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GSA TODAY

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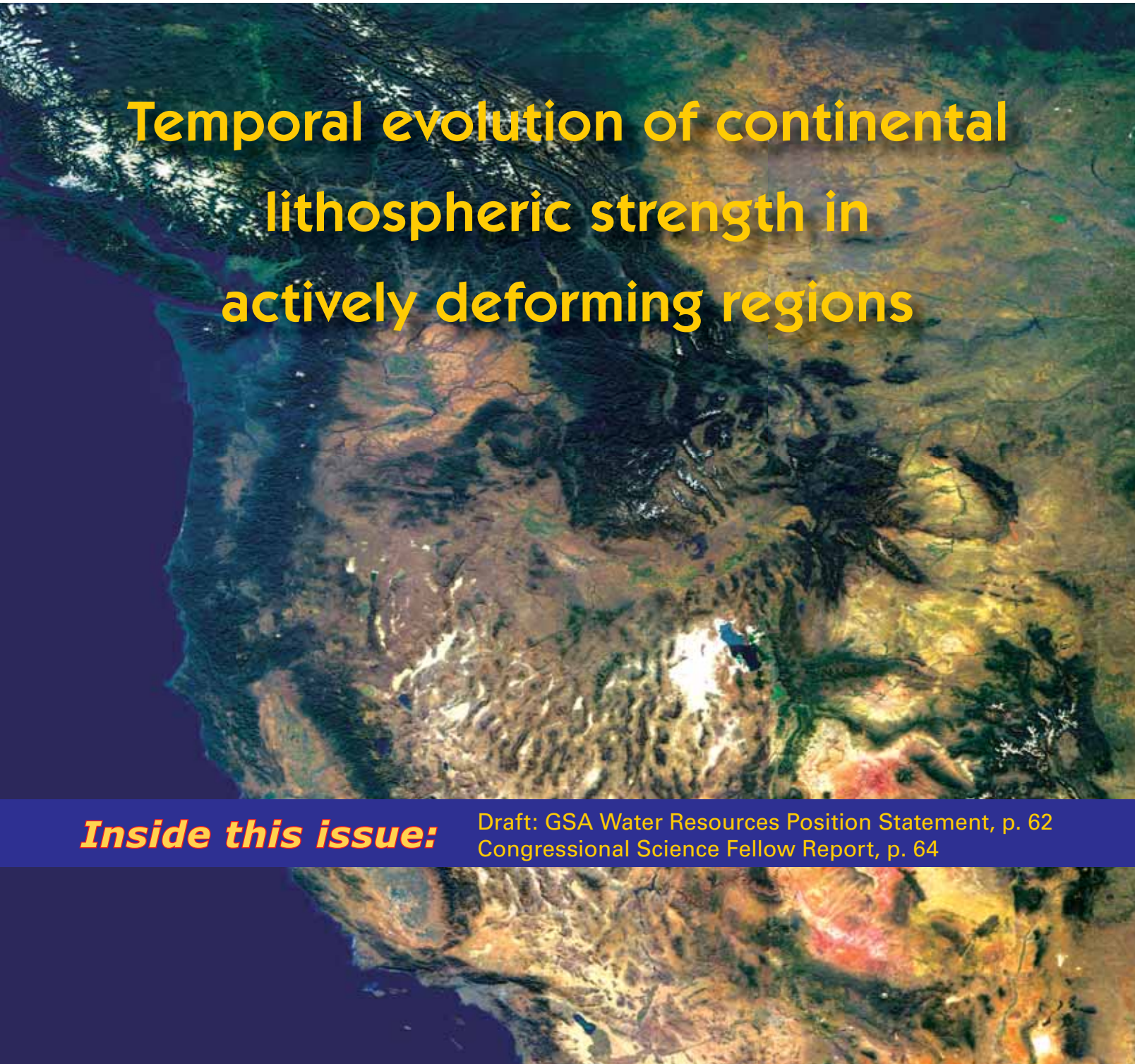

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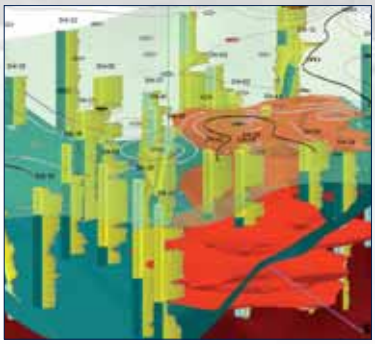

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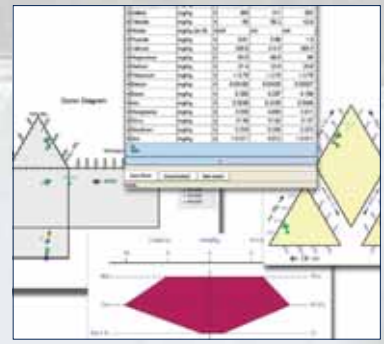

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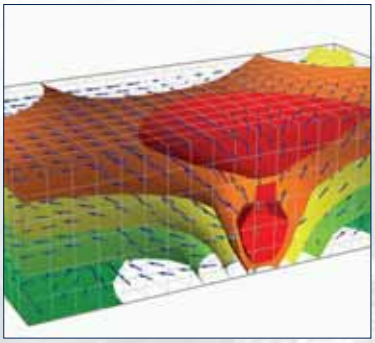

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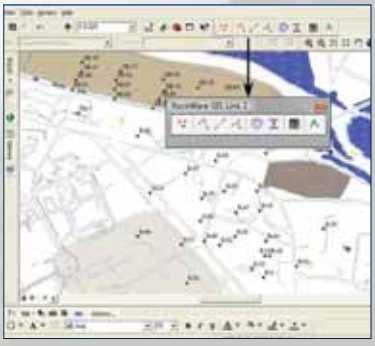

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SCIENCE ARTICLE

Cover: Natural-color image from NASA's Multi-Angle Imaging SpectroRadiometer (MISR). Data from 45 swaths of MISR's nadir camera were combined to create this mosaic of the western U.S. and Canada. The image, draped over a shaded relief digital terrain elevation model from the U.S. Geological Survey, extends from 48°N 128°W in the northwest to 32°N 104°W in the southeast. Courtesy NASA Goddard Space Flight Center, Langley Research Center, and the Jet Propulsion Laboratory MISR team, http://photojournal.jpl.nasa.gov/catalog/PIA04330. See "Temporal evolution of continental lithospheric strength in actively deforming regions" by Thatcher and Pollitz, p. 4–11.

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Temporal evolution of continental lithospheric strength in actively deforming regions

Wayne Thatcher *and* ***Fred F. Pollitz,*** *USGS, 345 Middlefield Road, Menlo Park, California 94025-3591, USA*

ABSTRACT

It has been agreed for nearly a century that a strong, load-bearing outer layer of earth is required to support mountain ranges, transmit stresses to deform active regions, and store elastic strain to generate earthquakes. However, the depth and extent of this strong layer remain controversial. Here we use a variety of observations to infer the distribution of lithospheric strength in the active western United States from seismic to steady-state time scales. We use evidence from post-seismic transient and earthquake cycle deformation, reservoir loading, glacio-isostatic adjustment, and lithosphere isostatic adjustment to large surface and subsurface loads. The nearly perfectly elastic behavior of Earth's crust and mantle at the time scale of seismic wave propagation evolves to that of a strong, elastic crust and weak, ductile upper mantle lithosphere at both earthquake cycle (EC, ~10^0 to 10^3 yr) and glacio-isostatic adjustment (GIA, ~10^3 to 10^4 yr) time scales. Topography and gravity field correlations indicate that lithosphere isostatic adjustment (LIA) on ~10^6–10^7 yr time scales occurs with most lithospheric stress supported by an upper crust overlying a much weaker ductile substrate. These comparisons suggest that the upper mantle lithosphere is weaker than the crust at all time scales longer than seismic. In contrast, the lower crust has a chameleon-like behavior, strong at EC and GIA time scales and weak for LIA and steady-state deformation processes. The lower crust might even take on a third identity in regions of rapid crustal extension or continental collision, where anomalously high temperatures may lead to large-scale ductile flow in a lower crustal layer that is locally weaker than the upper mantle. Modeling of lithospheric processes in active regions thus cannot use a one-size-fits-all prescription of rheological layering (relation between applied stress and deformation as a function of depth) but must be tailored to the time scale and tectonic setting of the process being investigated.

INTRODUCTION

The existence and importance of the lithosphere—the mechanically strong outer layer comprising Earth's crust and uppermost mantle—has been recognized both before and since the plate tectonic revolution of the 1960s. Here we define strength as the maximum deviatoric stress the lithosphere supports at a given depth, with "strong" lithosphere maintaining stresses at ≥100 MPa and "weak" lithosphere ≤10 MPa. Barrell (1914) first showed that topographic loads at Earth's surface were supported by a strong lithosphere overlying a buoyant, inviscid asthenosphere. Jeffreys (1932) (*in* Jeffreys, 1952, p. 185–200) demonstrated that the weight of great mountain ranges generates high stresses that require support by a strong elastic element in the crust. Gunn (1947) applied the ideas of Barrell to model the flexure of the crust produced by surface loads such as oceanic islands and mountain ranges. With the discoveries of plate tectonics, Elsasser (1969) realized that the lithosphere described in these pioneering studies was a natural means for "guiding" (i.e., transmitting) plate boundary driving and resisting stresses for long distances into plate interiors. In a series of papers published in the early 1970s, Walcott resuscitated the work of Gunn to initiate plate flexure studies on the continents and in the ocean basins and to interpret the results in a plate tectonic context (e.g., Walcott, 1970). Watts and colleagues (Watts et al., 1975, 1980; Watts, 1978) applied these methods systematically to ocean basins. They showed that the effective elastic thickness of the lithosphere (*Te*) correlates with plate age and maximum depth of earthquakes, which is consistent with the conventional thermal model of oceanic lithosphere that cools conductively and thickens as it is advected away from a mid-oceanic ridge. Many subsequent studies have used the gravitational signal or the surface deformation due to flexure of continental lithosphere to estimate *Te* in a wide range of settings (see Watts, 2001).

Rock mechanics results from the laboratory (Byerlee, 1978; Goetz and Evans, 1979; Brace and Kohlstedt, 1980) and from deep-level mines and borehole measurements (McGarr and Gay, 1978) provided evidence that the lithosphere was strong and elastic in the upper crust and increasingly ductile and ultimately weaker in the lower crust and upper mantle. For oceanic lithosphere, the derived strength profile was particularly simple, increasing linearly with depth due to frictional resistance to fault slip in the crust and uppermost mantle, then decreasing exponentially with increasing depth and temperature in the upper mantle. The conventional strength profile for the continental lithosphere was apparently more complex—controlled by friction and increasing with depth in the upper crust, decreasing in a ductile lower crust, then increasing abruptly with compositional change at the Moho before subsequently decaying rapidly with depth in the upper mantle.

Work in the 1980s and 1990s provided support for the conventional strength profile for continental lithosphere but also raised troubling questions. The apparent location of earthquake hypocenters in the uppermost mantle beneath Tibet and elsewhere seemed to confirm the high strength of the lithospheric mantle under continents (e.g., Chen and Molnar, 1983) as well as beneath ocean basins, where mantle earthquakes had long been reliably identified (e.g., Watts, 1978). It was recognized that exhumed metamorphic core complexes represented mid-crustal rocks that had been pervasively deformed by ductile flow during crustal extension (e.g., Crittenden et al., 1980). This, as well as the suggestions that the mid-crust beneath the Tibetan Plateau was effectively fluid at sufficiently long time scales (Zhao and Morgan, 1985, 1987; Royden et al.,

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1997), appeared to conform nicely with the iconic image of a low strength zone in the continental lower crust interposed between strong upper crust and strong upper mantle (i.e., the "jelly sandwich" model). Nonetheless, it was realized about the same time (e.g., Sibson, 1986) that at least in some regions, lower crust with more mafic composition would be considerably stronger than the quartzofeldspathic crust usually invoked in constructing strength profiles. Furthermore, careful analysis near plate boundaries of stress indicators such as surface heat flux (Lachenbruch and Sass, 1980; Wang et al., 1995) and earthquake fault plane solutions (Zoback et al., 1987; Wang and He, 1999), showed that the conventional strength profiles do not apply in those locations and that major faults are weaker than the blocks they bound. In addition, there has been a growing appreciation that small amounts of water have enormous influence on the ductile strength of crust and upper mantle minerals, allowing a wide range of permissible rheological strength profiles (e.g., Karato and Wu, 1993; Kohlstedt et al., 1995).

