the international spirit of HESS. This fear proved to be ill-founded, and in the fall of 1999, through the combined effort of Kennard B. Bork, president of HESS, and Kenneth L. Taylor, chair of the GSA HoG Division, HESS formally became an Associated Society of GSA. This has resulted in many jointly sponsored programs at GSA annual meetings and has proven to be a benefit to both HESS and the GSA HoG Division. HESS is now affiliated with the American Geological Institute and looks forward to future affiliations with other groups and organizations interested in the history of any aspect of the earth sciences.

The main function of HESS is still the publication of *Earth Sciences History*, a journal that appeals to a wide range of scientists, historians, and archivists. Kennard B. Bork (HoG Award, 1997) of Denison University and later a HESS President was the first of many guest editors; volume 1, no. 1, was

published in 1982. Gerald Friedman was the founding editor and remained editor until 1993. In only its second year, *Earth Sciences History* moved to two issues per year. By 1987, the journal was reaching about 500 members and 100 institutions, and is now in volume 24.

From its inception, HESS has viewed itself as an international organization. By its very nature, HESS has more international membership and scope than the GSA HoG Division. HESS is more broadly defined than the HoG Division in that HESS includes the history of all aspects of earth sciences, including oceanography and meteorology. Also, several past issues of the journal have been devoted to topics in the history of earth sciences in areas well beyond North America. The journal's current editor, Patrick Wyse Jackson, is at Trinity College, University of Dublin, Ireland.

Next year, on 24–26 June 2007, the formal founding of HESS and *Earth Sciences History* will be celebrated in Troy, New York, at the Northeastern Science Foundation–Rensselaer Center of Applied Geology. Please see the June 2006 issue (v. 30, no. 2) of the HoG Division's Newsletter (available at <http://gsahist.org/>) for details on that meeting.

#### ACKNOWLEDGMENTS

I am indebted to the following, all of whom have better memories than I and who have made valuable contributions to this article: Michele L. Aldrich, Kennard B. Bork, Robert H. Dott, Jr., Gerald M. Friedman, Alan Leviton, Clifford M. Nelson, Kenneth L. Taylor, Hugh S. Torrens, and Ellis L. Yochelson. My thanks to all.

# Bicentennial Celebrations

1807 - 2007

The Geological Society of London



To register your interest in this trip contact Alys Johnson in the Conference Office on [alys.johnson@geolsoc.org.uk](mailto:alys.johnson@geolsoc.org.uk)

For further details of all Bicentenary events contact Alys Johnson, Burlington House, Piccadilly, London, W1J 0BG  
Tel: +44 (0)20 7434 9944  
Fax: +44 (0)20 7439 8975

The *Beagle* in the Beagle Channel by Conrad Martens, courtesy of the National Maritime Museum

## In Darwin's footsteps - experience the Geology of Tierra del Fuego\*

**Date** yet to be finalised - The Leaders are willing to run the trip in either February-March 2007 (austral autumn) or October-November 2007 (austral spring) depending on the wishes of a majority of those interested in participating. The schedule and localities to be visited are also open to discussion, subject to accessibility and logistic/cost limitations.

The excursion will focus on the tectonics, stratigraphy and glacial geology of Andean and extra-Andean Tierra del Fuego. It will include several specific localities visited and mapped by Charles Darwin in the course of the voyage of HMS *Beagle*. Tierra del Fuego, where the Andean Cordillera swings eastward through the Patagonian orocline into the North Scotia Ridge, is a critical location for the interface of climate and tectonics, being the southernmost landmass outside Antarctica and in the core of the globe-encircling southern hemisphere westerly wind system. It is cut by the transform fault separating the South American and Scotia plates.

Transport will be by road and boat. A one week 'add on' trip will involve sailing west along the Beagle Channel to its spectacular northwest arm, into which glaciers from the Cordillera Darwin ice-cap flow over the high grade metamorphic rocks that were first noted by Darwin and are a unique complex in the Andean Cordillera.

**Proposed duration:** 14 days (plus optional extra week)

**Proposed dates:** March or October 2007

**Estimated cost:** £2500 (plus £1500 optional week-long boat trip)

**Organiser:** Ian Dalziel, University of Texas at Austin; Co-Leader Robert H Dott Jr, University of Wisconsin

**Min/Max numbers:** Main excursion min 10 - max 25; optional 'add on' one week boat trip min 10 - max 16

\*This field excursion will be affiliated to the 10th International Symposium on Antarctic Earth Sciences, Santa Barbara, California August 26 to 1 September 2007 <http://isaes2007.geol.ucsb.edu/>.

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# PENROSE CONFERENCE REPORT

## When Did Plate Tectonics Begin?

14–18 June 2006

Lander, Wyoming, USA

Conveners:

**Kent C. Condie**, Department of Earth & Environmental Science, New Mexico Tech, Socorro, New Mexico 87801, USA, [kcondie@nmt.edu](mailto:kcondie@nmt.edu)

**Alfred Kröner**, Institut für Geowissenschaften, Universität Mainz, D-55099 Mainz, Germany, [kroener@mail.uni-mainz.de](mailto:kroener@mail.uni-mainz.de)

**Robert J. Stern**, Geosciences Dept. (FO2.1), University of Texas at Dallas, Box 830688, Richardson, Texas 75083-0688, USA, [rjstern@utdallas.edu](mailto:rjstern@utdallas.edu)

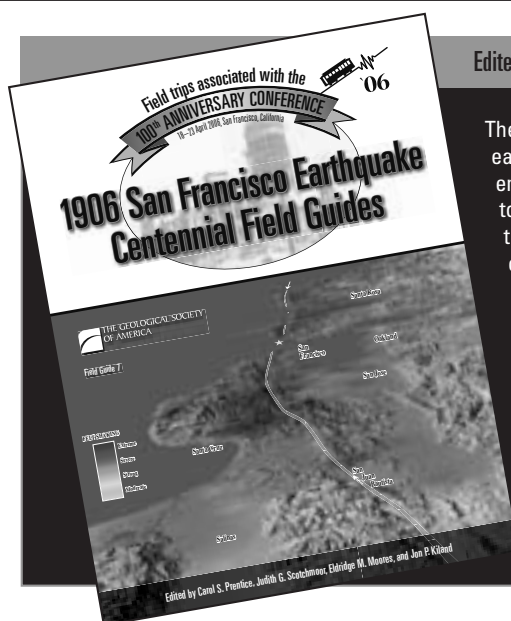
This Penrose Conference, addressing the question of when plate tectonics began on Earth, took place in Lander, Wyoming, on 14–18 June 2006. At the onset of the meeting, we addressed the question of what constitutes plate tectonics. Although participants agreed that plate tectonics involves horizontal plate motions on Earth's surface, including sites of plate formation and recycling into the mantle, there was considerable debate about how best to track plate tectonics back in time. Part of the

disagreement was related to whether the mechanism of recycling lithosphere into the mantle evolved as Earth cooled. One way to partially bypass this issue is to consider “modern-style” subduction (steep slab subduction) and “premodern-style” subduction, which may have been different (e.g., symmetric lithosphere foundering, flat subduction, or eclogite-driven delamination of oceanic or lower continental crust).

Although geodynamic models support the existence of coherent lithospheric plates throughout earth history, just when and how these plates became negatively buoyant is not yet clear. This is partly due to our uncertainty about the early thermal history of the mantle. Most participants agreed that the Archean mantle must have been hotter, but it is not clear how much hotter. A closely related and unsolved question asks how thick the early Archean oceanic crust was. Although it is commonly thought to have been thicker than now, thus making Archean plates more buoyant, Geoff Davies presented a model whereby the early oceanic crust may have been no thicker than at present if the upper mantle was strongly depleted. Another interesting question raised by Paul Silver was the possibility that plate tectonics may have stopped and restarted more than once during Earth's history.

Perhaps the most controversial subject at the meeting was that of tracking plate tectonics back into the Archean using modern rock associations and subduction *P-T* regimes. An arc-like petrotectonic assemblage (basalt-andesite-dacite-rhyolite-graywacke and associated minor rock types) is widespread to at least 2 Ga, common to 3 Ga, and is found locally in crust older than 3 Ga. We visited one such Archean greenstone (South Pass greenstone, Wyoming) on our first field trip.

Subduction-related ore deposits are common to at least 2.7 Ga, and sedimentary basins related to plate tectonics (passive



Edited by Carol S. Prentice, Judith G. Scotchmoor, Eldridge M. Moores, and Jon P. Kiland

The twenty field trip guides in this volume represent the work of earthquake professionals from the earth science, engineering, and emergency management communities. The guides were developed to cross the boundaries between these professions, and thus reflect this diversity: trips herein focus on the built environment, the effects of the 1906 earthquake, the San Andreas fault, and other active faults in northern California. Originally developed in conjunction with the 100th Anniversary Earthquake Conference held in San Francisco, California, in April 2006, this book is meant to stand the test of time and prove useful to a wide audience for general interest reading, group trips, or self-guided tours.

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margins, foreland basins, strike-slip basins, etc.) occur to at least 2.5 Ga, with possible examples as old as 3 Ga. Also, dual thermal regimes (low-*P*-high-*T* and high-*P*-low-*T*) suggestive of plate tectonics are identified at least to 2.8 Ga and possibly to 3.3 Ga. In addition, collisional orogens appear to exist to ca. 2 Ga and accretionary orogens to  $\geq 3.5$  Ga in the West Pilbara (Australia). Both types of orogens contain terranes with distinct terrane boundaries.

In contrast to subduction-related rock packages, blueschists, ultra-high pressure (UHP) metamorphism, and ophiolites do not become common in the geologic record until after 1 Ga, suggesting to Bob Stern that “modern-style” plate tectonics did not begin until about 1 Ga. However, as pointed out by John Percival, more efficient subduction in the Archean may have prevented blueschists and UHP metamorphic rocks from returning to the surface. Another possibility is that subduction geotherms may have been too steep in the Archean to pass through the blueschist stability field, although the relationship of mantle temperature to subduction geotherms is not well understood. Although complete ophiolites older than 2 Ga have not been found and are rare before 1 Ga, many Archean greenstones may represent fragments of upper oceanic crust, as in the section we examined on our second field trip to the Tin Cup Mountain area in central Wyoming. If the Archean oceanic crust was thicker than at present, perhaps only the upper part was obducted and preserved.

Paleomagnetic data, which clearly record differential motions (probably plate motions) to 1.9 Ga and possibly to 2.6 Ga, contribute to answering the question of when plate tectonics began. Also consistent with plate tectonics is a long-term history of depletion in the upper mantle and the recycling of ancient lithosphere, as recorded by various radiogenic isotopes. Xenoliths of Archean continental mantle lithosphere that have stable isotope signatures for surficial processes can only be explained by the recycling of sediments into the mantle, again consistent with the early onset of plate tectonics.

Jean Bédard presented a testable non-plate tectonics model for the Archean involving oceanic plateau production from mantle plumes in which plateau root zones melt to produce trond-

hjemite-tonalite-granodiorite granitoids and eclogitic restite sinks into the mantle. Although other alternatives to plate tectonics in the Archean were considered (such as mantle plume tectonics and “drip” tectonics, whereby drips of hot oceanic lithosphere sink into the mantle), they were not discussed in detail.

We took a straw vote before and after the meeting as to when participants thought plate tectonics began. Although in both cases about 70% voted that plate tectonics began sometime between 2.5 and 4 Ga, 20% of the participants changed their vote between the two ballots. One participant favored the idea that “modern-style” plate tectonics began about 1 Ga. Regardless of the fact that a consensus was not reached, most of the evidence at hand suggested that “modern-style” plate tectonics “evolved” from an earlier form of proto-plate tectonics sometime in the Archean. The group did agree that answering the question of when plate tectonics began is critical for understanding the evolution of the solid earth system, and participants appeared to leave the meeting rejuvenated and challenged by a greater appreciation of the multidisciplinary nature of the question as well as the many other questions that remain unanswered.

## PARTICIPANTS

Don Anderson, Mark Barley, Asish Basu, Jean Bédard, Keith Benn, Marcia Bjornerud, Wouter Bleeker, Chloe Bonamici, Dwight Bradley, Michael Brown, Ron Clowes, Kent Condie, Umberto Cordani, Geoff Davies, Annika Dziggel, Ken Eriksson, David Evans, Stephan Foley, Ron Frost, Zvi Garfunkel, Steve Harlan, Mark Harrison, Bob Hatcher, Pekka Hekkinen, Pete Hollings, Andrew Hynes, Balz Kamber, Annakaisa Korja, Alfred Kröner, Mike Leshner, Nate Lorentz, Shigei Maruyama, Mike Meredith, Paul Morgan, Jean-François Moyen, Paul Mueller, Julian Pearce, Vickie Pease, Petri Peltonen, John Percival, Sergei Pisarevsky, Ali Polat, Hugh Rollinson, Dave Scholl, Steve Shirey, Paul Silver, Suki Smaglik, Hugh Smithies, Bill Spence, Bob Stern, Gary Stevens, Paul Sylvester, Phil Thurston, Arie van der Velden, Joren van Hunen, Peter van Keken, Martin Whitehorse, Simon Wilde, Brian Windley, Alex Witze, Derek Wyman, and Guachon Zhao





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## Geoscience—The Past 25 Years


In our fall mailing to the GSA membership, we gave our ideas of the five most important things that have happened in the geosciences in the past 25 years. We promised a follow-up on the responses we received. Our five suggestions are listed below, ranked in order of your votes.

1. The emergence of the global warming discussion—32%.
2. The recognition of the relationship of ocean circulation patterns to climate change—23%.
3. The recognition of the significance of meteorites to the extinction of the dinosaurs—15%.
4. The emergence of deep-earth geophysics and resultant mantle/core discoveries—15%.
5. The development of better analytical techniques and instruments—15%.

Thanks to all of you who took the time to express your opinion. We appreciate your participation. Remember, if you have your own idea of the most important geoscience event during the past 25 years, we are interested in knowing about it!

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*Most memorable early geologic experience:*

I'll never forget eating 49 pancakes and still losing the pancake-eating contest to Hugh Wingerter on the last day of Northwestern's 1949 Lake Superior field trip.


—Henry James Dorman

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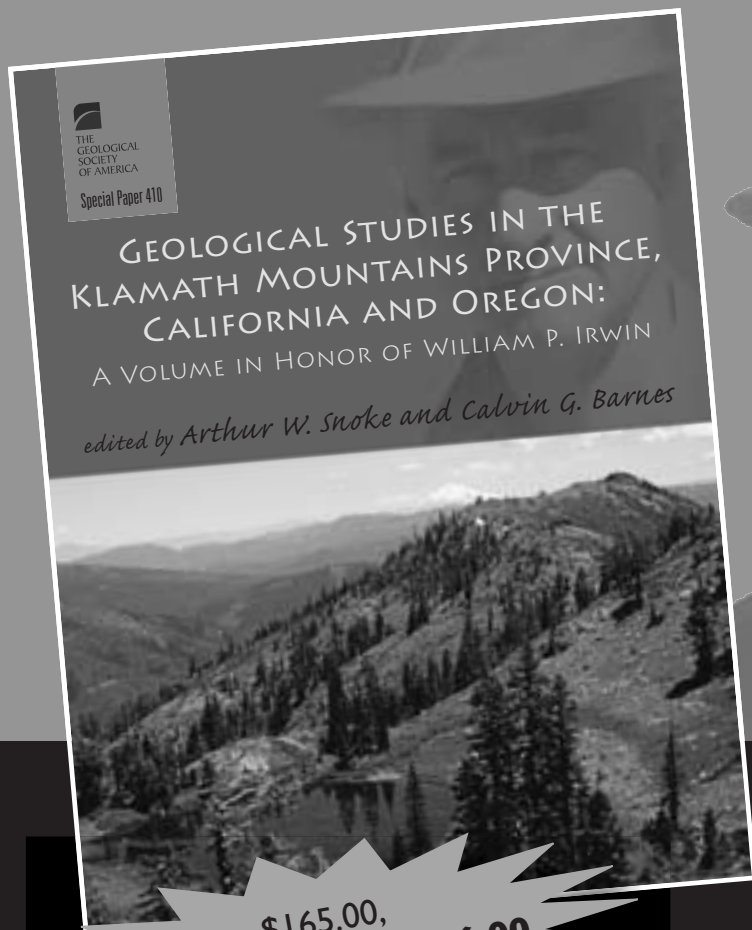
# Geological Studies in the Klamath Mountains Province, California and Oregon: A Volume in Honor of William P. Irwin

edited by Arthur W. Snoke and Calvin G. Barnes

This volume in honor of William P. Irwin (U.S. Geological Survey) has 23 chapters focusing on various aspects of the complex tectonic and petrologic history of the Klamath Mountains province, northwestern California and southwestern Oregon. An introductory chapter reviews the development of tectonic concepts for the province and regional and historical context for the subsequent chapters. The bulk of the volume focuses on the Jurassic history of the province, but it also includes important contributions on the older geologic history of eastern parts of the province and a review of the Neogene history of the province. Several

chapters contrast terranes of the Klamath Mountains province with possible analogous terranes in the Sierran Foothills to the south or Blue Mountains province to the northeast. An accompanying CD-ROM includes classic geologic maps of the province by Irwin, a bibliography of the province compiled by Irwin, descriptions of fossil localities in the Triassic and Paleozoic belt, new geologic maps of Late Jurassic plutonic complexes, and much new geochemical data. This volume will be of interest to regional geologists; structural geologists and tectonicists; petrologists; geochemists and isotope geologists; and geophysicists.

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# ANNOUNCEMENTS

## MEETINGS CALENDAR

### 2007

15–19 July 9th International Conference on Biogeochemistry of Trace Elements, Beijing, China. **Information:** [www.conference.ac.cn/icobte.htm](http://www.conference.ac.cn/icobte.htm).

17–20 July European Current Research on Fluid Inclusions (ECROFI-XIX), Bern, Switzerland. **Information:** [www.geo.unibe.ch/ecrofi](http://www.geo.unibe.ch/ecrofi); e-mail, [ecrofi\\_bern@geo.unibe.ch](mailto:ecrofi_bern@geo.unibe.ch).

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

## In Memoriam

**Robert R. Berg**  
College Station, Texas  
13 June 2006

**Richard R. Bloomer**  
Lago Vista, Texas  
26 December 2005

**Campbell Craddock**  
Saint Paul, Minnesota  
23 July 2006

**Frank L. Greene**  
Panama City, Panama  
5 August 2004

**P. Edgar Hare**  
Daytona Beach, Florida  
5 May 2006

**Maurice E. Kaasa Jr.**  
Johnson City, New York  
Notified 5 July 2006

**Roger L. Larson**  
Narragansett, Rhode Island  
4 May 2006

**Frederick H. Pough**  
Pittsford, New York  
7 April 2006

**Robert L. Redmond**  
Reno, Nevada  
21 May 2006

**Martin N. Sara**  
Vernon Hills, Illinois  
1 July 2006

**Werner F. Schreyer**  
Bochum, Germany  
Notified 12 July 2006

**Frank W. Trainer**  
Albuquerque, New Mexico  
30 May 2006

**Robert W. Wilson**  
Lawrence, Kansas  
26 June 2006



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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 2007**

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

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## Positions Open

### ASSISTANT PROFESSOR

#### THE UNIVERSITY OF LOUISIANA AT MONROE

The Department of Geosciences at The University of Louisiana at Monroe announces a tenure-track opening for an assistant professor of geology beginning in spring 2007. We are seeking applicants with a broad training and experience in geology with perhaps some abilities in geomorphology, environmental geology, or GIS/remote sensing. The successful candidate should be prepared to teach introductory physical and historical geology courses and must be committed to excellence in teaching and research. A Ph.D. is preferred. The Department offers a B.S. in atmospheric sciences and soon plans to create a B.S. in geosciences. Facilities include the Weather Research Center and a state-of-the-art computer laboratory for teaching and research.

Review of applications will begin on 4 October and will continue until the position is filled. Women and minorities are encouraged to apply. ULM is an AA/EEO employer.

Applicants should send a letter of application, curriculum vita, and the contact information for three professional references to Dr. Michael Camille, Head, Department of Geosciences, The University of Louisiana at Monroe, 700 University Ave., Monroe, LA 71209-0550.

Interviews will be conducted through the employment service at the fall GSA meeting.

#### CALIFORNIA STATE UNIVERSITY, FRESNO ANNOUNCES THREE POSITIONS

**Environmental Scientist—Climate/Global Change: Assistant Professor (Tenure Track); Vacancy #07TSM068.** The Department of Earth and Environmental Sciences seeks a broadly trained geologist who applies diverse modern approaches to conducting research in the areas of Atmosphere, and Climate or Global Change, including related fields (e.g., Glaciology or Palynology). Teaching responsibilities include: undergraduate courses in environmental sciences and graduate courses specializing in the environmental aspects of the atmosphere, the hydrosphere, and their interactions. Other expectations include developing a sustainable, externally funded research program, supervising thesis research, and mentoring students at the undergraduate and graduate levels. Additional information about the department is available at [www.csufresno.edu/geology/](http://www.csufresno.edu/geology/). An earned doctorate (Ph.D.) in a field of Environmental Sciences or related fields is required. Please send a C.V., statement of research and teaching interests, recent publication(s) and at least three letters of recommendation to Professor John Suen, Search Chair, California State University, Fresno, 2576 East San Ramon Avenue M/S ST 24, Fresno, CA 93740-8039 before November 15, 2006, for full consideration. The position will be open until filled.

**Engineering Geologist: Assistant Professor (Tenure Track); Vacancy #07TSM069.** The Department of Earth and Environmental Sciences seeks a broadly trained geologist whose background and training encompasses Engineering Geology. Teaching responsibilities at the lower division level will include introductory geology or environmental science courses. At the upper division and graduate levels, the candidate will be expected to teach Engineering Geology and courses such as Stream Habitat Restoration or other topics in the applied geosciences. Other courses might include Field Geology, and upper division Environmental Science Courses, or courses that pertain to the candidate's field of expertise. Other expectations include developing a sustainable, externally funded research program, supervising thesis research, and mentoring students at the undergraduate and graduate levels. Additional information about the department is available at [www.csufresno.edu/geology/](http://www.csufresno.edu/geology/). An earned doctorate (Ph.D.) in a field of Geology or related Earth Sciences field is required. Please send a C.V., statement of research and teaching interests, and at least three letters of recommendation to Associate Professor Keith Putirka, Search Chair, California State University, Fresno, 2576 East San Ramon Avenue M/S ST 24, Fresno, CA 93740-8039 before December 13, 2006, for full consideration. The position will be open until filled.

**Biogeochemist: Assistant Professor (Tenure Track); Vacancy #07TSM070.** The Department of Earth and Environmental Sciences seeks a broadly trained geologist with background and training in biogeochemistries, such as biogeochemistry and geobiology, and the interactions between the Lithosphere and the Biosphere. Teaching responsibilities at the lower division level will include introductory geology or environmental science courses. At the upper division and graduate levels, the candidate will be expected to teach courses in

Biogeochemistry. Other courses might include an upper division Environmental Geology Course, Petroleum Geology, or courses that pertain to the candidate's field of expertise. Other expectations include developing a sustainable, externally funded research program, supervising thesis research, and mentoring students at the undergraduate and graduate levels. Additional information about the department is available at [www.csufresno.edu/geology/](http://www.csufresno.edu/geology/). An earned doctorate (Ph.D.) in a field of Geology or related Earth Sciences field is required. Please send a C.V., statement of research and teaching interests, and at least three letters of recommendation to Associate Professor Steve Lewis, Search Chair, California State University, Fresno, 2576 East San Ramon Avenue M/S ST 24, Fresno, CA 93740-8039 before January 12, 2007, for full consideration. The position will be open until filled.

#### FIELD HYDROGEOLOGIST GEOHYDROLOGY SECTION

**KANSAS GEOLOGICAL SURVEY, UNIV. KANSAS**  
\$36K-\$46K. Assist section scientists in field work for hydrogeologic research. Section emphasis is state-of-the-science field studies and complementary theoretical research. Required: B.S. degree in natural science or engineering with emphasis on hydrogeology and at least 2 years experience in hydrogeologic field investigations. Priority date: 11/03/06. Details at <https://jobs.ku.edu>, position #00008396. A. Delaney, [hr@kgs.ku.edu](mailto:hr@kgs.ku.edu) or +1-785-864-2152.

#### GROUNDWATER MODELER DELAWARE GEOLOGICAL SURVEY (DGS) UNIVERSITY OF DELAWARE

The Delaware Geological Survey (DGS) at the University of Delaware (UD) is seeking qualified candidates for a ground-water modeling position. We seek a talented scientist to conduct basic and applied research and public service projects in ground-water modeling to support efforts to determine the occurrence, availability, quantity, and quality of ground water in Delaware.

This is a full-time 12-month position subject to annual review. Appointment rank will be commensurate with qualifications and accomplishments.

Applicants must have expertise in numerical modeling of ground-water flow and a solid background in geology/hydrogeology. Requires a M.S. degree, Ph.D. preferred, in geology, hydrology, or a related discipline and a minimum of three years of related experience. A strong record of successful projects and scholarly publication and/or technical reports is required.

Must be able to work independently and as part of a team. Effective written and oral communication skills and ability to interact with other researchers, government agencies, and the public are essential. A record of funded projects is desirable.

The DGS is a state-funded unit of UD dedicated to geologic and hydrologic research and public service. The DGS has a dynamic staff of 18 scientists and support personnel housed in a modern facility at the university's attractive Newark, Delaware campus. UD offers a generous comprehensive benefits package, including family educational benefits ([www.udel.edu/udjobs/](http://www.udel.edu/udjobs/)). Opportunities exist for collaboration with faculty and students in other UD departments. For further information about the DGS, please visit our Web site at [www.udel.edu/dgs/](http://www.udel.edu/dgs/).

This position is expected to be filled in late 2006, with exact starting date negotiable. To apply, please send curriculum vitae, statement of research interests, and the names and addresses of three references to Peter McLaughlin, Chair, Modeler Search Committee, Delaware Geological Survey, DGS Building, University of Delaware, Newark, DE 19716 ([ppmclau@udel.edu](mailto:ppmclau@udel.edu)). Application materials should be received by October 31, 2006. The curriculum vitae and all application materials shall be shared with departmental staff.

The UNIVERSITY OF DELAWARE is an Equal Opportunity Employer which encourages applications from Minority Group Members and Women.

#### EAST TENNESSEE STATE UNIVERSITY COLLEGE OF ARTS AND SCIENCES DEPT. OF PHYSICS, ASTRONOMY AND GEOLOGY ASSISTANT PROFESSOR, GEOLOGY

Tenure track Assistant Professor position beginning August 2007. As part of continuing efforts to expand our Geology Program, we seek an exceptional individual who combines field based research with theoretical studies. Preference will be given to those individuals who specialize in exploration geophysics and GIS although strong candidates in other geology sub-disciplines will be considered. The successful applicant will be expected to teach introductory geophysics, GIS and graduate-level courses in his/her specialized topic; establish a rigorous, externally funded research

program; advise students; oversee student projects; serve on committees; contribute to curriculum development; and perform departmental duties as assigned. Qualifications: Ph.D. in geology or a related field required; completion at time of appointment. Evaluation of applications will begin on December 15, 2006, but position will remain open until filled. The position is contingent upon state funding. ETSU is an equal opportunity employer. For more information contact [whitelaw@etsu.edu](mailto:whitelaw@etsu.edu) or phone (423) 439-7528. Submit a letter of application, statement of teaching philosophy, curriculum vitae, transcripts, and three letters of recommendation to Dr. Michael J. Whitelaw, Geology Search Committee Chair, Department of Physics, Astronomy and Geology, East Tennessee State University, Box 70652, Johnson City, TN 37614.