Long-standing arguments favoring the steady-state strength of the upper crust and weakness of the lower crust adjacent to the San Andreas fault system in western California (Lachenbruch and Sass, 1973; Lachenbruch, 1980) were also receiving increasing support. Gravity-topography admittance studies from the western United States obtained *Te* values of ~5–15 km, comparable to the thickness of the seismogenic upper crust throughout much of the active West (Lowry and Smith, 1995). Borehole stress measurements and related modeling suggested that much of the strength of the continental lithosphere resides in the upper crust (see results summarized in Townend and Zoback, 2000). A change with depth in the fault plane solutions of the deepest crustal earthquakes on the San Andreas system also suggested that all earthquake-generating stresses reside in the upper crust (Bokelmann and Beroza, 2000).

Two recent *GSA Today* articles have taken contrasting stands on the strength of continental lithosphere. Jackson (2002), relying primarily on joint work with colleagues (e.g., McKenzie and Fairhead, 1997; Maggi et al., 2000a, 2000b) argued that the conventional profile (i.e., the jelly sandwich model) should be largely abandoned because (1) reinterpretation of gravity anomalies caused by flexural loads indicate the strength of continental lithosphere resides in the crust (usually the upper crust); and (2) reanalysis of previously identified mantle earthquakes using seismic waveform data shows that these events may actually be located in the lowermost crust. Burov and Watts (2006) disagreed with the revisionist interpretation of the gravity data (see also Watts, 2001, p. 214–221) and appealed to mechanical models of lithospheric deformation to defend the conventional profile and argue for significant upper mantle strength.

The purpose of this paper is to draw attention to the increasing body of work using observed transient deformation following large crustal earthquakes that complements strength estimates based on glacio-isostatic adjustment (GIA) and lithosphere isostatic adjustment (LIA) data. This evidence supports the strong crust–weak upper mantle rheological model for the continental lithosphere in actively deforming regions. Figure 1 shows our inferred temporal evolution of lithospheric strength. Briefly put, at the time scale of elastic wave propagation, the entire lithosphere is strong and elastic, but the upper mantle

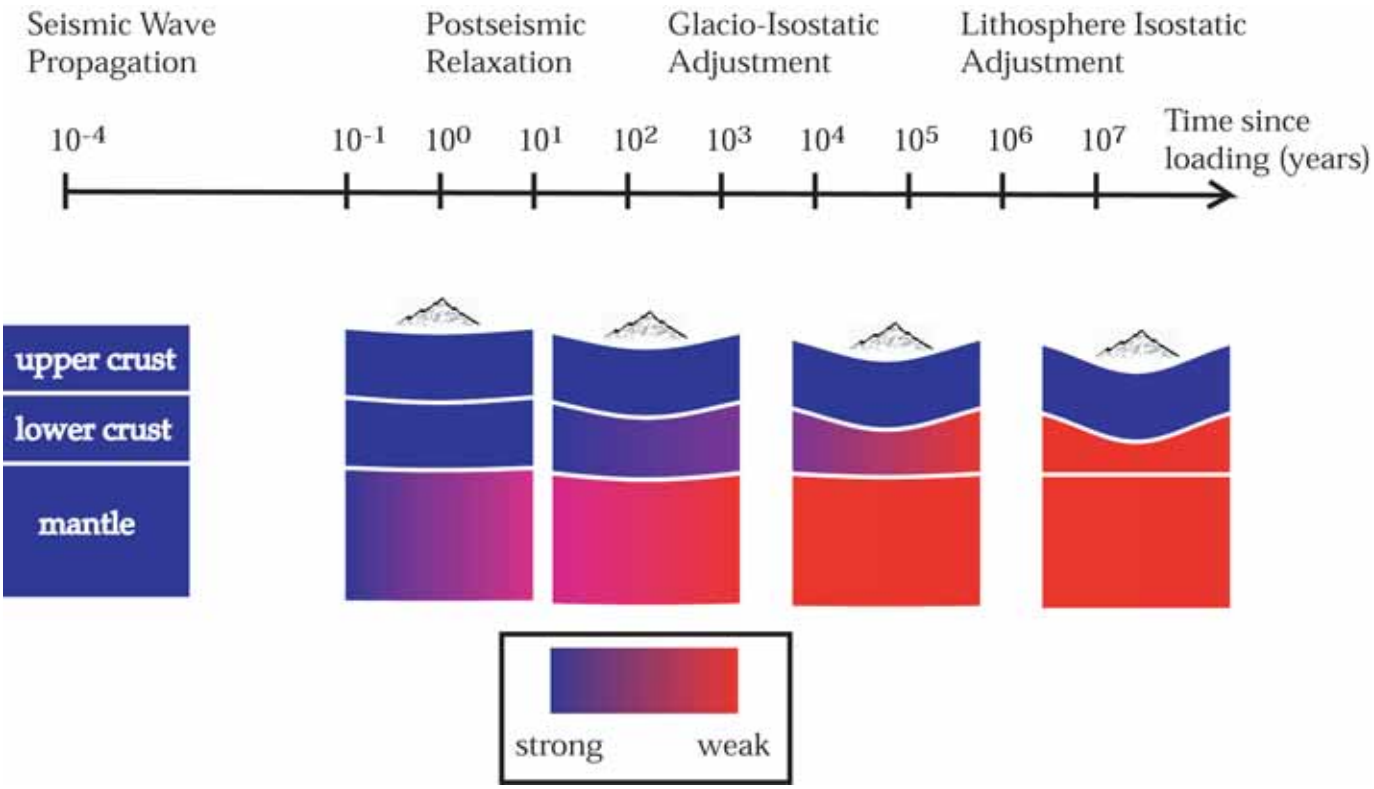

Figure 1. Evolution of strength in the crust and mantle of the western United States based on consideration of postseismic (PS) and glacio-isostatic adjustment (GIA) studies (Fig. 3) as well as topography and gravity (Lowry et al., 2000). The different time scales involved in lower crust and upper mantle weakening and the response to a surface load are shown.

and lower crust progressively weaken with time until only the upper crust supports significant stresses at the ~1–10 m.y. time scale of LIA. We propose Figure 1 as a working model to be critically evaluated, tested as new constraints on lithospheric strength become available, and appropriately modified, rejected, or accepted.

POSTSEISMIC TRANSIENT DEFORMATION

Conventional ground-based geodetic survey measurements have been applied since the 1970s to study postseismic (PS) deformation and infer lithospheric rheology (e.g., Nur and Mavko, 1974; Savage and Prescott, 1978; Thatcher et al., 1980; Thatcher and Rundle, 1984). However, over the past decade, new high-precision methods of space geodesy have greatly expanded the observational base and led to considerable refinement in our understanding of postseismic transient deformation and the processes controlling it. It is now recognized that post-earthquake deformation can be caused by (1) transient aseismic fault slip; (2) poroelastic relaxation due to fluid flow in the upper crust; and/or (3) viscoelastic relaxation in the lower crust and/or upper mantle. We confine our attention to postseismic deformation, where, in our view, the evidence is strong that the third process, viscoelastic relaxation through ductile flow, is the dominant process.

The essential features of the postseismic observations and the model used to explain them are shown in Figure 2. We consider the simplest case: two-dimensional earthquake faulting in an elastic layer of thickness H overlying a viscoelastic half-space (Fig. 2A). The model can be generalized to include three dimensions and multiple layers in a spherical Earth (Pollitz, 1997). Coseismic fault slip produces a vertical displacement pattern like that shown for normal faulting in Figure 2B. Elastic stresses imposed in the underlying half-space at the time of the earthquake gradually relax by ductile flow, producing a spatial pattern of time-decaying vertical and horizontal displacement that scales with H and with a temporal behavior that depends on the effective viscosity (η_{eff}) of the underlying half-space. Observing first-order features in the space-time behavior of the post-earthquake deformation thus provides constraints on H and on η_{eff} in the lower crust and uppermost mantle.

PS deformation thus has many similarities to elastic plate flexure due to surface loads like mountains and seamounts, with the spatial wavelength of the deformation depending on the thickness (*Te*) of a strong, load-bearing elastic plate. However, in the PS problem, the load, due to stress redistribution caused by faulting, is small, inducing stress increments of only 1–10 MPa, a small fraction of the integrated lithosphere strength.

RHEOLOGY THROUGH THE LENS OF TRANSIENT CRUSTAL DEFORMATION

Figure 3 summarizes the lower crust and upper mantle viscosities inferred from PS relaxation provided by geodetic data. All determinations should be regarded as lower bounds because no PS data span time intervals longer than 40 yr, and there is a tendency for the effective viscosity to increase with time after the earthquake. The figure demonstrates that effective upper mantle viscosity η_{eff} clusters near $3–4 \times 10^{18}$ Pa s, and lower crust viscosity is generally $1–2 \times 10^{20}$ Pa s or greater. Even lower viscosities and smaller mantle relaxation times are suggested by the very rapid PS deformation observed after the Hector Mine earthquake (Pollitz et al., 2001; Pollitz, 2003; Freed and Bürgmann, 2004), consistent with a transient or power-law rheology (mantle η_{eff} being initially very low, ~10^{17} Pa s, and increasing with time). The depth dependence of mantle viscosity inferred by Freed et al. (2007) suggests that the top 5–10 km of the mantle may have a much higher viscosity than the underlying mantle, as might be expected from the temperature dependence of viscosity (see Eq. 1). Figure 3 establishes nonetheless that at time scales up to 10^2 yr, the upper mantle, perhaps below a thin, high-viscosity lid, has an effective viscosity ~2 orders of magnitude less than the lower crust.

Although best documented in the western United States, the picture of an effectively elastic lower crust and low-viscosity upper mantle is also obtained in other areas (Ergintav et al., 2006; Thatcher et al., 1980; Pollitz and Sacks, 1996; Hilley et al., 2005; Hu et al., 2004; Wang, 2007).

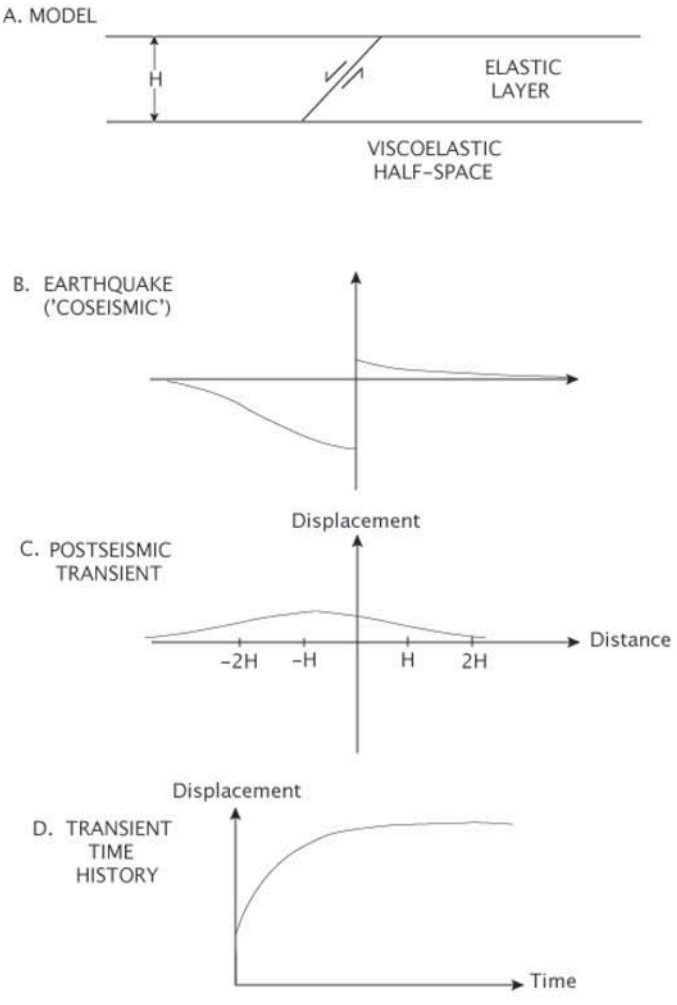

Figure 2. The earthquake cycle in an idealized continental model consisting of an elastic layer of thickness H underlain by a viscoelastic half-space (A). Profiles at Earth's surface: (B) vertical displacement associated with the static displacement field of the earthquake, and (C) the accumulated displacement over a definite postseismic time interval. (D) Time dependence of surface displacement, including the abrupt offset at time 0 (just after the earthquake) and decaying postseismic velocity with increasing time.

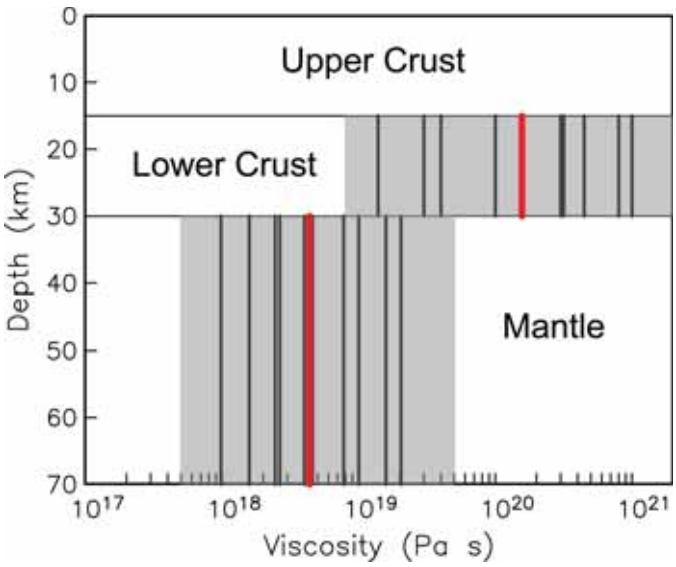

Figure 3. Summary of lower crust and upper mantle viscosities in the western United States estimated in crustal deformation studies of postseismic (and post–lake-filling) relaxation. Shaded areas bracket the complete range of estimated viscosities; vertical bars denote the mean viscosity obtained in an individual study. Red bars indicate the mean of all viscosity estimates in the respective lower crust and mantle regions. Because of the time scales involved (≤10^2 yr), all estimates represent lower bounds on possible longer-term effective viscosity. Viscosity estimates of contributing studies (Kaufmann and Amelung, 2000; Pollitz et al., 2000; Nishimura and Thatcher, 2003; Pollitz, 2003; Freed and Bürgmann, 2004; Gourmelen and Amelung, 2005; Chang and Smith, 2005; W.C. Hammond, 2007, personal commun.) are tabulated in Bürgmann and Dresen (2008) and W.C. Hammond (2007, personal commun.). Most viscosity estimates are based on a Newtonian rheology. Exceptions are Pollitz (2003), which uses a Burgers body for the upper mantle, and Freed and Bürgmann (2004), which uses a nonlinear rheology (Eq. 1 with n = 3.5); a range of η_{eff} is used to represent the Freed and Bürgmann (2004) model. Both the lower crust and upper mantle are schematically depicted with respective uniform viscosities—a simplification—though most studies have indeed assumed uniform viscosity in each domain.

ENDMEMBER FLOW PROFILES

Creep curves determined in laboratory experiments on numerous crustal and mantle materials generally yield steady-state flow laws of the form (e.g., Ranalli, 1995)

$$\dot{\varepsilon} = A\sigma^n \exp\left[-\left(Q + PV\right) / RT\right], \quad (1)$$

where A is a material constant, $\dot{\varepsilon}$ is the strain rate, σ is differential stress needed to deform the material at this strain rate, Q and V are the activation energy and volume, respectively, P is pressure, T is absolute temperature, R is the gas constant, and n is the stress exponent. More generally, we can write $\sigma = 2\,\eta_{eff}\,\dot{\varepsilon}$, so that at a given strain rate, the differential stress increases with increasing effective viscosity η_{eff}. We define this differential stress as the ductile strength (or simply "strength") of the material. It then follows that the viscosity profile in Figure 3 implies that the lower crust is much stronger than the upper mantle in the western United States.

The rheology is linear (Newtonian) when n = 1 and nonlinear when $n \neq 1$. As expected from the temperature dependence of Equation 1, experiments for thermally activated creep show that all constituent minerals of the lower crust (including quartz, plagioclase, and phyllosilicates) and upper mantle (olivine, pyroxenes, and garnet) are weaker the higher the temperature. Water weakening of quartz and olivine indicates that crust and mantle rocks are also sensitive to water content (e.g., Mackwell et al., 1985; Gleason and Tullis, 1995). Figure 4 summarizes the expected viscosities of representative rock types in the lower crust and upper mantle at typical tectonic strain rates (10^{-14}–10^{-13} s^{-1}) for a geotherm considered representative of the western United States on average.

Mineral assemblages other than quartz are likely to be more representative of the lower crust (Sibson, 1986); a range of observations suggests that wet olivine may be more representative of the upper mantle in tectonically active areas (Pollitz et al., 2000; Dixon et al., 2004; Hyndman et al., 2005). These choices would result in a substantially stronger lower crust and weaker upper mantle (Fig. 4), consistent with the inferred effective viscosity or strength in the western United States (Fig. 3). An excellent recent review by Bürgmann and Dresen (2008) discusses these issues in greater depth.

TIME-DEPENDENT LITHOSPHERIC STRENGTH

Deformation observed in the ~1–10 yr after major earthquakes occurs with increasingly longer time constants, suggesting that as stresses relax and strain rates decline the effective viscosity increases. Given that the viscosities obtained from PS relaxation shown in Figure 3 are the lower bounds, the lower crust may be effectively elastic over the time scale of the earthquake cycle (~10^2 to 10^3 yr), so any time-dependence in effective viscosity would then be undetectable.

Assuming that both lower crust and mantle viscosity continue to increase with time even beyond PS time scales, both consequently undergo a gradual loss of strength. How rapidly do the lower crust and uppermost mantle evolve to a state of lower strength? Two lines of evidence support the strong crust–weak upper mantle model.

First, constraints derived from GIA studies apply over time scales of ~10^3–10^4 yr. In the western United States, these include removal of surface loads at the end of the last ice age, ca. 15 ka B.P.; surface uplift that followed draining of pluvial Lake Bonneville and Lake Lahontan in the Basin and Range Province (Bills et al., 1994, 2007); and flexural rebound of Puget Sound on removal of its glacial load (James et al., 2000). Given the available lower bounds on lower crustal viscosity from the PS studies (10^{20}–10^{21} Pa s; see Fig. 3), it might be expected that the lower crust would have relaxed over GIA time scales. On the contrary: the GIA studies independently suggest essentially the same rheological layering as shown in Figure 3, indicating a strong elastic upper crust, a high-viscosity, effectively elastic lower crust and a weaker upper mantle.

Second, the relation between topography and the gravity field in the western United States provides constraints on lithospheric rheology over the time scales of lithospheric adjustment to large surface and subsurface loads that may reflect its steady-state strength. The time scale over which LIA equilibrium is achieved is not well known but may be in the range ~10^6–10^7 yr. Figure 5, modified from Lowry et al. (2000), maps the spatial distribution of effective elastic thickness (*Te*) derived in this way. It also shows sites where PS and GIA studies have constrained rheology

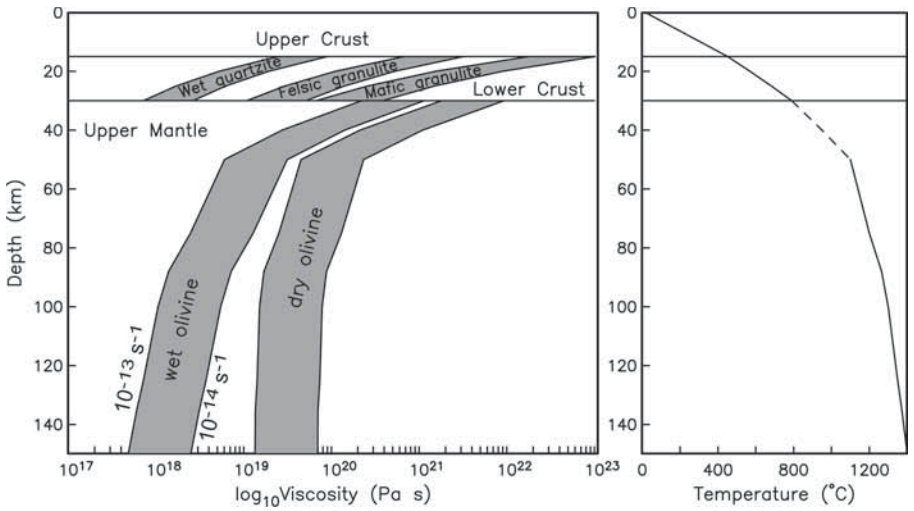

Figure 4. Range of depth-dependent effective viscosity of lower crust and mantle materials at strain rates between 10^{-14}/s and 10^{-13}/s; lowest viscosities correspond to the larger strain rate, as indicated for wet olivine. Mantle viscosity curves are given by Dixon et al. (2004; Eq. 1 therein; their η_{eff} is divided by two here), with material constants for wet and dry olivine provided in their Table 2 and the mantle temperature profile given in their Table 3. In the crust, the geotherm is prescribed by Afonso and Ranalli (2004; Eq. 3 and Table 2 therein), with a surface heat flow of 70 mW/m^2 and Moho depth of 30 km. Lower crust viscosity curves are based on material constants for wet quartzite (Kirby and Kronenberg, 1987), felsic granulite, and mafic granulite (Wilks and Carter, 1990). The jelly sandwich model is represented by the combination of wet quartzite for the lower crust and dry olivine for the upper mantle.

in the crust and uppermost mantle. As maps of surface heat flux show (e.g., Sass et al., 1989), much of the *Te* variation in the western United States shown in Figure 5 is directly related to the thermal regime and the depth of the brittle-ductile transition in the crust. Note also that *Te* is systematically greater to the east, consistent with the lower surface heat flux and cooler crust in the central and eastern United States. It is clear from this map that *Te* is ~5–15 km over much of the active West, considerably less than the crustal thickness. The most straightforward interpretation of these results and those discussed above is that lower crust and upper mantle stresses maintained over PS and GIA time scales relax by ductile flow at greater (LIA) times and that lithospheric stress is supported by the seismogenic upper crust alone.

CHAMELEON LOWER CRUST

In contrast to the consistent weakness of the mantle beneath plate boundary zones at both shorter (10^0 to 10^4 yr) and longer ($\geq 10^6$ yr) time scales, the lower crust appears to exhibit different behavior at different time scales and in thermally extreme tectonic settings. At PS and GIA time scales, the lower crust is strong, and its behavior is essentially elastic. For ~10^6 yr and longer after load application, the lower crust relaxes and is effectively inviscid. At earthquake cycle time scales (10^2–10^3 yr repeat time of major earthquakes), the lower crust may behave essentially like the upper crust, with narrow weak zones of concentrated shear separating stronger, nearly elastic blocks.

It may seem paradoxical that although the lower crust is strong and nearly elastic at time scales $\leq 10^4$ yr, it is essentially devoid of even small earthquakes. However, this behavior can be understood if earthquake fault slip requires significant ambient stress levels and the lower crust is weak at long time scales. The absence of earthquake-generating stresses in the lower crust is expected if this region is weak at long time scales and does not support significant steady-state stress, as suggested by the small *Te* values determined for much of the western United States (Fig. 5). A transition from strong upper crust to weak lower crust is also supported by consistent changes with depth in the fault plane solutions of the deepest upper crustal earthquakes occurring along the San Andreas fault system in California. Bokelmann and Beroza (2000) show that inferred principal stress axes of these small earthquakes imply a transition from high to low ambient stress at the seismic-aseismic transition depth (~15 km in California), consistent with negligible long-term strength of the lower crust.

The lower crust may also be weak at shorter time scales due to special thermal conditions not found in most active regions (e.g., Pollitz et al., 2001; McKenzie and Jackson, 2002). In highly extended terranes, the observation of an essentially flat Moho (e.g., McCarthy et al., 1991) suggests pervasive bulk ductile flow of the lower crust. Likewise, the very flat topography of the Tibetan Plateau and the contrasting topographic gradients at its north, east, and southeast margins suggests lower crustal flow over large distances in this region (Zhao and Morgan, 1987; Clark and Royden, 2000). Topography created in continental collision zones is accompanied by crustal thickening, with lower crustal rocks at twice their typical depths. The higher temperatures encountered below ~40 km are expected to lead to anomalously low crustal strength at these depths.

FIELD AND LABORATORY CONSTRAINTS

Field observations and laboratory experiments bearing on rheology of the ductile lithosphere each have strengths and limitations. Field observations of lithospheric loading due to earthquakes, ice sheets, and tectonic-magmatic topography represent direct experiments on earth materials at true scale and strain rate. Loads are known, but rheological layering and its lateral variations must be inferred (nonuniquely) from inevitably limited measurements made at Earth's surface. Finally, the composition and state of lithospheric rocks is imperfectly known.