#### GEOSCIENCE EDUCATION, ASSISTANT PROFESSOR GRAND VALLEY STATE UNIVERSITY

The Geology Department invites applications for a tenure-track position to begin fall 2007. Candidates must hold a Ph.D. in geoscience with demonstrated interest/experience in K-12 science education or a Ph.D./Ed.D. in science education with a strong earth science background. We seek a creative and dynamic educator with expertise that complements the existing strengths of the department faculty, a demonstrated commitment to effective teaching, academic experiences with culturally diverse populations, and a record of active scholarship. Primary teaching responsibilities will be in courses that serve the Integrated Science (elementary education) and Earth Science (secondary education) majors with additional teaching in introductory courses, and upper-level general education theme courses.

The successful candidate may expect to develop courses and field experiences; conduct research with undergraduate students; advise pre-service teachers; contribute to in-service teacher education; and act as the geology department liaison with the State Department of Education, the College of Education, and K-12 teachers. The geology department includes 9 tenure-track faculty and ~100 majors (geology + earth science) and serves ~250 integrated science majors. The department values field experience and collegial faculty-student interactions. ([www.gvsu.edu/geology/](http://www.gvsu.edu/geology/)).

Applicants should send a letter of application, vitae, statements of teaching philosophy and research interests, and the names and contact information for at least three references familiar with your teaching and/or research potential to Search Committee Chair, Department of Geology, Grand Valley State University, Allendale, MI 49401, +1-616-331-3728. Applications must be postmarked by December 1, 2006. Grand Valley is an affirmative action, equal opportunity institution.

#### GEOLOGICAL OCEANOGRAPHER UNIVERSITY OF SOUTH CAROLINA ASSISTANT/ASSOCIATE PROFESSOR IN SEDIMENTARY PROCESSES

The Marine Science Program and the Department of Geological Sciences at the University of South Carolina invite applications for a tenure-track, assistant or associate professor position in the general area of Geological Oceanography with emphasis on sedimentary processes. This position is part of an ongoing initiative to enhance coastal ocean science at the University of South Carolina. The position is a 9-month academic year appointment as Primary Marine Science faculty. A Ph.D. is required at the time of appointment. Post-Doctoral experience is desirable.

We are looking for an individual with outstanding research and teaching capabilities who will complement our existing programs in physical, chemical, biological and geological oceanography. Specifically, we seek an individual who will add to our growing expertise in coastal observations and coastal oceanography. Applications are encouraged from individuals whose research interests fall in areas including, but not limited to, modern sedimentary processes and benthic fluxes. The successful candidate is expected to teach geological oceanography, as well as other undergraduate and/or graduate courses in marine science, and to direct an active externally funded research program.

The Marine Science Program at USC is a multi-disciplinary faculty of approximately 40 from various departments including geology, biology, chemistry and environmental health. The program is associated with the Belle W. Baruch Institute for Marine and Coastal Sciences at USC, which has a field laboratory and small boat facility near Georgetown, SC.

Applicants should include with their application their vita, a statement of research and teaching interests and goals, and the names, addresses and phone numbers of at least three references. This information should be sent to Chair, Geological Oceanography Search Committee,

Department of Geological Sciences, University of South Carolina, Columbia, SC 29208.

Review of applications will begin on **1 November 2006**, and will continue until a candidate is selected.

For more information about the Marine Science Program and the Department of Geological Sciences visit our Web sites at [www.mscl.sc.edu](http://www.mscl.sc.edu) and [www.geol.sc.edu](http://www.geol.sc.edu).

The University of South Carolina does not discriminate in educational or employment opportunities or decisions for qualified persons on the basis of race, color, religion, sex, national origin, age, disability, sexual orientation or veteran status. The University of South Carolina is an affirmative action, equal opportunity employer. Minorities and women are encouraged to apply.

#### LOW-TEMPERATURE GEOCHEMISTRY UNIVERSITY OF OKLAHOMA

The School of Geology and Geophysics at the University of Oklahoma solicits applications for a tenure-track appointment at the Assistant Professor level in low-temperature geochemistry. The School is a key component of the new College of Earth and Energy, which includes the Mewbourne School of Petroleum and Geological Engineering, the Sarkeys Energy Center, and the Oklahoma Geological Survey. We seek an individual whose skills lie in the application of physical chemistry through experimental, analytical, or numerical methods to model interactions among minerals, fluids, and possibly biological systems at shallow crustal to surface conditions. This includes but does not restrict the search to the subjects of weathering, diagenesis, biomineralogy, paleoenvironmental reconstruction (continental and oceanographic), and environmental geochemistry. The low-temperature geochemist should complement current departmental strengths in organic geochemistry, igneous petrochemistry, paleoclimate and global change, the acquisition of magnetism in sedimentary rocks, and the physical and chemical properties of reservoir rocks. The School encourages interdisciplinary teaching and research with allied academic programs in science and engineering, and with the Sam Noble Oklahoma Museum of Natural History. Learn more about the School's faculty and facilities at <http://geology.ou.edu>.

The successful candidate will be expected to develop a vigorous, externally funded research program and to teach courses in geochemistry at the undergraduate and graduate levels. Candidates must hold a Ph.D. at the time of appointment.

Applicants should submit a current CV, a statement of research and teaching interests, and arrange to have at least three letters of reference sent directly to the search committee. Applications and questions should be sent to Chair, Geochemistry Search, School of Geology and Geophysics, University of Oklahoma, 100 East Boyd Street, Room 810 Sarkeys Energy Center, Norman, OK 73069-5816.

The University of Oklahoma is an Affirmative Action, Equal Opportunity Employer. Women and minorities are encouraged to apply.

#### WATERSHED AND EARTH SCIENCES TWO ASSISTANT PROFESSORS

The Department of Earth & Environmental Sciences at Wright State University invites applications for **two** tenure-track positions at the rank of Assistant Professor for September 2007. Preference will be given for one position to candidates whose research focuses on watershed processes. The candidate's discipline might include (but is not limited to): surface and subsurface hydrology, contaminant transport, process geomorphology, quaternary studies, or biogeochemistry. Preference will be given for the second position to candidates whose research focuses on the theory and applications of geophysical and remote sensing methods. The candidates should complement and broaden existing strengths in hydrology, environmental geochemistry, sediment transport, GIS, remote sensing, geophysics, aquatic toxicology, and environmental risk assessment within the department, and complement existing strengths in watershed ecosystems within the broader Environmental Sciences Ph.D. program. We prefer candidates who use interdisciplinary approaches, GIS and other spatial modeling and visualization tools. The candidates will have the opportunity to collaborate with facilities for remote sensing, drilling, GIS, chemical analysis, surface and subsurface water sampling, aquatic toxicology, and utilize nearby experimental watersheds. Departmental space is undergoing a multimillion dollar renovation. We seek candidates who will establish an active research program that supports Environmental Sciences Ph.D. students and contribute to Masters and Bachelors degree programs in geological sciences and environmental sciences. The successful candidates will

also teach 3 to 4 quarter courses per year (undergraduate to advanced graduate in their area of expertise). Candidates should have earned a Doctorate in Earth Sciences or a related field. Postdoctoral experience preferred. Wright State has ~17,000 students with over \$60 million per year in extramural funding and located in the Dayton, Ohio metropolitan area. For more information see [www.wright.edu/ees](http://www.wright.edu/ees). Please send an electronic letter of application, with a statement of research and teaching interests, CV, and names and contact information for 3 references to [cindy.harrison@wright.edu](mailto:cindy.harrison@wright.edu). Review of applications will begin October 16th and continue until the positions are filled. Wright State University is an Affirmative Action Equal Opportunity Employer.

#### 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, 2007. Expertise in metropolitan water quality issues and integrated research and teaching 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](http://www.csam.montclair.edu/earth). 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 ([ophorid@mail.montclair.edu](mailto:ophorid@mail.montclair.edu)). Hydrology Search Committee Chair (VF-30), 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.

#### IGNEOUS PETROLOGY OR VOLCANOLOGY CALIFORNIA STATE UNIVERSITY, LOS ANGELES

The Department of Geological Sciences seeks to fill a tenure-track position in igneous petrology, volcanology, or volcanic hazards at the assistant professor level, with a starting date of September 2007 and at an initial salary commensurate with qualifications and experience. A Ph.D. in geology from an accredited institution of higher education is required. The successful applicant must demonstrate a potential for or a record of research, scholarly and/or creative activity involving students whenever possible, and a potential for effective teaching using a variety of methodologies. A demonstrated ability and/or interest in working in a multi-ethnic, multicultural environment is also required. Duties will include teaching at the undergraduate and graduate level. Teaching responsibilities will include igneous/metamorphic petrology, optical mineralogy, introductory courses, and advanced courses in applicant's area of expertise. We seek applicants capable of integrating laboratory and field instruction. Maintaining an active research program, mentoring and advising students at the undergraduate and graduate level, and participating in University service are expected. Applicant documentation should include a statement of teaching and research interests, a detailed curriculum vita, three letters of recommendation, and official transcripts from institutions awarding highest degree. Employment is contingent upon proof of eligibility to work in the United States and completion of the University's Application for Academic Employment form. Review of applications will begin on November 15, 2006 and will continue until the position is filled. Address applications, required documentation and/or requests for information to Dr. Kim Bishop, Search Committee Chair, California State University, Los Angeles, 5151 State University Drive, Los Angeles, CA 90032-8203, [kbishop@calstatela.edu](mailto:kbishop@calstatela.edu) (323) 343-2409. Department Web Page: [www.calstatela.edu/dept/geology](http://www.calstatela.edu/dept/geology).

#### DEPARTMENT OF GEOLOGICAL SCIENCES COLLEGE OF NATURAL SCIENCE AND MATHEMATICS

#### CALIFORNIA STATE UNIVERSITY, FULLERTON ENVIRONMENTAL GEOCHEMISTRY, HYDROGEOCHEMISTRY, TENURE TRACK

The Department of Geological Sciences at California State University Fullerton invites applications for a tenure-track, Assistant Professorship that will begin August 2007. The successful candidate is expected to develop an active, field-based, externally-funded research program in coastal Environmental Geochemistry and/or Hydrogeochemistry involving undergraduate and master's students, and must be committed to excellence in teaching the diverse student population at CSU Fullerton. A Ph.D. in Geological Sciences or a related field is required at the time of appointment.

Teaching responsibilities include aqueous geochemistry, general education classes such as oceanography, and upper-division/graduate courses in the candidate's field of expertise. The department places a strong emphasis on field-based instruction in all class offerings. For a complete description of the requirements, go to <http://diversity.fullerton.edu/>.

The Department currently has approximately 50 undergraduate majors, 25 M.S. students and 12 full-time faculty. Fullerton's location offers convenient access to coastal, mountain, and desert environments, providing many opportunities for field-based research and instruction. Abundant collaborative research and teaching opportunities exist within the Departments of Geological Sciences, Biology, Chemistry and Biochemistry and the Environmental Studies Program. Applicants are encouraged to visit <http://geology.fullerton.edu/> for additional information.

To apply, please send (1) a detailed curriculum vita; (2) a letter of application; (3) a teaching statement that includes: a discussion of relevant course work and/or experience in preparation for teaching, a list of courses you would feel comfortable teaching, and a statement of your teaching philosophy; (4) a statement of your future research plans and goals; and (5) letters of recommendation from at least three references familiar with your teaching and research potential. Applicants and referees should send materials directly to Search Committee Chair, Department of Geological Sciences, California State University, 800 N. State College Blvd., Fullerton, California 92834-6850.

Applications will be accepted until the position is filled. To insure full consideration, submit all application materials by November 20, 2006.

CSU Fullerton is an Equal Opportunity/Title IX/503/504/VEVRA/ADA Employer.

#### ASSISTANT PROFESSOR GEOLOGY AND CHEMISTRY

#### UNIVERSITY OF HOUSTON-DOWNTOWN

The University of Houston-Downtown is currently seeking a tenure track Assistant Professor of Geology & Chemistry to begin Fall, 2007. We seek an individual expertise in geochemistry, teaching responsibilities in chemistry and geology, including the ability to teach most of the following courses: Historical & Physical Geology, Geochemistry, Petrology, and Introductory Chemistry. Prospective candidate should be able to develop a research program incorporating undergraduate research and be willing to interact with industry, particularly Petrochemical Industry in conjunction with development of new Baccalaureate program in Geosciences. Applicant must have a Ph.D. in Chemistry/Geology or in a related field.

All applicants must complete an on-line application at <http://jobs.uhd.edu>.

Applicants must also submit a cover letter, curriculum vitae, a statement of teaching philosophy, a statement of research interests, a copy of undergraduate and graduate school transcripts, and have three letters of recommendation sent to Ms. Heather Davis, Program Coordinator, University of Houston-Downtown, One Main Street, Ste. N-813, Houston, TX 77002. Deadline to apply is October 31, 2006.

Applicants must be permanent resident or citizen of United States prior to hiring. This is a security sensitive position and a complete background investigation is required. In accordance with H.B. #558, Selective Service Registration may be required. Offer of employment contingent upon verification of individual's eligibility for employment in the United States.