In contrast, laboratory experiments on ductile flow are carried out on known materials, directly observe the micromechanical nature of ductile shearing, and determine rheological laws at pressures, temperatures, and compositions thought to prevail in Earth's lithosphere. However, lab experiments are typically carried out at length scales ~8 orders of magnitude smaller and strain rates ~4–8 orders of magnitude faster than deformation processes occurring in the earth.

Given these contrasting strengths and limitations, it is increasingly being recognized that the role of field observations is

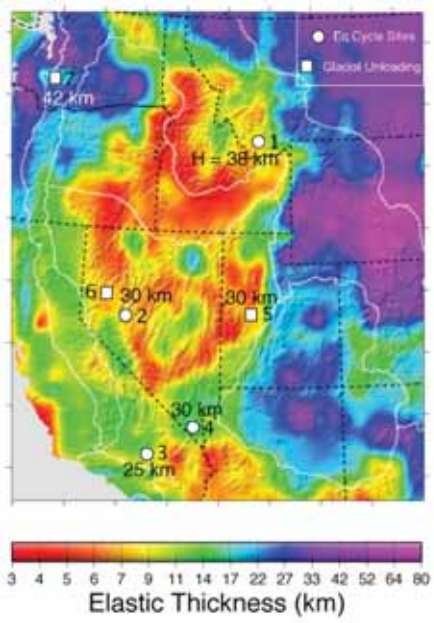

Figure 5. Effective elastic thickness *Te* in the western United States (Lowry et al., 2000) and the locations of crustal deformation sources that yield estimates of lower crust and upper mantle viscosity. Sites where PS and GIA constraints on crust and upper mantle rheology have been obtained are shown by white circles (PS) and squares (GIA). 1—Hebgen Lake, Montana (Nishimura and Thatcher, 2003); 2—Central Nevada Seismic Belt (W.C. Hammond, 2007, personal commun.); 3—Hector Mine, California (Pollitz et al., 2001); 4—Lake Mead, Arizona (Kaufmann and Amelung, 2000); 5—Lake Bonneville, Utah (Bills et al., 1994); 6—Lake Lahontan, Nevada (Bills et al., 2007); 7—Puget Sound, Washington (James et al., 2000). In all these cases, the effective elastic layer thickness *H* (values given beside each locality) is comparable to the crustal thickness of ~30 km, considerably greater than the *Te* obtained from the topography–gravity shown here.

to discriminate among the many possible rheologies for the lithosphere determined by laboratory experiments. For example, the growing evidence that upper mantle lithosphere is weak in at least some geologic settings has led to suggestions (e.g., Dixon et al., 2004; Hyndman et al., 2005; Jackson, 2002; Maggi et al., 2000a; Pollitz et al., 2000) that upper mantle rocks are hydrated by subduction magmatic processes and deform according to power law flow appropriate for wet olivine determined in the lab (e.g., Karato and Wu, 1993; Hirth and Kohlstedt, 1996). In the same spirit, we can appeal to laboratory results to rationalize the temporal evolution of strength of the lower crust. We suggest that the temporal transition from elastic to roughly inviscid behavior follows if lower crustal effective viscosity (which could be either power law or linear) is relatively high (>10^{21} Pa s), consistent with a mafic granulite composition (Fig. 4). In this case, little deformation occurs at PS and GIA time scales, but stresses relax at longer times.

PS and GIA processes in tectonically active regions involve application of impulsive loads that lead to transient ductile flow superimposed on the steady-state background deformation caused by plate driving and resisting forces and internal lithospheric buoyancy. At present, we know of no definitive evidence from laboratory or field studies that would permit us to determine whether the transient and steady-state deformation mechanisms are identical. However, transient loading of the lithosphere (i.e., PS and GIA loads) and steady-state adjustment of the lithosphere to topographic loads (i.e., LIA loads) both require a weak upper mantle. This strongly suggests to us that, regardless of deformation mechanism, this weakness is a robust feature of tectonically active regions.

DISCUSSION

Modeling of active deformation must take into account the rheological layering appropriate to the process being considered. At earthquake cycle and GIA time scales, the entire crust is strong and elastic and deformation is accommodated on faults and ductile shear zones, while the upper mantle is viscously coupled to the overlying crust but much weaker. Postseismic observations indicate that the upper mantle is strong (and its effective viscosity low) immediately following a large earthquake, when strain rates are high. Its strength decreases sharply (and effective viscosity increases) with time as strain rates decline, and the interseismic strength is much less than that of the lower crust. At the time scales of isostatic compensation, the upper crust carries most of the lithospheric strength and the lower crust and uppermost mantle are effectively inviscid. For the steady-state conditions appropriate for modeling lithospheric dynamics and deformation, the upper crust is strong and elastic except where cut by weak faults, and it is viscously coupled to the lower crust and upper mantle.

While the model of lithospheric strength presented here refers only to data from active regions, there is some evidence that the temporal evolution of strength we infer may also be appropriate for cratonic lithosphere. Milne et al. (2001) used present-day measurements of vertical and horizontal deformation from a 33-station continuous GPS network in Fennoscandia to propose a GIA model with a 120-km-thick elastic layer (95% confidence interval 90–170 km) overlying an upper mantle of viscosity 0.5–1.0 × 10^{21} Pa s. On the other hand, Poudjom-Djomani et al. (1999) have applied the gravity-topography coherence method in the same region to estimate *Te* ranging from 10 to 70 km (10–40 km at all but a few of the GPS sites used by Milne et al. [2001] in their analysis). The difference between the two estimates is independent of the ongoing dispute over the proper analysis of gravity and topography data (McKenzie and Fairhead, 1997; Watts, 2001; Burov and Watts, 2006). Although Poudjom-Djomani et al. (1999) used the Bouguer coherence method criticized by McKenzie and Fairhead (1997), application of the free air coherence method preferred by McKenzie and Fairhead (1997) generally produces even smaller *Te* values in cratonic regions. Comparison of the GIA and LIA results suggests a strong upper crust and upper mantle lithosphere at GIA time scales but lithospheric stresses supported largely or exclusively within the cratonic crust at longer times.

Our conclusions differ from those of Burov and Watts (2006), who argue for a strong upper mantle lithosphere based on their modeling of long-term active tectonic deformation at lithospheric scales. In our view, their strongest argument is that high-strength upper mantle lithosphere is required to prevent its advective removal and descent into the deeper mantle, which would juxtapose hot asthenosphere at the base of the crust and result in an inadmissibly high heat flux at Earth's surface in many regions. Perhaps upper mantle lithosphere in active regions is weak enough to deform readily but just strong enough to support its own weight, perhaps through a finite yield stress condition that is not formally included in ductile flow laws like those given by Equation 1. Beyond this speculation, we have no ready explanation for the incompatibility of our inferences and the Burov-Watts modeling results.

We do worry, however, that literal acceptance of the laboratory rheologies used in their modeling, particularly for long time scales and low strain rates, may not be justified and suggest that the more direct observations bearing on lithospheric strength described here should be accorded more weight.

SUMMARY AND CONCLUSIONS

We appeal to three types of crustal loading to propose a working model of continental lithospheric strength valid from ~1 yr to million-year time scales in actively deforming regions (Fig. 1). Results of observations and simple models imply a strong crust–weak mantle lithosphere at PS and GIA time scales. For GIA and steady-state deformation processes, available data suggest a strong upper crust overlying a much weaker lower crust and upper mantle.

Our working model is consistent with first-order observations and has the advantage of simplicity. It is based on observations and simple models of elastic flexure and ductile flow and accounts for lithospheric strength from earthquake cycle to steady-state time scales. It does not depend upon large extrapolations in length- and time-scales between laboratory-derived flow laws and real earth deformation processes.

However, our proposed model has several shortcomings and raises unanswered questions. Observations have limited depth resolution and cannot exclude the possible existence of a thin upper mantle lid that is strong at PS and GIA time scales. Also, inferences of lithospheric strength at LIA time scales may be affected by non-elastic processes in highly flexed crust near faults (especially normal faults in extended terranes; see Hassani and Chéry, 1996), leading to underestimates of true elastic plate thickness. Furthermore, our model does not constrain the actual micromechanical mechanisms responsible for ductile deformation of the lower crust and upper mantle lithosphere. For example, low strain and stress increment PS and GIA transient loading may induce flow via a different micromechanical mechanism than that governing steady-state flow due to large loads (and hence larger strains and stresses) occurring at LIA and longer time scales. On the other hand, this uncertainty does not limit the applicability of our inferred strength distributions at the time scales appropriate to PS, GIA, and LIA processes, and our conclusions do not depend strongly on the ductile flow laws appropriate for lower crust and upper mantle lithosphere.

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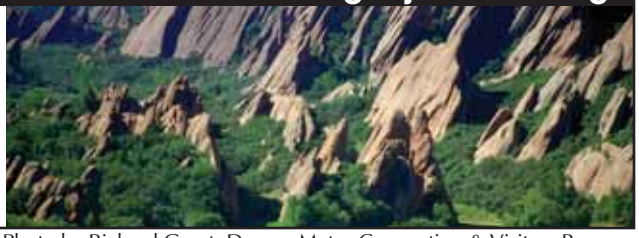


Arrowhead Golf Course southwest of Denver. Photo by Richard Grant. Denver Metro Convention & Visitors Bureau.

2007–2009 GSA Celebrates The International Year of Planet Earth

planetearth®
Earth Sciences for Society

Around the shores of the Indian Ocean, some 230,000 people are dead because the world's governments have not yet grasped the need to use geoscientists' knowledge and understanding of the Earth more effectively.

Yet that knowledge is readily available in the practical experience and publications of some half a million Earth scientists all over the world, a professional community that is ready and willing to contribute to a safer, healthier, and wealthier society if called upon by politicians and decision makers.

The International Year of Planet Earth (2007–2009) aims to contribute to the improvement of everyday life, especially in the less developed countries, by promoting the societal potential of the world's earth scientists. (*Episodes*, IUGS, v. 29, no. 1, p. 62; reprinted with permission)

—IYPE Project Leader and Past IUGS President Eduardo F.J. de Mulder

Eduardo F.J. de Mulder

www.yearofplanetearth.org

The International Year of Planet Earth (IYPE)

THE 2008 JOINT MEETING REFLECTS SCIENTIFIC THEMES OF THE IYPE

- Climate Change through Time: Evidence in the Geologic Record
- The Impending Global Water Crisis: Geology, Soils, Agronomy, and International Security
- Energy Budgets and the Global Market
- Globalization of Biogeochemical Cycles
- Wetland and River Restoration: Environmental Saviors or Scientific Failures?
- Coastal Impacts: Can Massive Environmental Restoration and Coastal Engineering Protect the Gulf Coast from Future Hurricane Impacts and Rising Sea Levels?
- Geobiology and Biomineralization: From the Origins of Life to the Origin of Cities
- Emerging Trace Contaminants in Surface and Groundwater Generated from Waste Water and Solid Waste Application
- Carbon Sequestration: Methods, Markets, and Policy
- Human Influences on the Stratigraphic Record

Support the IYPE Initiative—Come to Houston!
https://www.acsmeetings.org/2008/

IYPE FAQS

Q What is IYPE?

- Initiative of the International Union of Geological Sciences (IUGS) and the United Nations Educational, Scientific, and Cultural Organization (UNESCO).
- Consists of two major programs:
  - Science program—focused on complex interactions within the earth system and its long-term sustainability;
  - Outreach program—includes educational ventures at all levels.

Q Why is it 3 years long?

- The IYPE triennium began in 2007 with a three-continent launch of event planning, and expanded from there;
- The focus is on 2008, but activities will continue into 2009.

Q What are we doing?

- GSA became an IYPE International Partner in 2007. GSA Past President Steve Wells served on the IYPE Board of Directors with a focus on increasing U.S. awareness and involvement in the initiative.
- GSA helped organize a U.S. National Committee for IYPE. Participants are focused on event-planning, fund-raising, and marketing-promotion-outreach.
- Working through the U.S. National Committee, GSA intends to establish a legacy of international cooperation on geoscience issues of global significance.

Background image: Vermillion Cliff, Utah. Wonderglobe. Images produced by Reto Stöckli. Used with permission from NASA.

"The aim of the International Year of Planet Earth is to demonstrate new and exciting ways in which Earth sciences can help future generations meet the challenges involved in ensuring a safer and more prosperous world."