The University of Houston-Downtown is an Affirmative Action/Equal Opportunity employer and does not discriminate on the basis of race, gender, age, color, religion, national origin, disability, sexual orientation or veteran status in the recruitment and admission of students, the recruitment and employment of faculty and staff, and the operation of any of its program and activities, as specified by all applicable laws and regulations. Women and minorities are encouraged to apply to this Hispanic-Serving, Minority-Serving Institution.

More information about this position can be found at [www.dh.utu.edu/academic/colleges/sciences/naturalscience](http://www.dh.utu.edu/academic/colleges/sciences/naturalscience).

#### GEOBIOLOGY, ASSISTANT PROFESSOR EARTH AND PLANETARY SCIENCES

#### UNIVERSITY OF CALIFORNIA, SANTA CRUZ

The Department of Earth and Planetary Sciences at the University of California, Santa Cruz, seeks applicants doing cutting edge research in Geobiology. We are particularly interested in candidates focused on research areas that include, but are not limited to, paleobiology, paleoecology, geomicrobiology, biogeochemistry, and astrobiology. The successful applicant is expected to develop a vigorous, externally-funded research program

and supervise research by graduate and undergraduate students. Faculty in our program teach across the spectrum of undergraduate and graduate levels, with a strong commitment to high quality instruction. This faculty position is expected to contribute teaching expertise to important curricular areas in our large undergraduate and graduate programs. The campus is especially interested in candidates who can contribute to the diversity and excellence of the academic community through their research, teaching, and/or service.

The Earth and Planetary Sciences Department ([www.es.ucsc.edu](http://www.es.ucsc.edu)) consists of 20 faculty, ~60 graduate students, and ~100 undergraduate majors. Additionally, researchers are supported on campus by the Institute of Geophysics and Planetary Physics and the Institute of Marine Sciences. Diverse analytical and computational resources are available on campus, and UCSC researchers have access to a wide range of additional colleagues and facilities in the San Francisco and Monterey Bay areas.

RANK: Assistant Professor (Tenure-track)

SALARY: Commensurate with qualifications and experience.

MINIMUM QUALIFICATIONS: Ph.D. (or equivalent) in Earth Sciences or related field completed or expected by effective date, a demonstrated record of research excellence and potential to obtain external funding, and a commitment to and talent for teaching at undergraduate and graduate levels.

POSITION AVAILABLE: July 1, 2007

TO APPLY: To ensure full consideration, send curriculum vitae, a brief summary of research and teaching interests, reprints, and the names and addresses of five people from whom the Department may request letters of recommendation to Assistant Professor Search Committee c/o Judy Van Leuven, MSO, Department of Earth and Planetary Sciences, University of California, 1156 High Street, Santa Cruz, CA 95064. Please refer to position #686-07 in all correspondence. For inquiries only: [judy@pmc.ucsc.edu](mailto:judy@pmc.ucsc.edu); +1-831-459-4478.

CLOSING DATE: Position is opened until filled. To ensure full consideration, applications must be received by November 22, 2006. Full ad details and information about UC Santa Cruz is available on our Web site at [www.es.ucsc.edu/jobs/index.html](http://www.es.ucsc.edu/jobs/index.html).

UCSC is an AA/EOP Employer. Women and minorities are encouraged to apply. Visit the AHR Web site: <http://www2.ucsc.edu/ahr/employment/>.

**MICHIGAN STATE UNIVERSITY  
DEPARTMENT OF GEOLOGICAL SCIENCES  
SOLID-EARTH GEOCHEMISTRY/GEODYNAMICS**

The Department of Geological Sciences at Michigan State University announces an academic year tenure-track position in solid-earth geochemistry/geodynamics beginning Fall 2007. The position is at the Assistant Professor level. The successful candidate will be expected to develop a strong, externally funded research program, be committed to excellence in teaching at both the graduate and undergraduate level, and be able to contribute enthusiastically to both the intellectual and collegial life of the department. This position is open to candidates with a Ph.D. in Geological Sciences that focuses on chemical evolution of the crust and mantle, and applied processes; field experience is desirable. Post-doctoral experience and the ability to complement one or more existing departmental strengths is desirable.

Additional information on the Department can be obtained on our Web page at [www.geology.msu.edu](http://www.geology.msu.edu). Michigan State University is an Equal Opportunity/Affirmative Action Institution and strongly encourages applications from women, minorities, and persons with disabilities. Persons with disabilities have the right to request and receive reasonable accommodation. Review of applications will begin 20 December 2006 and continue until the position is filled. Interested applicants should forward a curriculum vita, official transcripts, a statement of teaching and research interests, and the names and contact information for three references to Ralph E. Taggart, Chair, Department of Geological Sciences, Michigan State University, 206 Natural Science Building, East Lansing, MI 48824-1115.

**TECHNICIAN—DICKINSON COLLEGE**

Pending funding, the Dickinson College Geology Department invites applications for a full time technician to begin summer 2007. The successful candidate will be a task oriented, self-motivated, highly organized individual with good interpersonal skills, has a master's degree in geology or related earth science field and a valid driver's license. Responsibilities for our analytical instrumentation include basic maintenance, calibration, sample preparation, and teaching students proper usage. Additional responsibilities include teaching occasional introductory geology labs, assisting on

field trips, Web site maintenance, etc. Applications, including a cover letter describing experience with analytical instrumentation, computers, field equipment, etc., a curriculum-vitae, and contact information 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 29 January 2007. Preliminary interviews will be conducted through the employment services at the fall GSA meeting in Philadelphia.

Our curriculum emphasizes project-based learning with a strong field component. This is greatly facilitated by our location in the folded Appalachians, at the northern terminus of the Blue Ridge, near the Triassic rift basins. 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, DC metro corridor. Dickinson is committed to diversity, and we encourage candidates who will contribute to meeting that goal to apply. Applications and nominations of women and minorities are strongly encouraged.

**TECTONICS AND EROSION  
DEPARTMENT OF EARTH & SPACE SCIENCES  
AT THE UNIVERSITY OF WASHINGTON**

The Department of Earth & Space Sciences at the University of Washington invites applications for a tenure-track faculty member whose research focuses on the interactions between tectonics and erosion. Preferred research areas include, but are not limited to, petrology directed toward the sedimentary record of erosion or thermochronology, active tectonics, and computational geodynamics. We are especially interested in scholars who investigate connections among the geodynamics of orogenesis, surface processes, climate, and the growth and decay of mountainous topography, and who may develop collaborative and interdisciplinary links with the Quaternary Research Center, Program on Climate Change, and ESS faculty involved in solid-earth studies.

Applicants should have a Ph.D. degree in a relevant field by the start of the appointment and will be expected to participate in undergraduate and graduate teaching, independent research, and service. It is anticipated the position will be filled at the Assistant Professor level. In exceptional circumstances, appointment as Associate or full Professor may be considered for candidates who have demonstrated a commitment to mentoring under-represented students in the sciences.

Applications must include curriculum vitae and list of publications, a statement of research and teaching experience and interests, and three letters of reference (sent directly to the search committee by the referees).

Electronic application is strongly preferred and must be in PDF format and sent to [tectonics-search@ess.washington.edu](mailto:tectonics-search@ess.washington.edu), with subject line "Tectonics-Application, (your name)." Hard-copy applications and reference letters may be sent to Tectonics Search Committee, c/o Dept. of Earth and Space Sciences, University of Washington, Box 351310, Seattle, WA 98195-1310.

Priority will be given to applications, including recommendations, received by October 31, 2006.

The University of Washington is building a culturally diverse faculty and strongly encourages applications from women and minority candidates. The University is an Equal Opportunity/Affirmative Action employer.

**GEOBIOLOGY  
DEPARTMENT OF EARTH & SPACE SCIENCES  
AT THE UNIVERSITY OF WASHINGTON**

The Department of Earth and Space Sciences at the University of Washington invites applications for a tenure-track position in geobiology. Preferred research areas include, but are not limited to, biogeochemistry and/or geomicrobiology, emphasizing the reciprocal interactions between the Earth (lithosphere, hydrosphere and atmosphere), life and environments through time. We are particularly interested in individuals who pursue interdisciplinary research, can contribute to the study of sedimentary rocks, use new geochemical, microbiological, genetic and/or computing techniques in their research and who can incorporate these into their teaching. Opportunities for collaboration exist with departmental research groups in isotopic geochemistry, sedimentology/stratigraphy, Quaternary studies and surface processes, the Burke Museum, Program on Climate Change, Astrobiology Program, the Department of Atmospheric Sciences and the School of Oceanography.



**TRINITY  
UNIVERSITY**

The Department of Geosciences at Trinity University invites applications for the **Gertrude and Walter Pyron Professor of Geosciences**. Appointment to this endowed position is at the rank of Professor with tenure. The position includes a reduced teaching load, a yearly stipend and staff support.

We seek candidates whose research program is widely recognized, extramurally funded, and provides opportunities for meaningful involvement of undergraduates. Demonstrated dedication to and success in undergraduate education are required. The successful candidate will be expected to teach courses related to petroleum geology and contribute to the department and university core curricula. We are open to a wide range of research specialties, including but not limited to marine geology, carbonate geology, global geochemical cycles, paleoecology and paleoclimatology.

Trinity University, founded in 1869, is one of the nation's top private undergraduate institutions. The Department has granted degrees in the geosciences for over 40 years and is a member of the Keck Geology Consortium. Additional information can be found at [www.trinity.edu/departments/geosciences/](http://www.trinity.edu/departments/geosciences/).

Applications or letters of nomination should be sent to **Dr. Glenn Kroeger, Department of Geosciences, Trinity University, One Trinity Place, San Antonio, Texas 78212-7200**. Completed applications must include a cover letter, curriculum vitae, a detailed statement of undergraduate teaching experience and philosophy, documentation and/or evaluations of teaching effectiveness, a description of research plans, and the names and contact information of four professional references. Review of completed applications will begin January 8, 2007. *Women and minority candidates are strongly encouraged to apply.* Trinity University is an Equal Opportunity Employer.

CLASSIFIED ADVERTISING



## Head

### Department of Geology & Environmental Science

The Department of Geology and Environmental Science at James Madison University is seeking a department head to share our vision to remain one of the premier undergraduate geoscience departments in the nation. To facilitate this vision, the successful candidate will possess exceptional communication skills, a background in academic leadership, and a history of leadership within the geoscience and higher education communities. The Department Head is expected to strengthen and enhance existing cross-disciplinary ties with other departments within the College of Science and Mathematics (<http://csm.jmu.edu/>) and elsewhere in the university and community. Candidates must have a record of teaching and scholarship that is appropriate for appointment at the rank of associate professor or professor.

Our department (<http://www.jmu.edu/geology/>) has a history of educating citizens about the Earth and Earth history, which includes active involvement by all department faculty in the university's General Education program, as well as preparing high quality geoscience majors. Our graduates are recognized for their strong foundation in core geoscience disciplines with experience in undergraduate research. At present, the department has 10 tenured or tenure-track faculty, 2 full-time lecturers, 2 research scientists, 2 staff members and averages 65 undergraduate majors. Degree options include a BS in Geology and a new BA in Earth Science with emphasis on Earth Science education. The department has an excellent record of placing students in graduate programs and employment in geoscience professions.

To apply complete an electronic application at <https://JobLink.jmu.edu>, referencing posting number 0401040. Candidates should also submit a detailed curriculum vitae, statements of educational philosophy, administrative philosophy, and research interests, and three letters of reference to:

**Dr. David Carothers**  
**Search Committee Chair**  
**College of Science and Mathematics**  
**James Madison University**  
**Harrisonburg, VA 22807**  
**carothdc@jmu.edu**

Screening of applicants will begin in October 2006; however, applications will continue to be accepted until the position is filled.

Salary is commensurate with experience.

James Madison University is an equal opportunity/affirmative action/equal access employer and especially encourages applications from women, minorities and persons with disabilities.

Applicants should have a Ph.D. degree in a relevant field by the start of the appointment and will be expected to participate in undergraduate and graduate teaching, independent research, and service. It is anticipated the position will be filled at the Assistant or Associate Professor level. In exceptional circumstances, appointment as full Professor may be considered for candidates who have demonstrated a commitment to mentoring students from underrepresented groups in the sciences.

Applications must include curriculum vitae and list of publications, a statement of research and teaching experience and interests, and three letters of reference (sent directly to the search committee by the referees). Electronic application is strongly preferred and must be in PDF format and sent to [geobio-search@ess.washington.edu](mailto:geobio-search@ess.washington.edu), with subject line "Geobio-Application, (your name)." Hard-copy applications and reference letters may be sent to Geobiology Search Committee, c/o Dept. of Earth and Space Sciences, University of Washington, Box 351310, Seattle, WA 98195-1310.

Priority will be given to applications, including recommendations, received by October 31, 2006.

The University of Washington is building a culturally diverse faculty and strongly encourages applications from women and minority candidates. The University is an Equal Opportunity/Affirmative Action employer.

#### HYDROLOGIST MIDWESTERN STATE UNIVERSITY

Geosciences Assistant/Associate Professor—tenure track, Spring 2007. Ph.D. in geosciences with a broad professional background. Teach Introductory Geology, Hydrology, GIS, Remote Sensing, and Geomorphology. Preferred: teaching and field experience, and refereed publication record. MSU, a member of COPLAC, is a comprehensive public university serving approximately 6500 students. Send application letter, vita, and names and addresses of three references to Dr. Brent Elliott, Department of Geosciences, Midwestern State University, 3410 Taft Blvd., Wichita Falls, TX 76708. [brent.elliott@mwsu.edu](mailto:brent.elliott@mwsu.edu). Screening starts immediately, and continues until position is filled. EEO/ADA. [www.mwsu.edu](http://www.mwsu.edu).