—Earth Sciences for Society, http://www.esfs.org/

Research Themes of IYPE

- **Groundwater**—Toward sustainable use
- **Hazards**—Minimizing risk, maximizing awareness
- **Earth & Health**—Building a safer environment
- **Climate**—The "stone tape"
- **Resources**—Toward sustainable use
- **Megacities**—Going deeper, building safer
- **Deep Earth**—From crust to core
- **Ocean**—Abyss of time
- **Soils**—Earth's living skin
- **Earth & Life**—Origins of diversity

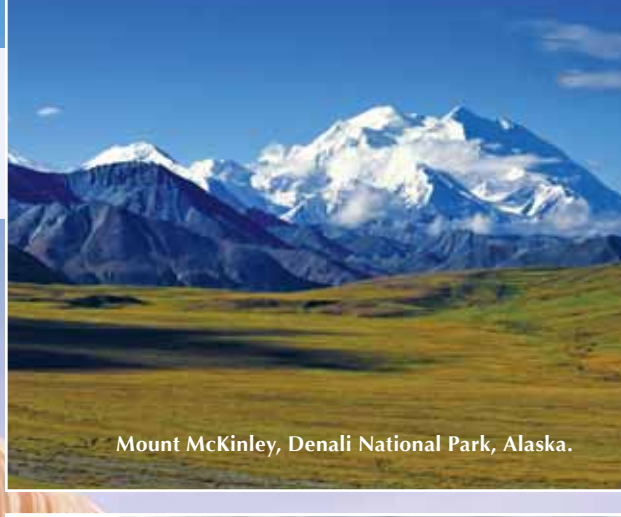
A prospectus on each theme is available at
www.yearofplanetearth.org.

"The initiative will seek to raise the awareness of the contribution to, and role of, the Earth sciences in society in the minds of politicians, decision-makers, the media, and the general public."

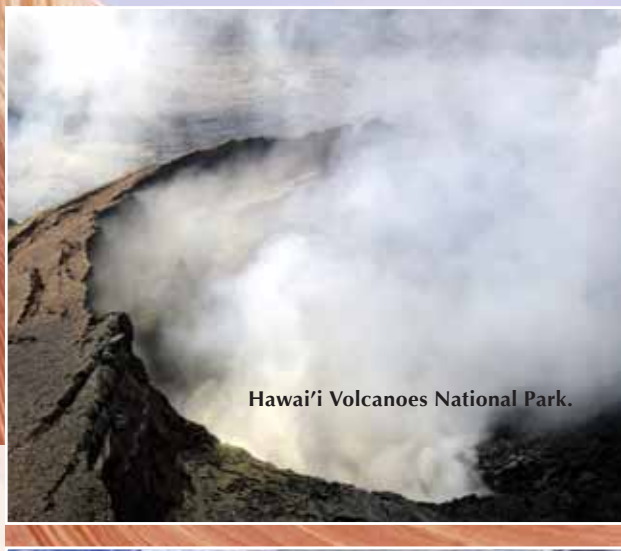
—Earth Sciences for Society, http://www.esfs.org/

Participating Organizations in the U.S. National Committee for IYPE

- American Association of Petroleum Geologists
- American Association of State Geologists
- American Geological Institute
- American Geophysical Union
- American Institute of Professional Geologists
- Association of Environmental and Engineering Geologists
- Geological Society of America
- International Union of Geological Sciences
- National Aeronautics and Space Administration
- National Ground Water Association
- North American Committee for Stratigraphic Nomenclature
- Northeastern Science Foundation
- Society for Sedimentary Geology
- Soil Science Society of America
- United States Geological Survey



Mount McKinley, Denali National Park, Alaska.



Hawai'i Volcanoes National Park.

Horseshoe Canyon of the Colorado River.

Lava flow, Hawaii.

Announcing

HOUSTON 2008 JOINT ANNUAL MEETING

THE GEOLOGICAL SOCIETY OF AMERICA®

AMERICAN SOCIETY OF AGRONOMY
CROP SCIENCE SOCIETY OF AMERICA
SOIL SCIENCE SOCIETY OF AMERICA

Wonderglobe. Images produced by Reto Stöckli. Used with permission from NASA.

Important Dates and Deadlines

20 May	Space Request Deadline
Early June	Registration and Housing Open
3 June	Abstracts Deadline
14 July	Early Bird Registration Deadline
2 September	Standard Registration and Housing Deadlines
8 September	Registration Cancellation Deadline
Mon.–Sat., 29 Sept.–4 Oct.	Pre-Meeting Field Trips
Fri.–Sun., 3–5 Oct.	Pre-Meeting Short Courses & Workshops
Sat., 4 Oct., 7–9 p.m.	GSA Presidential Address & Awards Ceremony
Sun., 5 Oct., 7–9 p.m.	Welcoming Party & Exhibits Opening
Sun.–Tues., 5–7 Oct.	Employment Service Center

5–9 October	Technical Program
Sun.–noon Thurs., 5–9 Oct.	Oral Sessions
Sun.–Wed., 5–8 Oct.	Poster Sessions (full-day sessions; authors present 4–6 p.m.)
Mon., 6 Oct., 7–9:30 p.m.	Group Alumni Reception
Mon., 6 Oct.	Private Alumni Receptions
Wed., 8 Oct.	Closing Reception
Thurs.–Fri., 9–10 Oct.	Post-Meeting Short Courses & Workshops
Thurs.–Sun., 9–12 Oct.	Post-Meeting Field Trips
Exhibit Hall Hours:	Sun., 5 Oct., 7–9 p.m. Mon.–Tues., 6–7 Oct., 9 a.m.–6 p.m. Wed., 8 Oct., 9 a.m.–2 p.m.

GSA ASSOCIATED SOCIETIES

American Association of Stratigraphic Palynologists
American Institute of Professional Geologists
American Quaternary Association
American Rock Mechanics Association
American Society of Limnology and Oceanography
Association for Women Geoscientists
Association of American State Geologists
Association of Earth Science Editors
Association of Environmental and Engineering Geologists
Association of Geoscientists for International Development
The Clay Minerals Society*
Council on Undergraduate Research Geosciences Division
Cushman Foundation
Environmental & Engineering Geophysical Society
Geochemical Society
Geoscience Information Society
Groundwater Resources Association of California
History of Earth Sciences Society
International Association of GeoChemistry
International Association of Hydrogeologists
Karst Waters Institute
The Mineralogical Society
Mineralogical Society of America
National Association of Black Geologists and Geophysicists
National Association of Geoscience Teachers
National Cave and Karst Research Institute*
National Earth Science Teachers Association
National Ground Water Association
Paleontological Research Institution
Paleontological Society
Seismological Society of America
Sigma Gamma Epsilon
Society for Sedimentary Geology
Society of Economic Geologists
Society of Vertebrate Paleontology

GSA welcomes these new Associated Societies!

GSA ALLIED SOCIETIES

American Association of Petroleum Geologists
American Water Resources Association
Asociación Geológica Argentina
Geological Association of Canada
Geological Society of Australia
Geological Society of London
Geological Society of South Africa
National Association of State Boards of Geology
Sociedad Geológica Mexicana A.C.
Soil Science Society of America

Planning a Special Event for the 2008 Joint Annual Meeting?

Reserve your space now!

Space Request Deadline: 20 May 2008

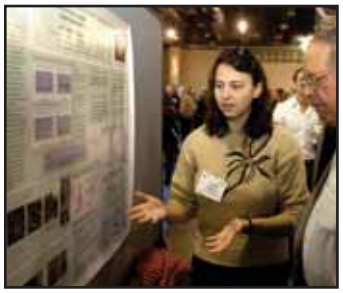
This year's meeting is going to be bigger and better than ever, so make sure your event is included in the program! Start planning today for your business meeting, alumni party, reception, banquet, or social event at the Houston 2008 Joint Annual Meeting. We are now accepting reservations via the online **meeting space request form.** Link directly to the page at **rock.geosociety.org/space_request.**

Information. Inspiration. Experience.

These are things you bring your students as a

GSA Campus Rep!

GSA has a strong network of member-volunteers at colleges and universities around the world—but there are still campuses where students are missing out on learning first-hand from a respected teacher about the advantages of belonging to The Geological Society of America. Volunteer to serve your students and strengthen your Society.



See if your school has a Campus Rep:
Visit www.geosociety.org/members/campus.htm
or contact Christa Stratton, cstratton@geosociety.org

First Announcement

HOUSTON 2008 JOINT ANNUAL MEETING

The Geological Society of America®

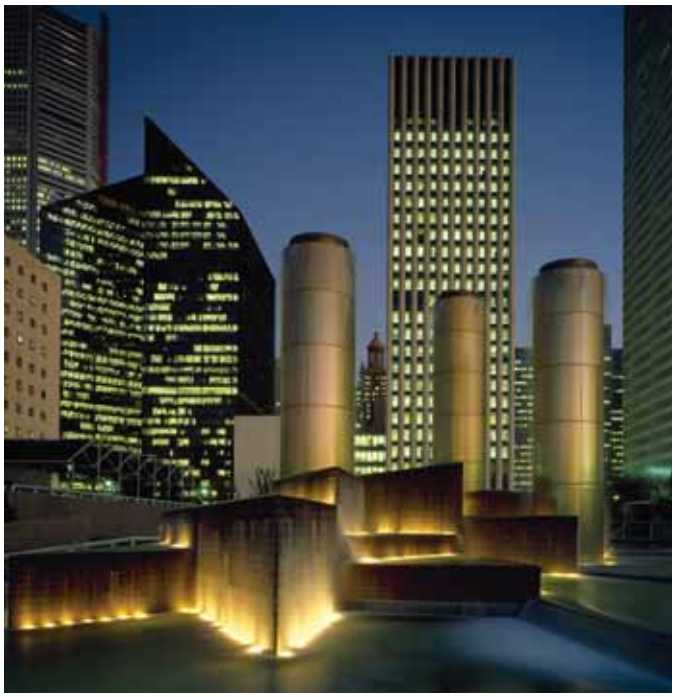
Soil Science Society of America
American Society of Agronomy
Crop Science Society of America

Gulf Coast Association of Geological Societies with the Gulf Coast Section SEPM

Hosted by the Houston Geological Society

Submission deadline: 3 June 2008

http://gsa.confex.com/gsa/2008AM/index.epl



Tranquility Park, Houston.

SESSIONS OF THE GULF COAST ASSOCIATION OF GEOLOGICAL SOCIETIES

GC1. Energy Budgets and the Global Market
Cosponsored by *American Geological Institute*
Peter McCabe (President, AGI), CSIRO; Arthur D. Donovan, Houston, Tex.

Earth scientists must provide critical information for policy-making on future energy use. This session examines the geologic constraints on the world's future energy mix and the consequences for the earth system of alternate energy-mix scenarios.

GC2. Applied Micropaleontology: Tools and Techniques for the 21st Century
Cosponsored by *Cushman Foundation for Foraminiferal Research; Paleontological Society; Gulf Coast Association of Geological Societies; Society for Sedimentary Geology (SEPM); Paleontological Research Institute*
Brian J. O'Neill, Shell International Exploration & Production, New Orleans, La.; Alicia C.M. Kahn, Chevron Corp., Houston, Tex.; Jere H. Lipps, Univ. of California at Berkeley; Andrew Bowman, Chevron Corp., Houston, Tex.

This session capitalizes on the Houston location, creating a forum for dialogue between industry biostratigraphers and their colleagues in universities, government, and resource management, showcasing digital technologies using microfossils to provide the solutions to geologic and environmental problems.

GC3. Shale Gas
Stanley T. Paxton, USGS–Water Science Center, Oklahoma City, Okla.; Mike Miller, BP

This session will focus on gas shale properties, how these properties relate to regional geology (including stratigraphy and depositional environment), and the tools and techniques employed in their evaluation.

GC4. Hydrates and Shallow Gas
Michael A. Smith, The G2 Group, Kenner, La.; Bob Hardage, Bureau of Economic Geology, Univ. of Texas, Austin, Tex.

New shallow subsurface gas plays are emerging in both the shallow and deepwater Gulf of Mexico. This session will address the habitat of shallow gas and hydrate and its significance as a resource and hazard.

GC5. Integrated Pore Pressure Predictions: Case Studies
Marty Albertin, BP; Phil Heppard, ConocoPhillips

Talks in this session will highlight current trends in pore pressure and fracture gradient prediction and detection applied toward improving the design and drilling efficiency of complex wells in difficult geologic environments.

GC6. The Geology of the GOM Coastal Plain: Insights into Offshore GOM Exploration
Ernest A. Mancini, Univ. of Alabama, Tuscaloosa, Ala.; Dave Cooke, Mineral Management Service

This session is designed to present geological data and interpretations regarding Gulf Coastal Plain strata and demonstrate the application of this information in the formulation of petroleum exploration strategies for the Gulf of Mexico (GOM).