#### COMMUNITY COLLEGE OF SOUTHERN NEVADA CURRENTLY RECRUITING FOR: GEOLOGY INSTRUCTOR, SPRING, 2007

This position will teach introductory physical and historical geology classes and associated labs and may also be required to teach physical geography or environmental science classes.

For full job description and qualifications, please access our Web site and apply online at <https://jobs.ccsn.edu> or telephone +1-702-651-7481/+1-702-651-7482 for more information. EEO/AA.

#### PALEONTOLOGIST/PALAEOECOLOGIST UNIVERSITY OF MIAMI, CORAL GABLES, FLORIDA

The Department of Geological Sciences, College of Arts and Sciences invites applications for a tenure-track position at the assistant-professor level from persons who use paleontology as a research tool in such fields as paleoecology, environmental geology, and global climate change. The department is particularly interested in expertise in comparative (modern/ancient) shallow marine paleoecology and paleontology as a complement to our coastal stratigraphy and paleoenvironmental research program.

The position is located at the main campus in Coral Gables.

Applicants will be expected to teach undergraduate courses in invertebrate paleontology, historical geology, and evolution of the biosphere. Also, the successful applicant will be expected to collaborate with other faculty, guide graduate students, advise undergraduate students, seek extramural research funds, develop and maintain an active research program, and participate in the general activities of the university.

Research interests of the current faculty members range from coastal and shallow marine sedimentation to isotopic studies of the mantle, climatic and hydrologic modeling, volcanism, tectonics, environmental mineralogy, carbonate and organic sediment processes and diagenesis.

The Department works closely with the 15 faculty members of the Division of Marine Geology and Geophysics at the Rosenstiel School on the Key Biscayne campus approximately seven miles from main campus.

Applicants should submit a letter summarizing their research interests, a curriculum vitae and the names of three references before December 1, 2006, to Dr. Harold R. Wanless, Chairman, Faculty Search Committee, Department of Geological Sciences, University of Miami,

Box 249176, Coral Gables, FL 33124-9176, or [hwanless@miami.edu](mailto:hwanless@miami.edu).

We expect to fill the position by April 1, 2007 with a start date of August 15, 2007. The University of Miami is an equal opportunity/affirmative action employer.

#### EXECUTIVE DIRECTOR AMERICAN GEOLOGICAL INSTITUTE

The Search Committee invites applications for the position of Executive Director for the American Geological Institute (AGI). Interested applicants should be broadly educated scientists who have demonstrated leadership and vision in the earth sciences; have an established record of success as an earth scientist; have proven senior management and budgetary experience and interpersonal skills; and have a record of success as a not-for-profit fundraiser. The applicants must have the ability to communicate effectively with the scientific community, academia, industry, government and the public.

A Ph.D. in an earth science or related discipline is required. The successful candidate must be willing to locate in the Washington, D. C. area and be prepared to maintain a demanding travel schedule.

The Executive Director conducts the affairs of the Institute, with direction from the Executive Committee, including administering all planning and standing policies, supervising AGI staff, and coordinating the various activities, projects, and programs of the Institute. The Executive Director maintains liaison relationships with the officers and administrators of AGI affiliated societies, with other geoscience and science-related organizations and with academia, government agencies, industry and the public.

Interested persons are invited to submit a resume, a letter stating qualifications, and a list of 5 references. Review of applications will begin October 20, 2006.

Chair, Search Committee, American Geological Institute, 4220 King Street, Alexandria, VA 22302

Applications and inquiries will receive confidential consideration. AGI is an equal-opportunity employer.

#### POST-DOCTORAL POSITION QUANTITATIVE SEISMIC GEOMORPHOLOGY BUREAU ECONOMIC GEOLOGY

Applications are invited for a position in the field of Quantitative Seismic Geomorphology at the Post-Doctoral level. This position is fully funded for 2 years, supported jointly through the Quantitative Clastics Laboratory (QCL) Industrial Associates program at the Bureau of Economic Geology, The University of Texas Jackson School of Geosciences and the John A. and Katherine G. Jackson Endowment. QCL is a long-standing applied research program in clastic continental margin evolution. Please visit our Web site for more information, [www.beg.utexas.edu/indusassoc/dm2](http://www.beg.utexas.edu/indusassoc/dm2).

This position is specifically targeted toward the use of mega-scale 3D seismic data sets and supplemental data to develop techniques in paleogeomorphic analysis of ancient landscapes and seascapes. The successful candidate will, as part of a multidisciplinary team, engage in research focused on understanding how to quantify elements in seismic images to calculate physical conditions active in and climatic influences on ancient landscapes. This position offers the opportunity to utilize world-class seismic data to impact advances in seismic geomorphology, paleoclimatology, paleogeomorphology, and biogeography. The position provides an excellent opportunity for scientific achievement and career growth in an exceptional setting.

**Qualifications:** Applicants must have a Ph.D. in geology or earth resources. Preference will be given to applicants with specialties in 3D seismic interpretation and visualization. Experience in geomorphology, surface hydrology, or paleoclimatology would be highly advantageous. The successful candidate must demonstrate strong interpersonal and communications abilities, provide a record of successful collaborative research experiences, and have a willingness to work with industry scientists to apply techniques and research results. The candidate absolutely must have a demonstrated record of intent to publish.

**To Apply:** Applicants must send a letter of application, resume with record of publications, brief statement of professional goals with an emphasis on research objectives, and names and addresses of three professional references to Ms. Jenny Turner, Bureau of Economic Geology, Jackson School of Geosciences, University Station Box X, Austin, TX 78713-8924, U.S.A. Review of applications will begin no later than October 1, 2006.

The University of Texas at Austin is an Equal Opportunity/Affirmative Action Employer. All positions are security-sensitive; conviction verification conducted on applicants selected.



# AGU Books on Natural Hazards, Management, and Policy



Look to AGU books for the most up to date research on natural hazards, science management, and policy. All AGU books are peer reviewed and of the highest scientific quality.

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*Roy C. Sidle and Hirotaka Ochiai*

This book charts our understanding of landslide processes, prediction methods, and related land use issues. How and where do landslides initiate? What are the human and economic consequences? These questions and more are answered in this volume.

2006, 370 pp., softbound, ISBN 0-87590-322-3  
List Price: \$40.00 **AGU Member Price: \$28.00**

## **HURRICANE! Coping With Disaster**

*Robert Simpson, Richard Anthes,  
Michael Ganstang, Editors*

"...combines accomplished authors with an almost electric sense of excitement and adventure at the forefront of discovery. The author's vision and perspective on hurricane research is sheer mastery." *Weatherwise* January/February 2004

From the Galveston catastrophe of 1900, where more than 8000 people died, to the economic devastation wrought by Hurricane Andrew in 1992 in the United States, scientists have striven to understand and track hurricanes while charting their societal effects.

2003, 360 pp., softbound, ISBN 0-87590-297-9,  
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With half of the Earth's people now living in cities, our capacity to understand and resolve urban issues has global implications. This book covers such topics such as natural hazards and the city, including landslides, tsunamis, and seismic risks. For urban geoscientists, researchers, and students of cities.

2003, 440 pp., softbound, ISBN 0-87590-299-5  
List Price: \$57.00, **AGU Member Price: \$39.90**

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From the local to the global scale, water use and sustainability are issues of historic importance. Never before has water science needed to inform water policy so much, and never before have we seen how challenging it is to advance that relationship.

2004, 422 pp., softbound, ISBN 0-87590-320-7  
List Price: \$49.00, **AGU Member Price: \$34.30**

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**ASTROBIOLOGY  
ASSISTANT/ASSOCIATE PROFESSOR  
UNIVERSITY OF WASHINGTON**

The Astrobiology Program (<http://depts.washington.edu/astrobio>) at the University of Washington invites applications for a tenure-track Assistant Professor or tenured Associate Professor position. The Program has 20 graduate students from six different departments. We will consider strong candidates in any area bearing on Astrobiology, either providing new astrobiological expertise to our Program or strengthening areas of current research, which include: early solar system dynamics, habitability of planets, Martian surface features and atmospheric processes, extrasolar planets, comets and interplanetary dust particles, magnetospheres, mass extinctions, life and the early Earth, evolution of metabolic processes, microbial life under extreme conditions, and life detection techniques.

Depending on a candidate's background, the appointment can be in Astronomy, Atmospheric Sciences, Biology, or Earth & Space Sciences.

Applicants must have a Ph.D. in a field relevant to Astrobiology by the date of appointment. Duties include undergraduate and graduate teaching, vigorous independent research, and service. A strong record of published research and a demonstrated commitment to interdisciplinary research and education are essential. In exceptional circumstances, appointment as a Full Professor may be considered for candidates who have demonstrated a commitment to mentoring underrepresented students in the sciences.

Applications must include curriculum vitae and list of publications, a statement of research and teaching experience and interests, and three letters of reference (sent directly to the search committee by the referees). Electronic application is strongly preferred and must be in PDF format and sent to [astrobio-search@ess.washington.edu](mailto:astrobio-search@ess.washington.edu), with subject line "ASTROBIO-Application, (your name)." Hard-copy applications and reference letters may be sent to Astrobiology Search Committee, c/o Dept. of Earth and Space Sciences, University of Washington, Box 351310, Seattle, WA 98195-1310. Priority will be given to applications, including recommendations, received by October 31, 2006.

The University of Washington is building a culturally

diverse faculty and strongly encourages applications from women and minority candidates. The University is an Equal Opportunity/Affirmative Action employer.

**EARTH SCIENTIST  
GEOLOGIC APPLICATIONS OF REMOTE SENSING  
DARTMOUTH COLLEGE**

The Department of Earth Sciences at Dartmouth College invites applications from creative scientists and educators for a position at the level of Assistant Professor. We will consider applicants with expertise in any line of fundamental inquiry in the Earth Sciences and with proven research potential in the processing and interpretation of remotely-sensed observations of the Earth's surface and lithosphere. The successful candidate will join in Dartmouth's commitment to excellence in undergraduate and graduate education and research, and will complement existing strengths of the Department and College.

Send curriculum vitae, a description of professional interests and objectives, reprints or preprints of up to three significant publications, and the names, addresses (including street address), e-mail addresses and fax/phone numbers of at least three references to Search Committee, Department of Earth Sciences, Dartmouth College, 6105 Fairchild Hall, Hanover, NH 03755, e-mail: [earth.sciences@dartmouth.edu](mailto:earth.sciences@dartmouth.edu), url: [www.dartmouth.edu/~earthsci](http://www.dartmouth.edu/~earthsci).

Review of applications will begin 16 October 2006 and will continue until the position is filled. The appointment will be effective 1 July 2007.

Dartmouth College is an equal opportunity/affirmative action employer, is committed to diversity, and encourages applications from women and minorities.

**MINERALOGIST/PETROLOGIST  
DICKINSON COLLEGE**

The Dickinson College Geology Department invites applications for a one year position at the Assistant Professor level to begin Fall 2007. The successful candidate 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 mineralogy, petrology, and a topical

introductory course. 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 29 January 2007. Preliminary interviews will be conducted through the employment services at the fall GSA meeting in Philadelphia.

Our curriculum emphasizes project-based learning with a strong field component. This is greatly facilitated by our location in the folded Appalachians, at the northern terminus of the Blue Ridge, near the Triassic rift basins. 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 is committed to diversity, and we encourage candidates who will contribute to meeting that goal to apply. Applications and nominations of women and minorities are strongly encouraged.

**ASSISTANT PROFESSOR OF GEOLOGY  
SEDIMENTARY PETROLOGY  
SONOMA STATE UNIVERSITY**

The Department of Geology at Sonoma State University is seeking a highly motivated teacher/scholar to teach and do research with undergraduate students in geology. The available tenure track position is at the rank of assistant professor and requires a doctorate in geology or related field. We are seeking a soft-rock geologist who can teach sedimentary petrology and an accompanying sedimentary petrology field course, and complement our program with one or more surface process courses, such as hydrology, soils, geomorphology, or neotectonics. For complete information, see the detailed Position Opportunity Announcement at [www.sonoma.edu/aa/fa](http://www.sonoma.edu/aa/fa). AA/EOE.



**USGS Mendenhall Postdoctoral Research Fellowship Program (Fiscal Year 2008)**

The U.S. Geological Survey (USGS) invites applications for the Mendenhall Postdoctoral Research Fellowship Program for Fiscal Year 2008. 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 2008 begins in October 2007.

Opportunities for research are available in a wide range of topics including: petroleum system modeling; non-linear behavior in mineralizing systems; improved earthquake monitoring; 3D geologic mapping; tsunami sources and characteristics; effects of ground water dynamics on volcanism; Holocene climate/future climate; use of wireless sensor networks in the study of dynamic earth processes; biogeochemistry of Fe, S, C, and Hg; submarine ground water systems; environmental impact of uranium mining; uncertainty in probabilistic seismic hazard maps; ecosystem health indicators; geophysical technique development for aquifer heterogeneity characterization; coastal landscape evolution; earthquake physics; community resilience to hurricanes; geologic controls on continuous hydrocarbon accumulations; undiscovered mineral resources under cover; linkages between watershed change and ecosystem health; and field experiments to constrain mass wasting transport laws.

The postdoctoral fellowships are 2-year appointments. The closing date for applications is November 15, 2006. Appointments will start October 2007 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.