GC7. Faults: Friend and Foe
Peter Hennings, ConocoPhillips; Steve Naruk, Shell International E&P, Houston, Tex.

This session addresses characterization and modeling of faults in outcrop and in the subsurface with an emphasis on the identification of geologic parameters that influence hydraulic behavior (whether sealing, permeability-enhancing, or both).

GC8. Allochthonous Salt: Impact from Exploration to Production
Fred Diegel, Shell; Bill Hart, BP

Allochthonous salt canopies can not only obscure high value subsalt hydrocarbon targets, but can also present unique drilling and production challenges. This session focuses on current methods of subsalt exploration, drilling, and facilities planning.

GC9. Visualization of Depositional Systems
Jim Thomson, BP; Kevin Bradford, Shell

This session explores advances in visualization techniques that enable geoscientists to identify, interpret, and investigate models of depositional systems in a broad array of environments, from fluvial to deep marine.

GC10. Predictive Models for Deep-Water Reservoir Distributions: The Subsalt Challenge
Morgan D. Sullivan, Houston, Tex.; Gary, S. Steffens, Shell Int'l Exploration & Production Inc., Houston, Tex.

One of the greatest uncertainties in subsalt exploration is predicting reservoir distribution, continuity and connectivity. This session focuses on predictive deep-water reservoir models and their application to the subsalt challenge.

GC11. Old Fields—New Life: How New Technologies or New Ideas Have Made a Difference
Cosponsored by *GSA Structural Geology and Tectonics Div.; Gulf Coast Association of Geological Societies*
Wayne M. Ahr, Texas A&M Univ., College Station, Tex.; Bill Hill, BP

As much as 65% of oil in existing fields still remains in place. At US$90 per barrel, it is now economical and geopolitically safe to find new ways to release and extract oil from old fields and produce gas from unconventional sources such as shales and coal beds.

GC12. Advances in Seismic Imaging—Impact on Exploration through Production: Case Studies
Jos Terken, Shell; Mark Williams, BP

The session aims to bring together geoscientists working throughout the field lifecycle to showcase the impact enhanced seismic imaging has had on the understanding of field complexities and their impact from exploration through production.

GC13. Depositional Systems: Insights from Outcrops, Shallow Seismic, or Coastal Studies
Antonio B. Rodriguez, Univ. of North Carolina at Chapel Hill, Morehead City, N.C.; Keith Shanley, Shanley Inc.

Constraining the evolution of depositional systems and developing an understanding of their component parts based on process-oriented research is fundamental to sedimentology. We seek contributions that highlight recent advances supported by field-based research.

GC14. Uncertainty Assessment and its Impact on Decision Making
Gary P. Citron, Houston, Tex.; Katrina Withers, ExxonMobil

This session addresses how uncertainty in exploration is characterized for more effective bias removal, communication, and, hopefully, more informed decisions. Accordingly, the session addresses uncertainty from the perspective of the prospect generators, available risk team input, and decision makers.

GC15. Gulf of Mexico Coastal Plain Paleontology
Cosponsored by *Paleontological Society; Gulf Coast Association of Geological Societies*
Louis G. Zachos, Univ. of Texas, Austin, Tex.; Ann Molineux, Univ. of Texas, Austin, Tex.

The session will cover any aspect of paleontology (stressing Cenozoic marine faunas, both vertebrate and invertebrate) of the deposits exposed in the Gulf of Mexico coastal plain, including the region from Yucatán to Florida.

GC16. Environmental Geology and Hydrology
Brian Hunt, Barton Springs/Edwards Aquifer Conservation District, Austin, Tex.; Brian Smith, Barton Springs/Edwards Aquifer Conservation District, Austin, Tex.

This session will cover the hydrogeology of groundwater resources in the circum–Gulf of Mexico region and the application of hydrogeology to the management of those resources.

JOINT SESSIONS

A Celebration of Soil Science, Solute Transport, and National-Scale Water-Quality Research: In Honor of Jacob Rubin
Cosponsored by *GSA Hydrogeology Div.; S01 Soil Physics*
David Stonestrom, USGS, Menlo Park, Calif.; Jean M. Bahr, Univ. of Wisconsin, Madison, Wis.; Jack E. Barbash, USGS, Tacoma, Wash.

Jacob Rubin (1919–2007) made seminal contributions to the science of irrigation, unsaturated flow, reactive transport, and large-scale water-quality assessments. This session focuses on disciplines advanced during his 45-year career. Original research and retrospectives are welcome.

Biofuels Production: Environmental Challenges for Soil and Water
Cosponsored by *GSA Hydrogeology Div.; S06 Soil & Water Management & Conservation; S03 Soil Biology & Biochemistry; S11 Soils & Environmental Quality*
William W. Simpkins, Iowa State Univ., Ames, Iowa; Mahdi Al-Kaisi, Iowa State Univ., Ames, Iowa; Mark D. Tomer, USDA-Agricultural Research Service (ARS), Ames, Iowa

Energy security, rising oil prices, and global warming have pushed biofuels into the spotlight. We seek papers highlighting the environmental challenges and documenting impacts to soil quality and water quantity/quality of the expanding biofuels industry.

Biologically Induced Dissolution and Precipitation of Minerals in Soils and Sediments
Cosponsored by *S09 Soil Mineralogy; GSA Geobiology and Geomicrobiology Div.; The Clay Minerals Society; S03 Soil Biology & Biochemistry; S05 Pedology; S07 Forest, Range & Wildland Soils; S10 Wetland Soils; Gulf Coast Association of Geological Societies*
Debbie Soukup, Bakersfield, Calif.; Amy Brock, Western Illinois Univ., Macomb, Ill.

This session will explore the interactions among plant roots, microbes, and minerals that occur in various pedogenic environments and the influence of organisms on mineral weathering and formation.

Can Wetland Functions be Meaningfully Characterized from Landscape Position, Climatic Settings, and other Proxy Data?
Cosponsored by *GSA Hydrogeology Div.; GSA Geology and Society Div.; S10 Wetland Soils*
Donald I. Siegel, Syracuse Univ., Syracuse, N.Y.

Regulatory agencies routinely classify individual wetlands based on "hydrogeomorphic" map data. From these classifications, decisions are made assuming differences in wetland processes, termed *functions*, including water sources, geochemical processes related to nutrients, sediment retention capability, and ecological community makeup. This session poses the question of whether such approaches are scientifically meaningful.

Characterization and Interpretation of Soils and Geologic Formations with Carbonates, Gypsum, and Other Soluble Salts
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; S05 Pedology; S09 Soil Mineralogy; Mineralogical Society of America*
Wayne Hudnall, Texas Tech Univ., Lubbock, Tex.; Thomas Reinsch

Division S05 Pedology will host a session on gypsum and other soluble salts. The unique properties of gypsum and other salt minerals in soils require a rethinking of how such soils are evaluated, quantified, and managed.

Connecting the Dots: Linking Energy and Mass Balance to Soil Morphologic and Stratigraphic Processes
Cosponsored by *GSA Hydrogeology Div.; GSA Quaternary Geology and Geomorphology Div.; S01 Soil Physics; S05 Pedology*
Eric McDonald, Desert Research Institute, Reno, Nev.; Michael Young, Desert Research Institute, Las Vegas, Nev.

Near-surface movement of energy and mass are significantly connected to pedologic and geomorphic processes, and vice versa. This session seeks to highlight the interactions between soil physics, pedology, Quaternary geology, and near-surface hydrogeology.

Desert Pavements and Vesicular A Horizons (Posters)
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; S05 Pedology*
Robert C. Graham, Univ. of California, Riverside, Calif.; Eric V. McDonald, Desert Research Institute, Reno, Nev.; Leslie D. McFadden, Univ. of New Mexico, Albuquerque, N.Mex.

Desert pavements and vesicular soil horizons are important surficial features in deserts worldwide. Various aspects of these features will be explored in this session, including their formation, distribution, function, quantification, and application to geomorphic research.

Developments in Aeolian Research: Bridging the Interface between Soil, Sediment, and Atmosphere
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; S06 Soil & Water Management & Conservation; International Society of Aeolian Research (ISAR); S05 Pedology*
Thomas E. Gill, Univ. of Texas, El Paso, Tex.; Ted M. Zobeck, USDA-ARS, Lubbock, Tex.

Aeolian research—investigating the detachment, transport, and deposition of sediments and soils by wind—is where soil scientists, geologists, and others meet.

Digital Detection, Interpretation, and Mapping of Soil, Sediments, and Bedrock
Cosponsored by *GSA Geoinformatics Div.; S05 Pedology; S09 Soil Mineralogy*
John M. Galbraith, Virginia Tech, Blacksburg, Va.; Jon Hempel, USDA–Natural Resources Conservation Service (NRCS)–National Geospatial Development Center, Morgantown, W.Va.

GIS spatial analysis, landscape analysis and modeling, remote sensing and mapping of important soil and geologic properties such as metals and minerals, sources of sand and gravel, geothermal sources, and elevation change due to natural adjustments by nature.

Emerging Contaminants in Water, Soils, and Sediments: Sources, Pathways, Interactions, and Ecological Impacts
Cosponsored by *GSA Hydrogeology Div.; National Ground Water Association–Association of Ground Water Scientists and Engineers; A05 Environmental Quality; Gulf Coast Association of Geological Societies*
Brian G. Katz, USGS, Tallahassee, Fla.; Patrick J. Phillips, USGS, Troy, N.Y.

Recent studies have identified the widespread occurrence of emerging contaminants in surface water and groundwater and their effects on aquatic biota. This interdisciplinary session will highlight research on sources, pathways, fate, and transport of emerging contaminants; interactions with soils and sediments; and impacts to ecological systems.

Gains and Losses: Soil Nutrients and Moisture in Aridic Soils Under Changing Climates
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; S06 Soil & Water Management & Conservation; S05 Pedology*
Marith Reheis, USGS, Denver, Colo.; Mark Miller, USGS, Kanab, Utah; Ted M. Zobeck, USDA-ARS, Lubbock, Tex.

Nutrients and moisture in aridic soils are affected by complex interactions among parent material, geomorphic setting, biologic activity, wind erosion and dust inputs, precipitation regime, and land use. All of these, except parent material and geomorphic setting, will be affected by global change.

Hydrogeomorphology and Hydropedology: Emerging Disciplines that Embrace Earth and Soil Sciences
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; S01 Soil Physics; S05 Pedology; S06 Soil & Water Management & Conservation*
Roy C. Sidle, Kyoto Univ., Kyoto, Japan; David R. Montgomery, Univ. of Washington, Seattle, Wash.; Henry Lin, Penn State Univ., University Park, Pa.

The emerging interdisciplinary fields of hydrogeomorphology and hydropedology focus on the interactions and linkages of hydrologic processes with landforms and pedology, respectively. These emerging disciplines call for integrated research and applications.

Hydrological Responses to Changing Climate: Implications for Agriculture and Ecosystems
Cosponsored by *S06 Soil & Water Management & Conservation; S11 Soils & Environmental Quality; GSA Hydrogeology Div.*
Mark D. Tomer, USDA-ARS, Ames, Iowa; William W. Simpkins, Iowa State Univ., Ames, Iowa

Climate warming is having impacts on hydrology, including the dynamics and extent of floods and drought. We seek papers evaluating how hydrologic systems are changing in differing environments, and on implications for agriculture and ecosystems.

Impacts of Energy Development on Water Resources
Cosponsored by *GSA Hydrogeology Div.; A05 Environmental Quality; Gulf Coast Association of Geological Societies*
Richard W. Healy, USGS, Lakewood, Colo.; James K. Otton, USGS, Lakewood, Colo.

We seek papers addressing water quality and quantity issues associated with development of alternative energy sources such as biofuels, oil shale, and coal gasification, and traditional sources such as oil, natural gas, and coal.

Land Subsidence Attributable to Subsurface Fluid Extraction in Coastal Lowlands: Contributions to Relative Sea-Level Rise
Cosponsored by *GSA Hydrogeology Div.; GSA Structural Geology and Tectonics Div.; National Ground Water Association, Association of Ground Water Scientists and Engineers; Harris-Galveston Subsidence District; U.S. Geological Survey Subsidence Interest Group; Gulf Coast Association of Geological Societies*
Devin L. Galloway, USGS, Sacramento, Calif.; Stanley A. Leake, USGS, Tucson, Ariz.; Keith R. Prince, USGS, Menlo Park, Calif.; Thomas J. Burbey, Virginia Polytechnic Institute, Blacksburg, Va.

Anthropogenic aquifer-system compaction and land subsidence caused by subsurface fluid extraction will be explored in terms of spatial and temporal characteristics vis-à-vis eustasy and other isostatic changes contributing to relative sea-level rise.

Land Use and Short-Term Erosion Processes
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; S05 Pedology; S06 Soil & Water Management & Conservation; A02 Military Land Use & Management*
Scientific Category: Environmental Geoscience; Sediments, Clastic
Gerald Matisoff, Case Western Reserve Univ., Cleveland, Ohio; Peter Whiting, Case Western Reserve Univ., Cleveland, Ohio; K.G. Karthikeyan, Univ. of Wisconsin, Madison, Wis.

This session will report research on erosion under different land use practices, on spatial delineation of sediment source areas, and on techniques to effectively implement remedial and protective measures.

Natural Zeolite Utilization in Agriculture, Environmental Science, and Industry: Characterization, Properties, and Applications
Cosponsored by *Mineralogical Society of America; S02 Soil Chemistry; S09 Soil Mineralogy; S11 Soils & Environmental Quality*
Robert S. Bowman, New Mexico Tech, Socorro, N.Mex.; Philip S. Neuhoff, Univ. of Florida, Gainesville, Fla.

The high reactivity and unique crystallography of natural zeolites lead to their use in environmental remediation, industry, and agriculture. This session highlights recent research advances in the characterization of natural zeolites, their properties, and applications.

Organic Contaminants: The Soil and Sediment Reservoir
Cosponsored by *S11 Soils & Environmental Quality; S02 Soil Chemistry; S03 Soil Biology & Biochemistry; GSA Geobiology and Geomicrobiology Div.; GSA Geology and Health Div.*
Joseph J. Pignatello, The Connecticut Agricultural Experiment Station, New Haven, Conn.; Hui Li, Michigan State Univ., East Lansing, Mich.; Thomas Moorman, USDA-ARS National Soil Tilth Laboratory, Ames, Iowa

A broad range of biologically active organic pollutants enter soil via agricultural and urban activities. This session will emphasize the role of soils and sediments as sources, sinks, and catalysts for reactions involving these compounds.

Role of Metals, Minerals, and Microbes in Urban Development and Maintenance
Cosponsored by *S03 Soil Biology & Biochemistry; GSA Engineering Geology Div.*
Stuart Birnbaum, Univ. of Texas, San Antonio, Tex.; Michael A. Wilson, USDA-NRCS, Lincoln, Neb.; Paul Santi, Colorado School of Mines, Golden, Colo.

Scale and Accuracy in Estimating Water Balance
Cosponsored by *GSA Hydrogeology Div.; A03 Agroclimatology & Agronomic Modeling*
Robert Lascano; Steve Evett; Dave Stannard

Agronomists, hydrogeologists, and soil scientists are interested in modeling the water balance at scales ranging from a field to a whole catchment. This session will include discussions of evapotranspiration and water-balance computations of cropped surfaces.

Scaling Methods in Hydrological Research
Cosponsored by *GSA Hydrogeology Div.; S01 Soil Physics*
Jianting Zhu, Desert Research Institute, Las Vegas, Nev.; Michael Young, Desert Research Institute, Las Vegas, Nev.

This session features contributions on theoretical and applied research on upscaling and downscaling of a wide range of hydrogeological and soil processes.

Soil Physics and Vadose Zone Hydrology: Our Future Contributions
Cosponsored by *GSA Hydrogeology Div.; S01 Soil Physics; S05 Pedology*
Scott W. Tyler, Univ. of Nevada, Reno, Nev.; J.M. Hendrix, Univ. of Arkansas, Little Rock, Ark.

In the spirit of the joint GSA-SSSA meeting, we encourage presentations demonstrating emerging advances, challenges, and opportunities for the future in the study of the region between the land surface and the water table.

Soil Respiration: From Human to Geologic Time Scales
Cosponsored by *S03 Soil Biology & Biochemistry; S05 Pedology; S07 Forest, Range & Wildland Soils; S09 Soil Mineralogy; The Clay Minerals Society*
Paul A. Schroeder, Univ. of Georgia, Athens, Ga.; Alan J. Franzluebbers, USDA, Watkinsville, Ga.

Controlling factors on carbon dioxide efflux from the land surface to the atmosphere are explored on diurnal, annual, millennial, and deep time scales. How does soil respiration vary with lithology, climate, time, space, and management?

Soils through Time: Critical Zone Studies of Processes and Their Effects
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; Geochemical Society; S05 Pedology*
Marjorie S. Schulz, USGS, Menlo Park, Calif.; David Stonestrom, USGS, Menlo Park, Calif.; Daniel D. Richter, Duke Univ., Durham, N.C.

This session will focus on processes in the critical zone over time scales that range from millennial to annual. We encourage submission of papers that explore interactions involving rock, soil, water, air, and living organisms.

Subsurface Fate and Transport of Agricultural Contaminants
Cosponsored by *GSA Hydrogeology Div.; GSA Geology and Society Div.; S02 Soil Chemistry; S06 Soil & Water Management & Conservation; S11 Soils & Environmental Quality*
Christopher Green, USGS, Menlo Park, Calif.; Thomas Harter, Univ. of California, Davis, Calif.; Jan Fleckenstein, Univ. of Bayreuth, Bayreuth, Germany

With increasing demands on the world's limited arable lands, managing the quality of their water resources becomes more challenging and important. This session focuses on the subsurface processes that control water quality in agricultural areas.

U.S. Agriculture's Role in Soil Carbon Sequestration and Greenhouse Gas Mitigation (GRACEnet)
Cosponsored by *GSA Geobiology and Geomicrobiology Div.; S03 Soil Biology & Biochemistry; S06 Soil & Water Management & Conservation*
Stuart Birnbaum, Univ. of Texas at San Antonio, San Antonio, Tex.; Ronald F. Follett, USDA-ARS, Fort Collins, Colo.; Ronald F. Turco, Purdue Univ., W. Lafayette, Ind.

There is increasing interest among many groups for using agricultural lands to sequester C and reduce GHG emission. Information is being developed on management practices to enhance soil C sequestration and mitigate GHG emissions.

Urban Geochemistry and Associated Human and Ecological Health Issues
Cosponsored by *S11 Soils & Environmental Quality; S02 Soil Chemistry; GSA Geology and Health Div.*
Nicholas Basta, The Ohio State Univ., Columbus, Ohio; Dibyendu Sarkar, Univ. of Texas, San Antonio, Tex.

Urbanization has taken a toll on ecological and human health. Session topics include geochemical mapping; risk assessment of inorganic and organic soil contaminants; clean-up; and scientific and regulatory challenges regarding urban contamination.

Variably-Saturated Flow in Soil and Rock: What's the Same, What's Different?
Cosponsored by *S01 Soil Physics; S05 Pedology; GSA Hydrogeology Div.*
John Nimmo, Menlo Park, Calif.; Boris A. Faybishenko, Lawrence Berkeley National Laboratory, Berkeley, Calif.; Henry Lin, Penn State Univ., University Park, Pa.

Flow that is sometimes unsaturated occurs in diverse media of the critical zone. This session emphasizes studies that involve both soil and rock or one of these with interpretations relevant to the other.

Pardee Keynote Sessions

INVITED PAPERS

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

These Pardee Keynote Symposia are special events of broad interest to the geoscience community. The sessions are interdisciplinary, representing issues on the leading edge of a scientific discipline or area of public policy and addressing broad, fundamental issues. Selection was on a competitive basis. This year's Pardee Symposia were reviewed and accepted by the Annual Program Committee; ***all speakers are invited.***

P1. Breakthroughs in Paleontology: The Paleontological Society Centennial Symposium

Cosponsored by *Paleontological Society; Cushman Foundation; GSA Geobiology and Geomicrobiology Div.; GSA Geoscience Education Div.; GSA History of Geology Div.; Paleontologic Research Institute*

Scientific Category: Paleontology, Diversity, Extinction, Origination; History of Geology; Paleoclimatology/Paleoceanography

Jere H. Lipps, Univ. of California, Berkeley, Calif.; J. Willian Schopf, Univ. of California, Los Angeles, Calif.

This session celebrates the Paleontological Society's centennial by highlighting the signal advances made in paleontology over the past 100 years. Presentations will fall into three major themes: (1) unveiling the record of life's history; (2) paradigm-changing breakthroughs; and (3) paleontology's contributions to society and the world.

P2. Critical Zone Studies of Soils and Weathering: Implications for Interpreting Climate and Landscapes of the Past

Cosponsored by *GSA Sedimentary Geology Div.; S05 Pedology; GSA Quaternary Geology and Geomorphology Div.; Society for Sedimentary Geology (SEPM)*

Scientific Category: Paleoclimatology/Paleoceanography; Geochemistry; Quaternary Geology

Steven G. Driese, Baylor Univ., Waco, Tex.; Lee C. Nordt, Baylor Univ., Waco, Tex.

This session will focus on uniting the efforts of geoscientists studying ancient soil systems with those engaged in studies of modern surface soils and rock weathering, identifying important controls on rates and processes of weathering and soil formation in modern systems and relating these to interpreting climates and landscapes of the past.

P3. Energy, Water, Soil, and Crops: Status and Challenges for 2050

Cosponsored by *GSA Geology and Society Div.; C03 Crop Ecology, Management & Quality*

Scientific Category: Public Policy; Environmental Geoscience

Vernon B. Cardwell, Univ. of Minnesota, St. Paul, Minn.; John D. Kiefer, Univ. of Kentucky, Lexington, Ky.

This session will explore the geological and agricultural barriers and challenges of achieving sustainable energy, water, and soil uses for the needs of humans and aquatic and terrestrial life by 2050.

P4. Large-Scale Continental Deformation at Plate Boundaries

Cosponsored by *GSA Structural Geology and Tectonics Div.*

Scientific Category: Geophysics/Tectonophysics/Seismology; Tectonics; Structural Geology

Lucy M. Flesch, Purdue Univ., West Lafayette, Ind.; Nathan Niemi, Univ. of Michigan, Ann Arbor, Mich.

This session is dedicated to understanding large-scale continental deformation along the North American plate boundary—both motions and processes. The session will address new results from the Plate Boundary Observatory (PBO), USArray, SAFOD, geologic data, and methods that integrate this data.

P5. Perspectives on an Emerging Workforce Crisis in Geology: Assessing a Looming Irony

Scientific Category: Public Policy; Geoscience Information/Communication; Geoscience Education

John Holbrook, Univ. of Texas, Arlington, Tex.; Kevin Bohacs, ExxonMobil Upstream Research Co., Houston, Tex.

The recent and rapid increase in demand for geologists has yet to foster a comparable surge in enrollment. Industries served by geology are scrambling for available graduates. Academia's response is hampered by competing priorities and limited resources. This session assembles diverse perspectives to assess the existence, intensity, and best response to this perceived "workforce crisis" in geology.

P6. Return to the Moon: A New Era of Lunar Exploration

Cosponsored by *GSA Planetary Geology Div.*

Scientific Category: Planetary Geology; Volcanology; Tectonics

Louise Prockter, Applied Physics Laboratory, Johns Hopkins Univ., Laurel, Md.; Jeffrey Plescia, Applied Physics Laboratory, Johns Hopkins Univ., Laurel, Md.

A new era of lunar exploration has begun, with current or soon-to-launch missions from Japan (Kaguya), China (Chang' E), the U.S. (Lunar Reconnaissance Orbiter), and India (Chandrayaan). This session will focus on recent and anticipated results from these missions.

GSA Topical and Discipline Sessions

HOUSTON 2008 JOINT ANNUAL MEETING

The following approved GSA sessions are topically focused with a mix of invited and volunteered papers. Sessions are designed to promote the exchange of interdisciplinary, state-of-the-art information. Papers can be submitted to a specific topical session, and you may choose up to three scientific categories. **Please submit your abstract at www.geosociety.org in the mode (oral or poster) and categories indicated in the session description.** An abstract submitted in the incorrect mode will be automatically transferred to a discipline session.

Submission deadline: 3 June 2008. Abstract submission fee: US$20 for students; US$35 for all others. If you cannot submit the abstract electronically, please contact Nancy Wright at +1-303-357-1061 or nwright@geosociety.org.

Herrmann Park, Houston. Photo courtesy of Greater Houston Convention and Visitors Bureau; photo by Jay Baker.