U.S. Department of the Interior  
U.S. Geological Survey

**PEVEHOUSE CHAIR IN GEOSCIENCES  
AN ENDOWED POSITION IN  
PETROLEUM GEOLOGY AND GEOPHYSICS  
TEXAS TECH UNIVERSITY**

The Department of Geosciences at Texas Tech University invites applications and nominations for the Pevehouse Chair in Geosciences. The purpose of this endowed position is to support education regarding the origin, exploration, and recovery of hydrocarbons. A Ph.D. in geosciences or closely allied field is required. Applicants should have post-doctoral research experience in the petroleum industry or academia as demonstrated in a record of publications. Their research should concentrate in geosciences, geophysical or other analytical techniques that are relevant to exploration and production of hydrocarbons. The chair holder is expected to conduct an externally-funded research program that involves collaboration with the petroleum industry. He/She will teach graduate and undergraduate courses, and mentor graduate student thesis research. The position is expected to be filled at the tenured full professor level.

Texas Tech is one of the four largest, state-supported, graduate research-oriented universities in Texas, with over 29,000 students enrolled. The Department of Geosciences consists of nineteen tenured/tenure-track faculty, thirteen in solid earth sciences and six in atmospheric sciences. About 70 undergraduate student majors and 40 graduate students are currently enrolled. The department computer labs have various GIS, geologic mapping/modeling, and seismic processing/interpretation software packages. Experimental facilities include laser ablation ICP-MS, TEM, SEM, XRD, heat flow, stable isotope labs, and remote sensing spectroradiometers. More detailed information on the department can be found at Web site <http://www.gesc.ttu.edu>.

In addition to the Geosciences, the chair holder will have opportunities to work with the Department of Petroleum Engineering which maintains experimental and analytical facilities in petrophysics, drill fluids, cement, enhanced recovery, and reservoir simulation. The department also has a nuclear magnetic resonance imaging lab and an artificial lift research lab with a 4100-ft test well with circulation equipment and automated well control equipment.

Lubbock is a community of over 200,000 people, located on the Southern High Plains of Texas, in proximity to major oil industry in the Permian Basin. The altitude and semi-arid climate of the region are conducive to outdoor activities. Lubbock frequently hosts musical, theatrical, and sports events, and offers numerous options for shopping and dining. The town also offers the best healthcare facilities in the region, including the university's Health Sciences Center. The cost of living is low compared to national norms.

Applicants must first go to the employment Web site of the university at <http://jobs.texastech.edu>. There, go to "Search Postings", search for requisition number 62209, and fill out necessary forms in applying for the position on-line. Then, applicants should submit a letter of application, curriculum vitae, a statement of teaching and research interest, names and contact information (including e-mail address) of at least 3 professional references. These documents can either be uploaded to the employment Web site or be mailed to Dr. Seiichi Nagihara, Pevehouse Chair Search Committee, Department of Geosciences, Texas Tech University, Box 41053, Lubbock, TX 79409-1053.

E-mail questions regarding the position are received at [seiichi.nagihara@ttu.edu](mailto:seiichi.nagihara@ttu.edu). Review of applicants will begin November 1 and continue until the position is filled.

Texas Tech University is an equal opportunity/affirmative action institution.

**MISSISSIPPI STATE UNIVERSITY  
LOCATION: MISSISSIPPI STATE, MS**

The Department of Geosciences at Mississippi State University invites applications for a new full-time, tenure track **Assistant Professor** (9-month appointment) position. A Ph.D. in Geology/Earth Science, Geoscience Curriculum and Instruction or closely related field with emphasis in geological applications is required for this position. This position is with the Geoscience Distance Learning Program and will begin on January 2007.

The Assistant Professor will be teaching geology and earth science courses in our Teachers in Geosciences programs. The Assistant Professor will also develop a research and service program in their specific area of specialization involving graduate students, other university departments and centers, and government and corporate agencies and sponsors. An interest in distance learning instruction techniques is essential. Extensive computer skills and an interest in leading summer field courses and teaching traditional on-campus courses are highly desirable.

The Geoscience Distance Learning Programs offer B.S. and M.S. degrees in Geosciences. The department presently offers seventeen undergraduate and twenty-two graduate courses via distance learning. For more information regarding the distance learning programs please visit [www.msstate.edu/dept/geosciences/distance.html](http://www.msstate.edu/dept/geosciences/distance.html).

Applications must be made online at <https://www.jobs.msstate.edu/>. Applicants should submit a letter of application, a curriculum vita, copies of transcripts and the names and addresses (including e-mail) of three people who may be contacted for letters of recommendation. The official transcripts should be sent to Dr. Chris Dewey, Search Committee Chair, Department of Geosciences, P.O. Box 5448, Mississippi State, MS 39762.

Screening of applicants will begin 1 November 2006 and continue until the position is filled. Women and minorities are encouraged to apply. Mississippi State University is an Affirmative Action/Equal Opportunity Employer.

**PALEONTOLOGY  
UNIVERSITY OF OREGON**

The Robert D. Clark Honors College (HC) of the University of Oregon invites applications for a tenure track position at the assistant professor level in Geology. Although applicants with expertise in all relevant areas are encouraged to apply, we are particularly interested in individuals specializing in the development and evolution of life on Earth through the study of fossil life forms. The HC is a liberal arts college of about 600 undergraduate students within the larger University of Oregon community; its mission is to provide a small college experience for the university's best prepared undergraduates.

Scientific research and scholarship of the highest quality are expected; *tenure standards for scholarship in the sciences and geology will apply*. Professional opportunities include interactions with the Department of Geological Sciences, the Center for Ecology & Evolutionary Biology, the Oregon Institute of Marine Biology, and the Museum of Natural and Cultural History, with its nationally ranked Condon Collection of over 70,000 fossil specimens, primarily vertebrate fossils from the Pacific Northwest.

The teaching responsibilities for this position differ from analogous positions within UO science departments by having a greater emphasis on undergraduate teaching across the sciences. The successful candidate will teach primarily within the Honors College, and will have principal responsibility for developing its introductory science curriculum. Honors College courses in all fields are taught in a seminar format. Tenure standards for teaching will be those used in the liberal arts and in the Honors College. Evidence of teaching excellence and breadth is highly desirable.

Completion of the Ph.D. is required. Candidates who promote and enhance diversity are strongly desired. Applicants should send (1) a curriculum vitae, (2) a statement of research and teaching interests and experience including discussion of potential contributions to both the HC and research department, and (3) contact information for at least three referees to Science Search Committee, Clark Honors College, 320 Chapman Hall, 1293 University of Oregon, Eugene, OR 97403. We will begin reviewing completed applications on November 15, 2006, and will continue until the position is filled.

Additional information about Clark Honors College may be found at <http://honors.uoregon.edu/>. The University of Oregon is an equal opportunity/affirmative action institution committed to cultural diversity and compliance with the Americans with Disabilities Act.

**ASSISTANT PROFESSOR  
NEAR-SURFACE GEOPHYSICS**

**DEPT. OF GEOLOGY, UNIVERSITY AT BUFFALO**  
The University at Buffalo Department of Geology invites applications for a tenure-track assistant professor position in near-surface geophysics. We seek a scientist who will integrate with our existing departmental strength in geohazards (contaminant hydrogeology, volcanic hazards, climate change, and seismic hazards). Of particular interest are researchers with expertise in hydrogeophysics or inverse methods.

We expect faculty to develop, maintain and publish an innovative, extramurally funded research program. The successful applicant must have a Ph.D. degree at the time of appointment and demonstrated potential to perform teaching duties. Teaching duties will include 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).

Send applications to Dr. Matthew Becker, c/o Robyn Wagner by e-mail [rlwagner@buffalo.edu](mailto:rlwagner@buffalo.edu) or post to Department of Geology, 876 Natural Sciences Complex, University at Buffalo, Buffalo, NY 14260. Applications

**ST. LAWRENCE  
UNIVERSITY**

**GEOLOGY:  
ASSISTANT PROFESSOR  
SEDIMENTOLOGY  
OCEANOGRAPHY  
TENURE TRACK**

The Geology Department at St. Lawrence University has an opening for a full-time, tenure track position at the rank of Assistant Professor. We desire an individual with expertise in Marine Sedimentology who will complement our existing strengths in Geomorphology, Structural Geology, Paleontology, Petrology and Geochemistry. The successful candidate will be expected to teach Sedimentology, an introductory course in Oceanography, and to assist in the teaching of our entry courses to the Geology program, in addition to advanced courses within their interest area.

We are a small, high quality, undergraduate program that emphasizes both field and laboratory aspects of the science. Our students are commonly involved with faculty in research and the nearby Adirondack Mountains, Canadian Shield, and St. Lawrence Valley offer rich opportunities for study. A high percentage of our majors advance to graduate programs. Each of the five faculty members in the department are involved in teaching introductory Geology courses and we encourage participation in interdisciplinary university programs.

Applicants must have a Ph.D., demonstrated ability in teaching, and a proven research record in their specialty. Interested candidates should submit a curriculum vitae, a letter of application expressing what the candidate feels she/he would contribute to the Geology program at St. Lawrence, and three letters of recommendation to: Dr. Catherine Shradly, Search Committee, Geology Department, St. Lawrence University, Canton, N.Y. 13617.

Processing of applications will begin February 5, 2007 and all materials must be received at that time.

St. Lawrence University is an Affirmative Action/Equal Opportunity employer. Women, minorities, and persons with disabilities are encouraged to apply.

CLASSIFIED ADVERTISING

**VISITING  
ASSISTANT PROFESSOR  
GEOMORPHOLOGY**

The Geology Department at St. Lawrence University has an opening for a one-year Visiting Assistant Professor. We desire an individual with expertise in Geomorphology and, ideally, Hydrology/Hydrogeology, who will complement our existing strengths in Structural Geology, Sedimentology, Paleontology, Petrology and Geochemistry. The successful candidate will be expected to teach Geomorphology, Hydrology/Hydrogeology, and to assist in the teaching of our entry courses to the Geology program, in addition to advanced courses within their interest area.

We are a small, high quality, undergraduate program that emphasizes both field and laboratory aspects of the science. Our students are commonly involved with faculty in research and the nearby Adirondack Mountains, Canadian Shield, and St. Lawrence Valley offer rich opportunities for study. A high percentage of our majors advance to graduate programs. Each of the five faculty members in the department are involved in teaching introductory Geology courses and we encourage participation in interdisciplinary university programs.

Applicants must have a Ph.D., demonstrated ability in teaching, and a proven research record in their specialty. Interested candidates should submit a curriculum vitae, a letter of application expressing what the candidate feels she/he would contribute to the Geology program at St. Lawrence, and three letters of recommendation to: Dr Stephen Robinson, Search Committee, Geology Department, St. Lawrence University, Canton, N.Y. 13617.

Processing of applications will begin March 5, 2007 and all materials must be received at that time.

St. Lawrence University is an Affirmative Action/Equal Opportunity employer. Women, minorities, and persons with disabilities are encouraged to apply.

should include, a CV, statement of research goals and teaching experience and interests, selected reprints, and contact information for at least three references. Applications should be complete by Nov. 1, 2006, when we will begin our review of candidates.

The University at Buffalo is an Equal Opportunity Employer/Recruiter.

**FLORIDA ATLANTIC UNIVERSITY, GEOPHYSICS**

The Department of Geosciences at Florida Atlantic University invites applicants for a tenure-track position at the rank of Assistant Professor in the general area of geophysics. Desirable areas of expertise include, but are not limited to, marine and/or environmental geophysics. We seek a dynamic individual who will develop an active research program that will add to the existing strengths of the department. More information about the Department can be found at [www.geosciences.fau.edu](http://www.geosciences.fau.edu). The successful candidate will be expected to teach some combination of undergraduate-level courses in Introductory geology, Coastal and Marine Science, Structural Geology, and Geophysics, participate in the field program, and teach a graduate-level course in candidate's specialty. Evidence of successful previous teaching is preferred. Candidates for this position should submit: (1) a letter of application including statements of teaching and research interests, (2) a curriculum vitae, (3) four names and addresses for letters of reference, and (4) graduate school transcripts to Dr. Anton Oleinik, Geophysics Search Chair, Department of Geosciences, Florida Atlantic University, 777 Glades Road, PS 336, Boca Raton, FL 33431. The position will commence in August 2007. Application deadline is 3 November 2006. No e-mail applications will be accepted. A Ph.D. in Geology or closely related field is required at the time of appointment. Florida Atlantic University is an Equal Opportunity/Equal Access Institution.

**POMONA COLLEGE FACULTY POSITION  
IN PETROLOGY/MINERALOLOGY**

The Geology Department at Pomona College invites applications for a tenure-track position at the level of Assistant Professor beginning 1 July 2007. For further details see [www.pomona.edu/ADWR/AcademicDean/FacultyJobs.shtml](http://www.pomona.edu/ADWR/AcademicDean/FacultyJobs.shtml). Applicants should send a letter of interest, curriculum vitae, undergraduate and graduate transcripts, a statement of teaching philosophy, a summary of research plans and three letters of reference to **Pet-Min Search, Geology Department, Pomona College, Claremont, CA 91711**. Web address: [www.geology.pomona.edu](http://www.geology.pomona.edu); e-mail: [GeoFacSearch@pomona.edu](mailto:GeoFacSearch@pomona.edu). Review of completed applications begins 15 November 2006 and will continue until the position is filled. Pomona College is an equal opportunity employer, and it especially invites applications from women and members of underrepresented groups.

**VANDERBILT UNIVERSITY  
EARTH AND ENVIRONMENTAL SCIENCES  
TENURE-TRACK POSITION, SOLID-EARTH  
DYNAMICS**

The Department of Earth and Environmental Sciences at Vanderbilt University invites applications for a tenure-track faculty position in the general area of solid-earth dynamics. This position, effective the Fall 2007 semester, is at the Assistant Professor level.

We seek an individual who is aimed at the highest standards of scholarship in research and teaching at both the undergraduate and graduate (M.S., Ph.D.) levels, and who will be attracted by opportunities at Vanderbilt for interaction with a diverse, enthusiastic faculty and student body in the Earth and environmental sciences and related fields. We welcome applications from candidates pursuing theoretical, experimental, and/or field-based work. The specific research specialty is open, but we are especially aiming at those studying the dynamics and evolution of Earth's surface and upper crust, with interest in processes in both ancient and modern systems. Examples include, but are not limited to, neotectonics, landscape dynamics, and physical volcanology.

Applications should include a vita, a statement of research and teaching interests, and names of at least three references (including mail and e-mail addresses and phone numbers). Select applicants will be later asked to provide student evaluations of teaching (if available). Applications should be submitted by e-mail in PDF, MS-Word or Corel-WP format to [EESposition@vanderbilt.edu](mailto:EESposition@vanderbilt.edu). Up to three representative papers may be sent via normal mail to Calvin Miller, Search Committee Chair, Department of Earth and Environmental Sciences, Vanderbilt University, 2301 Vanderbilt Place, Nashville, TN 37235. Review of applications will begin 15 December 2006. Vanderbilt is an equal opportunity/affirmative action employer. Women and minorities are especially encouraged to apply.

**TENURE-TRACK FACULTY POSITION  
GEOCHEMISTRY  
EASTERN WASHINGTON UNIVERSITY**

The Department of Geology at Eastern Washington University invites applications for a fulltime, tenure-track position in geochemistry. Appointment will be at the rank of Assistant Professor, and a Ph.D. in Geology is required. The successful candidate will be expected to teach courses in introductory geology, environmental science, and geochemistry. Preference will be given to candidates who can make use of existing analytical geochemical lab equipment including ICP-MS and AA. The successful applicant will contribute to current departmental strengths in teaching and research and will apply research-based instructional approaches suitable for a diverse student body. Candidates should: (1) send letter of application detailing teaching and research interests with an up-to-date CV, and (2) arrange to have at least three letters of reference sent to Geochemistry Search Committee, Department of Geology, Eastern Washington University, 130 Science Building, Cheney, WA 99004-2439. Questions may be directed to [charbolt@mail.ewu.edu](mailto:charbolt@mail.ewu.edu) or +1-509-359-2286. Review of applications will begin November 10, 2006 and continue until the position is filled. The position will begin in September 2007. For more information about Eastern Washington University and the Department of Geology, please see [www.ewu.edu](http://www.ewu.edu). The successful candidate will be required to show proof of eligibility to work in the U.S. pursuant to U.S. immigration laws. Eastern Washington University is an Equal Opportunity/Affirmative Action employer. Applications from members of historically underrepresented groups are especially encouraged to apply.

**TENURE-TRACK FACULTY POSITION  
IN APPLIED GEOPHYSICS  
UNIVERSITY OF KENTUCKY**

The Department of Earth and Environmental Sciences at the University of Kentucky invites applications for a tenure-track faculty position at the Assistant Professor level in Applied Geophysics, beginning August 2007. Field and modeling oriented candidates working in areas such as hydrogeophysics and environmental geophysics are particularly encouraged to apply. We are seeking candidates interested in interdisciplinary research, and who would interact with our existing programs in near-surface geophysics, hydrogeology, tectonics, and energy resources. A broad range of opportunities also exists for cooperation with other departments and agencies on campus (Kentucky Geological Survey, Department of Civil Engineering, Kentucky Transportation Center, Water Resources Research Institute, Center for Applied Energy Research, and the Tracy Farmer Center for the Environment).

In addition to developing a productive externally funded research program, the new faculty member will be expected to teach challenging courses at the undergraduate and graduate levels. Applicants will be expected to demonstrate a track record of publication and funding; experience beyond the Ph.D. is desirable.

Interested applicants should submit (e-mail pdf format and hard copy) curriculum vitae, a brief statement of research and teaching interests, copies of relevant research publications, and contact information for at least three references to Dr. Edward W. Woolery, Search Committee Chair, Department of Earth and Environmental Sciences, 101 Stone Research Building, University of Kentucky, Lexington, KY 40506-0053, [woolery@uky.edu](mailto:woolery@uky.edu)

Closing date for applications is Dec. 15, 2006. The University of Kentucky is an Affirmative Action employer, and applications from minority and female applicants are particularly encouraged. Upon offer of employment, successful applicants for certain positions must undergo a national background check as required by University of Kentucky Human Resources.

**EARTH SURFACE PROCESSES  
ASSISTANT PROFESSOR, DENISON UNIVERSITY**

The Department of Geosciences at Denison University invites applications for a new tenure track position in the areas of physical geography, earth surface processes or earth systems science to begin in Fall 2007. A Ph.D. at the time of appointment is required. We seek a broadly-trained scientist who shows potential as an outstanding teacher/scholar to teach introductory Physical Geography or Physical Geography and courses in the applicant's areas of expertise that will enhance the diversity of our program. Some fields of interest include hydrology, geomorphology, low temperature geochemistry, surface geophysics, biogeography, land use and resources, atmospheric sciences, and ocean sciences. Expertise in remote sensing and/or geographic information science is a plus. All candidates engaged in the study of modern

surface processes—broadly defined—and environmental change will be seriously considered.

We seek a colleague who is committed to teaching excellence in the liberal arts tradition, is field-oriented, has broad interests beyond their specialty, and will provide a balance of classroom, field and laboratory experiences for our majors. 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 the following: a letter of application; a statement of your approach to teaching and research in a liberal arts setting as well as ways in which your expertise would expand, enrich and complement our program; a vita; academic transcripts; and contact information for three references—to Dr. Tod Froking, Department of Geosciences, Denison University, Granville, OH 43023; +1-740-587-6217; [tfroking@denison.edu](mailto:tfroking@denison.edu). Application materials should arrive by October 30, 2006 for full consideration, although the search will remain open until the position is filled. We encourage early applications as we would like to meet with those attending GSA in late October. Denison University is an Affirmative Action, Equal Opportunity Employer. In a continuing effort to diversify our Campus Community, we strongly encourage women and people of color to apply.

**TWO TENURE-TRACK POSITIONS  
CANADA RESEARCH CHAIR TIER II (CRC II)  
AND METAMORPHIC PETROLOGIST/TECTONICS  
UNIVERSITY OF OTTAWA**

**Metamorphic Petrology/Tectonics.** Applications are invited for a tenure-track position at the level of Assistant Professor starting July 1, 2007. The preferred candidate will be an active researcher in the field of crustal and/or mantle processes that influence the composition of the lithosphere with emphasis on regional tectonics, geochemistry and petrology. Qualified researchers in other areas will be considered, but the successful candidate is expected to teach an undergraduate metamorphic petrology course.

An applicant should send a letter of application summarizing research interests and any teaching experience, a CV, three recent peer-reviewed publications and three names of references to the Department. The review process will begin November 15, 2006.

**Canada Research Chair Tier II.** We seek for an active, productive, and young researcher (<8 yrs. after date of obtaining the Ph.D.) in all areas of earth sciences. The primary responsibility of the CRC holder will be to develop research excellence on projects associated with the Canadian Shield Research Institute at the University. Other responsibilities will include participation in senior level undergraduate and graduate programs. The Canada Research Chairs program was established by the Government of Canada to foster research excellence in Canada. The successful candidate will be offered a full-time tenure-track faculty appointment in the Department. The review process will begin on October 7, 2006, or until the position is filled.

An applicant should send a brief outline of research interests and goals, a link of his/her research to the Canadian Shield, a CV with a list of publications, and three names of references to the Department.

The Department together with Carleton University forms a joint research and graduate institution, which is equipped with a variety of analytical facilities including X-ray laboratory, stable and radiogenic isotope laboratories, electron probe-SEM laboratory, and ICP-laboratory. In addition, Ottawa, the national capital, has a sizeable support network for research in sciences as it houses many federal governmental research institutions, including the Geological Survey of Canada and National Research Council.

For further information, and to submit an application, please contact: Kéiko Hattori, Chair, Department of Earth Sciences, University of Ottawa, 140 Louis Pasteur, Ottawa, Ontario, K1N 6N5, Canada, +1-613-562-5838, fax: +1-613-562-5192, [estchair@uOttawa.ca](mailto:estchair@uOttawa.ca).

**LABORATORY MANAGER, UNIVERSITY OF  
ARKANSAS  
STABLE ISOTOPE FACILITY**

**Department and BU:** Biological Sciences/BISC  
**Closing Date:** September 30, 2006 or until position is filled.

**Annual Salary:** Competitive salary, commensurate with experience

**Job Description/Responsibilities/Qualifications:** A laboratory manager is needed for the University of Arkansas Stable Isotope Laboratory (UASIL) in the Department of Biological Sciences at the University of Arkansas. The facility, has been in operation since 1999, and currently operates with three Finnigan mass spectrometers (two Delta-plus, one XP) and an **Agilent** 5790 mass selective detector interfaced to an **Agilent** 6890

GC. Peripherals to the IRMS systems include EA, GC, Gas Bench, TC/EA, PreCon devices and all supporting equipment. Capabilities include elemental analysis, trace gas analysis, nitrate, water, and compound-specific isotope analysis. The facility provides in-house and commercial services for isotope ratio analysis of C, N, O, and H from biological and geological samples. Analysis of samples for identification and quantification of compounds, such as phospholipids fatty acid methyl esters, is also available using GC-FID and GCMS. UASIL is a component of the Arkansas Statewide Mass Spectrometry Facility, and serves a large population of researchers at the University of Arkansas in Biological Sciences, Geosciences, Environmental Dynamics, Soils, Agronomy, and Environmental Sciences, Bioagricultural Engineering, and other departments.

The successful applicant will assume daily management of the facility. Responsibilities include daily operation and maintenance of the instruments, oversight of laboratory employees, training of students and post-doctoral associates, management of sample throughput, billing, technique development, quality assurance, and quality control. Salary is competitive, negotiable, and commensurate with experience.

**Application:** To apply for the position, send a cover letter detailing previous experience, a curriculum vitae, and three letters of reference to Dr. Steve Beaupre, Biological Sciences, University of Arkansas, Fayetteville, AR, 72701. Applications received before 30 September will receive full consideration. Questions about the position can be directed to Dr. S. Beaupre at [sbeaupre@uark.edu](mailto:sbeaupre@uark.edu)

Application review will commence on September 30, and will continue until the position is filled.

The University of Arkansas is an Equal Opportunity/Affirmative Action Employer. Applicants must have proof of legal authority to work in the United States at the time of hire.

**MENDENHALL POSTDOCTORAL FELLOW  
U.S. GEOLOGICAL SURVEY**

The U.S. Geological Survey (USGS) invites applications for a Mendenhall Postdoctoral Research Opportunity entitled: "Development of an index of ecosystem health in a mineralized area—metal-rhizosphere interaction." This is research opportunity #17, as described in the USGS Mendenhall Program Web page <http://geology.usgs.gov/postdoc>. The focus of the research is to extend the conventional definitions of soil health, and develop an indicator(s) for general forest and prairie ecosystem health that includes an assessment of the potentially toxic metals and metalloids such as Ag, As, Cr, Cu, Ni, and Se. The indicator(s) may be used by land management agencies, the mining industry, and the public to discriminate between natural weathering of mineralized terrane and the effects of mining on ecosystems. Common indicators of ecosystem health, such as primary production/respiration (P/R ratios) and the ratio of microbial biomass C (and microbial diversity) to soil organic C (Cmic/Corg), could be examined. Redox speciation and toxicity of bioavailable metals and metalloids could also be studied, to assess their impact on the rhizosphere of rooted plants. We welcome research proposals that will use these or additional parameters in the development of an ecosystem health index. A number of speciation and related analytical techniques will be available to the researcher including ICP-MS, laser ablation ICP-MS, SEM, sequential partial extraction, HPLC/atomic fluorescence, and chemoluminescence. Guidance is available for the researcher from advisors with expertise in soil geochemistry, plant physiology, rhizosphere microbial communities, analytical techniques, and mineral resources. Application deadline is 11-15-2006, with a starting date of 10-01-2007. The position will be located at the office of the USGS Minerals Resources Program, located on the campus of the University of Nevada-Reno, in Reno, NV. Salary begins at the GS-12 level. For more information please contact Dr. Lisa Stillings, +1-775-784-5803, [stillings@usgs.gov](mailto:stillings@usgs.gov).

**ELECTRIC POWER RESEARCH INSTITUTE**

The Electric Power Research Institute (EPRI) [www.epri.com](http://www.epri.com) based in Palo Alto, Calif., is seeking an applicant for a full time position in CO<sub>2</sub> Capture and Storage. EPRI was established in 1973 as an independent, nonprofit center for public interest energy and environmental research. The Research Project Manager position will support a large research effort focused on the scientific investigation of capturing carbon emissions for the utility industry's fleet of power plants. Applicants are expected to be a technical resource for geologic issues with respect to managing the liability of injecting CO<sub>2</sub> into structural and sedimentary traps. The applicant should ideally have a firm grasp of geochemistry, mineralogy or chemistry.

The successful candidate will be managing technical

research projects, preparing project and program plans, and delivering project results to funders and stakeholders. This work will require managing and acquiring funding sources. Applicants are expected to possess appropriate professional experience including a Ph.D. in geochemistry, structural geology, sedimentary geology, or a related geology discipline. Experience with GIS and basin modeling is a plus. EPRI seeks candidates with strong writing skills. Salary is competitive and commensurate with qualifications and experience. Travel will be required. Send curriculum vitae and cover letter to Ms. Phyllis Brown, HR Manager, EPRI, 3420 Hillview Avenue, C1005, Palo Alto, CA 94304 or e-mail to [pbrown@epri.com](mailto:pbrown@epri.com) Position may be filled in either Palo Alto, Calif., or Charlotte, N.C. Review of applications began in August 2006 and will continue until the position is filled. For expanded information, please visit [http://hotjobs.yahoo.com/Company-Profiles/E/Electric-Power-Research-Institute\\_4230](http://hotjobs.yahoo.com/Company-Profiles/E/Electric-Power-Research-Institute_4230).

**COLGATE UNIVERSITY, GEOLOGY DEPARTMENT  
STRUCTURAL GEOLOGY/TECTONICS  
POSITION POSSIBLE**

The Geology Department at Colgate University invites applications for an anticipated tenure-stream position at the rank of Assistant Professor in the field of structural geology/tectonics, beginning August 2007. We seek an individual with a Ph.D. who is committed to excellence in research and teaching at the undergraduate level. The area of specialization is open, but we are particularly interested in candidates whose research is field oriented. The successful applicant will teach Structural Geology, Tectonics, and develop other courses at the introductory level for non-majors and at the upper-level for geology students. Participation in the Geology Department's summer field course, involvement of undergraduates in research, and a willingness to contribute to other all-university curricula, such as the Scientific Perspectives program in the university's Core Curriculum, are expected.

Colgate University is a highly selective undergraduate liberal arts college with 2800 students. The Geology Department comprises 9 faculty, a senior lecturer/lab instructor, and a technician. Analytical facilities include SEM-EDS, XRF, XRD, ICP-MS, GC-MS, AA, stable isotope mass spectrometer, micropaleontology lab, and geophysical equipment. The Geology Department maintains a Web page at <http://departments.colgate.edu/geology>.

Colgate University is an equal opportunity employer and applications from women and minorities are encouraged. Developing and sustaining a diverse faculty and staff further the university's educational mission.

Review of applications will begin in September-early October, preliminary interviews will be held at GSA-Philadelphia, and on-campus interviews will begin shortly thereafter, pending status of the position at that time. Applications containing a curriculum vitae, statements of teaching philosophy and research interests, and the names of three professional references should be sent to Dr. Constance M. Soja, Chair, Department of Geology; Colgate University; 13 Oak Drive; Hamilton, NY 13346-1398.

**Opportunities for Students**

**Graduate Student Opportunities, Ohio University.**

The Department of Geological Sciences at Ohio University is seeking qualified students for its graduate program. Positions are available beginning January or September 2007. The department offers a competitive program leading to an M.S. degree in Geological Sciences with areas of emphasis including paleontology, stratigraphy/sedimentology, hydrogeology, geochemistry, geomorphology, planetary geology, geophysics, and tectonics. Prospective students are encouraged to contact faculty directly to discuss potential research topics. Qualified students are eligible to receive teaching assistantships that carry a tuition scholarship and a stipend of \$12,150/year. For program and application information, visit the department Web site at [www.ohio.edu/geology/](http://www.ohio.edu/geology/) or contact the graduate chair, David Schneider, [schneidd@ohio.edu](mailto:schneidd@ohio.edu), for additional information.

**Tulane University—Graduate Opportunities in Earth & Environmental Sciences.**

We consider graduate applications throughout the year. In addition to teaching assistantships, research assistantships are available for top applicants to the Ph.D. program, both through competitive fellowships and funded projects. Annual stipends range from \$18,000 to \$20,000. The department has a strong focus on river-ocean studies, with access to a research vessel and a variety of analytical and computing facilities. We are particularly interested in applicants who are excited by the many challenges

facied by the Gulf Coast in the recovery from Hurricane Katrina. Particular strengths are in sedimentology, stratigraphy, marine geology, paleoclimatology, neotectonics, structural geology, geological hazards and environmental geochemistry; there are also opportunities in paleontology, petrology and volcanology. Applications should be submitted online at [www.tulane.edu/%7Egradprog/](http://www.tulane.edu/%7Egradprog/) and should include a clear statement of research interests and career goals, a CV, transcripts, GRE scores, TOEFL scores (for international applicants), and 3 recommendation forms. More information about the department can be obtained via our Web site, [www.tulane.edu/~eens/](http://www.tulane.edu/~eens/). Women and minorities are encouraged to apply.

**Visiting Fellowships—Institute for Rock Magnetism.** Applications are invited for visiting fellowships (regular and student) lasting for up to 10 days during the period from 1 January through 30 June 2007. Topics for research are open to any field of study involving fine particle magnetism, but preference will be given to projects relating magnetism to geological or environmental studies, or to fundamental physical studies relevant to the magnetism of Earth materials.

A limited number of travel grants of up to \$750 are available to cover actual travel costs. No funds are available for per diem expenses. Application forms and information necessary for proposal preparation may be obtained from IRM manager Mike Jackson at the address below, or online at [www.irm.umn.edu](http://www.irm.umn.edu).

Short proposals (two pages, single-spaced text plus two forms and necessary figures and tables) are due by 30 October 2006 for consideration by the IRM's Review and Advisory Committee. Successful applicants will be notified in December 2006. Proposals should be sent by e-mail to [irm@umn.edu](mailto:irm@umn.edu), or by post to Facilities Manager, Institute for Rock Magnetism, University of Minnesota, 291 Shepherd Laboratories, 100 Union St. SE, Minneapolis, MN 55455-0128.

**Graduate Student Opportunity in Mars Geochronology.** A graduate research assistantship is available beginning January of 2007 for a motivated student to study optical dating properties of terrestrial analogs for Mars surface materials including silicates, sulfates and other salts. The ideal candidate will exhibit enthusiasm for planetary geology, mineralogy and sedimentology, have a strong background in general physics with aptitude for experimental science, and be willing to pursue a multidisciplinary degree path. Various support options are possible to accommodate a student seeking a M.S. or Ph.D. Please direct inquiries to Dr. Ken Lepper, Department of Geosciences, North Dakota State University, [ken.lepper@ndsu.edu](mailto:ken.lepper@ndsu.edu).

**Ph.D. Student Opportunity in Marine Sedimentology at Memorial University of Newfoundland.** Ph.D. research assistantships in marine sedimentology are available at Memorial University of Newfoundland Earth

Sciences Department, St. John's, Newfoundland, beginning between Jan. and Aug. 2007. We are seeking highly qualified and motivated students to participate in field-oriented research programs in the following topical areas: nearshore cohesive sediment dynamics, and river-ocean interactions in both high latitude and tropical settings. These projects are parts of large international team efforts that will provide excellent opportunities for students to meet and work with experts in the field.

Memorial University ([www.mun.ca](http://www.mun.ca)) is the largest university in Atlantic Canada, offering more than 100 degree programs to a student population of 17,000. Memorial's Earth Science Department ([www.esd.mun.ca](http://www.esd.mun.ca)) is one of the largest and most diverse Earth Sciences departments in Canada, with 28 faculty members and a new and well equipped building. The university is located in the provincial capital, St. John's ([www.stjohns.ca/index.jsp](http://www.stjohns.ca/index.jsp)), a small vibrant city of 170,000 with all the benefits of a large urban centre.

**Contacts:** Dr. Sam Bentley, Canada Research Chair in Seabed Processes and Seabed Imaging, Department of Earth Sciences, Memorial University of Newfoundland, St. John's, NL Canada A1B 3X5, Telephone: +1-709-737-2097, e-mail: [sjb@esd.mun.ca](mailto:sjb@esd.mun.ca), [www.esd.mun.ca](http://www.esd.mun.ca).

**Two Ph.D. Student Opportunities in Sedimentology and Diagenesis.** Two Ph.D. studentships are available at Memorial University of Newfoundland's Earth Sciences Department, St. John's, Newfoundland to study the effects of groundwater fluctuations on incipient diagenesis. We are seeking highly qualified and motivated students with an M.Sc. in a relevant subject area to participate in an integrated experimental-field- and core-based research program. Experimental methods will involve SEM, TEM and other textural analyses to evaluate the extent to which tidal groundwater fluctuations affect incipient cementation of the host sediment. The successful students will be responsible for either experimental design, implementation and data collection or design of field initiatives and data collection as well as study of ancient core examples from the oilfield of the Jean d'Arc Basin (offshore Newfoundland).

Memorial University ([www.mun.ca](http://www.mun.ca)) is the largest university in Atlantic Canada, with a student population of 17,000. Memorial's Earth Science Department ([www.esd.mun.ca](http://www.esd.mun.ca)) is the largest in Atlantic Canada, with 28 faculty members and a new and well equipped building. The university is located in St. John's ([www.stjohns.ca/index.jsp](http://www.stjohns.ca/index.jsp)), a small vibrant city of 170,000 people.

**Contact:** Dr. Duncan McLlroy, Canada Research Chair in Petroleum Geoscience, Department of Earth Sciences, Memorial University of Newfoundland, St. John's, NL Canada A1B 3X5, Telephone: +1-709-737-6722, e-mail: [dmc@esd.mun.ca](mailto:dmc@esd.mun.ca).

**M.Sc. Student Opportunity in Carbonate Geology at Memorial University of Newfoundland.** The Department of Earth Sciences at Memorial University of Newfoundland (MUN), Canada, has a strong reputa-

tion for excellence in research, with well-equipped labs ([www.esd.mun.ca](http://www.esd.mun.ca)). MUN is located in St. John's, the capital of Newfoundland and Labrador which is a quiet, beautiful city on the Atlantic Ocean.

A postgraduate (M.Sc.) position is available, pending availability of funds, in carbonate geology. We are looking for a student with interests in carbonate diagenesis and stable isotope geochemistry. The candidate must meet the criteria to register as a graduate student at the university ([www.mun.ca](http://www.mun.ca)).

**Contact:** Dr. Karem Azmy, Associate Professor, Department of Earth Sciences, Memorial University of Newfoundland, St. John's, NL Canada A1B 3X5, Telephone: +1-709-737-6731, e-mail: [kazmy@mun.ca](mailto:kazmy@mun.ca), [www.esd.mun.ca](http://www.esd.mun.ca)

**Graduate Student Assistantship in Geochemistry, Economic Geology.** The Department of Geological Sciences at the University of Missouri—Columbia invites applications for a M.S. or Ph.D. student opportunity to begin January, 2007 to research the geochemistry of fluids involved in precipitating carbonate-hosted Zn-Pb deposits in the Ozark region of the central United States. The research is funded by the USGS and will involve field, numerical modeling, and analytical components, with particular emphasis on LA-ICP-MS, Raman spectroscopy, and microthermometry. Applications are encouraged by October 31, 2006. For more information, please contact Dr. Martin Appold: +1-573-882-0701; [appoldm@missouri.edu](mailto:appoldm@missouri.edu).

**Ph.D. project—Late Paleozoic fusulinid biostratigraphy in Donets Basin.** Permian Research Institute (PRI), Boise State University, Boise, Idaho. The objective of the project is to provide chronostratigraphic fusulinid biostratigraphy framework, coupled with the conodonts biostratigraphy and the application of these integrated data to multiple quantitative tools (CONOP, RASC, CASP, GraphCor). This project is a part of interdisciplinary study in Donets Basin, and W. Europe focused on our understanding of the evolution of the late Paleozoic climate system. Guidelines for completing Ph. D. studies at the Boise State University can be seen at <http://earth.boisestate.edu/content/degreeprograms/graduate/>. As an Equal Opportunities Employer, The University welcomes applications from suitably qualified people from all sections of the scientific community, regardless of age, race, religion, gender or ethnic background. Candidates hold a Masters degree in geology or similar relevant areas, and have an interest in (micro) paleontology, biostratigraphy, sedimentology and stratigraphy. Strong knowledge of Russian language is essential. The candidate should send an application by e-mail with his/her curriculum vitae, publication list and relevant recommendations as well as a short description of possible scientific interests to Professor Vladimir I. Davydov, [vdavydov@boisestate.edu](mailto:vdavydov@boisestate.edu), +1-208-4261119, Dept. of Geosciences, BSU, Boise, ID 83725.

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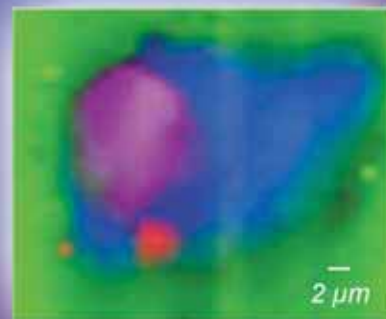
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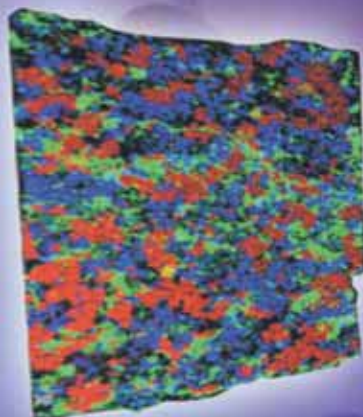
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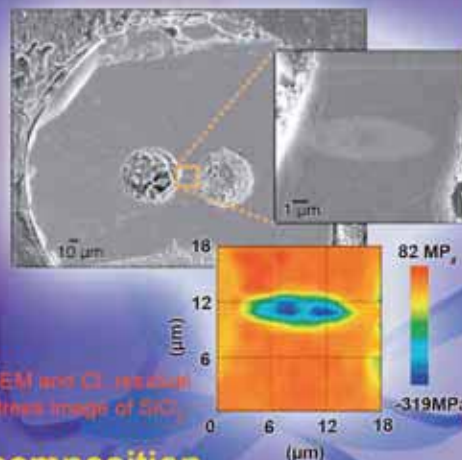
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