GENERAL DISCIPLINE SESSIONS

You may choose up to three discipline categories from the list on the electronic abstracts form (http://gsa.confex.com/gsa/2008AM/index.epl; or see page 53) into which you believe your abstract would fit best. Joint Technical Program Committee representatives will organize the papers into sessions focused on those disciplines.

T1. Response of Coastal Environments to Accelerated Sea Level Rise

Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; GSA Geology and Society Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Environmental Geoscience; Marine/Coastal Science; Quaternary Geology

John B. Anderson, Rice Univ., Houston, Tex.; Antonio B. Rodriguez, Univ. of North Carolina, Morehead City, N.C.

This session will focus on case studies that document past response of coastal environments to sea-level rise and on modeling results aimed at improving our understanding of coastal response to sea-level rise.

T2. Coastal and Aeolian Geomorphology Processes and Landforms

Cosponsored by *GSA Quaternary Geology and Geomorphology Div.*

Scientific Category: Geomorphology; Marine/Coastal Science; Remote Sensing/Geographic Info System

Chris Houser, Texas A&M Univ., College Station, Tex.

This session will showcase current research in coastal and aeolian geomorphology from both natural and modified systems. Research from turbulence to tectonic–global climate scales is welcome, and undergraduate and graduate students are encouraged to submit.

T3. The Coastal Zone—the Air-Land-Sea Interface, Where People Like to Live

Cosponsored by *GSA Engineering Geology Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Engineering Geology; Environmental Geoscience; Marine/Coastal Science

Christopher Mathewson, Texas A&M Univ., College Station, Tex.

The coastal zone is the air-land-sea interface where a significant population lives and works. These people are subjected to both long-term and short-term risks and hazards for which geologic information is critical.

T4. Oceanic Geohazards: Distribution, Controls, and Risks

Cosponsored by *Gulf Coast Association of Geological Societies*

Scientific Category: Environmental Geoscience; Geophysics/Tectonophysics/Seismology; Marine/Coastal Science

Brandon Dugan, Rice Univ., Houston, Tex.; Julia Morgan, Rice Univ., Houston, Tex.

This session will focus on oceanic geohazards and their risks, which could include (a) observations and analyses of deformation and failure; (b) depositional record; (c) experimental or numerical investigations; and (d) risk assessment.

T5. Coastal Tectonics of the Pacific Rim: Geomorphology, Structure, and Hazards

Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; GSA Structural Geology and Tectonics Div.*

Scientific Category: Geomorphology; Tectonics; Geophysics/Tectonophysics/Seismology

Jeff Marshall, Cal Poly Pomona Univ., Pomona, Calif.; Peter Sak, Dickinson College, Carlisle, Pa.

Pacific Rim coastlines are among Earth's most dynamic and hazardous landscapes, shaped by active tectonics, sea-level fluctuation, and rapid erosion/sedimentation. This session explores the geomorphic, structural, and stratigraphic records of Pacific basin coastal tectonics and hazards.

T6. Estuarine and Fjord Sedimentary Processes in Modern and Holocene Systems

Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; Gulf Coast SEPM; Gulf Coast Association of Geological Societies*

Scientific Category: Marine/Coastal Science; Geomorphology; Quaternary Geology

Timothy Dellapenna, Texas A&M Univ., Galveston, Tex.; Julia Wellner, Univ. of Houston, Houston, Tex.

This session will focus on linkages between sedimentary process and stratigraphy within estuarine and fjord systems, with special emphasis on records of processes in modern strata and linkages between sedimentary processes.

T7. The Mississippi River Delta Plain as a Natural Laboratory for Evaluating Forcing Mechanisms and Coastal Response to Rapid Relative Sea-Level Rise, Development of Transgressive Stratigraphic Models, and Innovations in Transgressive Coastal Management

Cosponsored by *U.S. Geological Survey; Louisiana Department of Natural Resources; Pontchartrain Institute for Environmental Sciences; New Orleans Geological Society; GSA Sedimentary Geology Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Marine/Coastal Science; Stratigraphy; Geomorphology

Michael D. Miner, Univ. of New Orleans, New Orleans, La.; James G. Flocks, USGS, Saint Petersburg, Fla.

Rapid sea-level rise in southern Louisiana drives transgressive processes on human timescales. Results from intensive monitoring and scientific studies providing new insight on transgressive drivers, processes, and form as well as science-based management strategies will be featured.

T8. Late Quaternary of the Northern Gulf of Mexico Margin: Climate Change, Sea-Level Change, and the Depositional Record

Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; GSA Sedimentary Geology Div.*

Scientific Category: Quaternary Geology; Sediments, Clastic; Marine/Coastal Science

Mike Blum, Louisiana State Univ., Baton Rouge, La.

This session will focus on advances in our understanding of Gulf of Mexico sediment dispersal systems, from source-to-sink, and will blend research on terrestrial records and records from the shelf and deepwater.

T9. Crises on the Reefs? Anticipating the Effects of Global Warming on Reefs by Reference to the Fossil Record—Is the Past Really the Key to the Present in the New Field of Conservation Paleobiology?

Cosponsored by *Paleontological Society; Society for Sedimentary Geology (SEPM); Paleontologic Research Institute; Cushman Foundation; Gulf Coast Association of Geological Societies*

Scientific Category: Paleontology, Diversity, Extinction, Origination; Sediments, Carbonates; Paleoclimatology/Paleoceanography

Claudia C. Johnson, Indiana Univ., Bloomington, Ind.; Jere Lipps, Univ. of California, Berkeley, Calif.; George Stanley, Univ. of Montana, Missoula, Mont.; Dennis Hubbard, Oberlin College, Oberlin, Ohio

Today coral reefs are in crisis. This session addresses the unique perspectives that both paleobiology and geology provide for understanding reef ecosystem change and for the development of methods and policies to deal with it.

T10. Ancient Polar Ecosystems and Environments: Proxies for Understanding Climate Change and Global Warming

Cosponsored by *Paleontological Society; Gulf Coast Association of Geological Societies*

Scientific Category: Paleontology, Paleoecology/Taphonomy; Stratigraphy; Geochemistry

Anthony Fiorillo, Museum of Nature and Science, Dallas, Tex.; Paul McCarthy, Univ. of Alaska, Fairbanks, Alaska

This session focuses on multidisciplinary studies that encompass multiple proxy indicators of ancient high-latitude ecosystems, particularly in the northern hemisphere. Papers focusing on reconstructing both local and regional ecosystems are particularly encouraged.

T11. Global Warming Science: Implications for Geoscientists, Educators, and Policy Makers

Cosponsored by *GSA Geoscience Education Div.; The American Quaternary Association (AMQUA); GSA Geology and Health Div.; GSA Geology and Society Div.; GSA Quaternary Geology and Geomorphology Div.; National Association of Geoscience Teachers; Gulf Coast Association of Geological Societies*

Scientific Category: Environmental Geoscience; Geoscience Education; Public Policy

George T. Stone, Milwaukee Area Technical College, Milwaukee, Wis.; Andrew M. Buddington, Spokane Community College, Spokane, Wash.

The principal goal of the session is to provide geoscientists and geoscience educators reviews of current hard science on global warming, its current and projected impacts, and policy implications for mitigation and adaptation.

T12. Channel Networks as a Template for Earth and Environmental Processes: Toward an Integrative Process Model for Landscape Evolution

Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; National Center for Earth Dynamics*

Scientific Category: Geomorphology; Sediments, Clastic; Environmental Geoscience

David Mohrig, Univ. of Texas, Austin, Tex.; Frank Pazzaglia, Lehigh Univ., Bethlehem, Pa.

We solicit contributions from scientists studying connections between channel networks and landscape attributes, including erosional, depositional, ecological, and geochemical processes. Studies carried out at all scales ranging from individual catchments to entire networks are appropriate.

T13. Sediment in Fluvial Systems: Production, Transport, and Storage at the Watershed Scale

Cosponsored by *GSA Quaternary Geology and Geomorphology Div.*

Scientific Category: Geomorphology; Engineering Geology; Sediments, Clastic

L. Allan James, Univ. of South Carolina, Columbia, S.C.; Michael Slattery, Texas Christian Univ., Fort Worth, Tex.

Fluvial sedimentary processes and alluvial reconstructions will be addressed at various spatial and temporal scales ranging from short-term transport mechanics, budgets, and fingerprinting, to intermediate-term anthropogenic or climatic changes, to Quaternary stratigraphy.

T14. Wood Debris and the Morphology of Alluvial Landscapes

Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; GSA Engineering Geology Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Geomorphology; Paleontology, Biogeography/Biostratigraphy; Engineering Geology

Tim B. Abbe, ENTRIX Environmental Consultants, Seattle, Wash.; Jeremy Bunn, ENTRIX, Seattle, Wash.; Scott R. Beason, ENTRIX, Seattle, Wash.

This session presents original work regarding the mechanisms and magnitudes to which wood debris can influence alluvial landscapes in the present and geologic record.

T15. Trends in Geomorphology: Advances and Innovations in Measurement and Analysis
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geomorphology; Marine/Coastal Science; Remote Sensing/Geographic Info System
Chris Houser, Texas A&M Univ., College Station, Tex.

Geomorphology has made significant advancements as new and innovative techniques and instruments are developed. Speakers in this session will describe how these new and innovative techniques are used in the study of geomorphic processes and landforms.

T16. River Response to Climate Change
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; GSA Engineering Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Quaternary Geology; Geomorphology; Engineering Geology
Scott R. Beason, ENTRIX Environmental Consultants, Seattle, Wash.; Tim B. Abbe, ENTRIX, Seattle, Wash.; Paul M. Kennard, Mount Rainier National Park, Ashford, Wash.

This session solicits recent empirical and theoretical research conducted in river systems around the world in order to increase the knowledge of the effects of climate change on river morphology and dynamics.

T17. Integration of Soils and Geomorphology in Deserts: A Tribute to the 50 Years of Soil Research of Dan Yaalon
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; S05 Pedology; Gulf Coast Association of Geological Societies*
Scientific Category: Quaternary Geology; Geomorphology; Hydrogeology
Rivka Amit, Geological Survey of Israel, Jerusalem, Israel; Eric McDonald, Desert Research Institute, Reno, Nev.; Yehouda Enzel, Hebrew Univ., Jerusalem, Israel

This session honors Dan Yaalon's contribution to the study of desert soils and geomorphology. Topics may include models of soil and surface processes, dust (source areas to pedogenesis), the effects of cumulative processes (geomorphic, climate), water balance, and landscape stability on pedogenesis, and stratigraphy of desert soils.

T18. Soil Geomorphology and Chronosequences
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; S05 Pedology; Gulf Coast Association of Geological Societies*
Scientific Category: Quaternary Geology; Geomorphology; Environmental Geoscience
Scott F. Burns, Portland State Univ., Portland, Oreg.

Soil geomorphology comprises the distribution of soils across the landscape in space and time, and a soil chronosequence comprises distribution of soils on similar landforms of differing ages.

T19. Loess and Loess Soils
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Quaternary Geology; Geomorphology
Randall Schaetzl, Michigan State Univ., East Lansing, Mich.; Mark Sweeney, Univ. of South Dakota, Vermillion, S.Dak.

This session covers the patterns, processes, rates, and ages associated with the generation and deposition of loess and related eolian sediments, and the soils formed in them, with emphasis on interactions between the eolian and pedologic systems or on soil development in various types of loess deposits.

T20. Assessment of Speleothem Paleoenvironment Proxies Using Studies in Modern Karst Systems
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Quaternary Geology; Paleoclimatology/Paleoceanography; Geochemistry
Jay Banner, Univ. of Texas, Austin, Tex.; Andrew Baker, Univ. of Birmingham, Edgbaston, Birmingham, UK

Growing interest in speleothem paleoenvironmental proxies requires assessment of their utility. This session focuses on the examination of physical, chemical, and organic processes in modern karst systems to provide a principal means for such assessments.

T21. Lakes, Playas, and Soils
Cosponsored by *GSA Limnogeology Div.; GSA Quaternary Geology and Geomorphology Div.; GSA Sedimentary Geology Div.*
Scientific Category: Limnogeology; Sediments, Carbonates; Sediments, Clastic
Elizabeth H. Gierlowski-Kordesch, Ohio Univ., Athens, Ohio

Alluvial plain sediments associated with lakes and playas record geologic information through non-deposition and soil formation. Sedimentation rates, climatic trends, and lake level changes through time can be inferred from soil processes and groundwater levels.

T22. Lacustrine, Palustrine, Wetlands, and Ponds: Important Distinctions, Useful Criteria
Cosponsored by *GSA Limnogeology Div.; GSA Sedimentary Geology Div.; Society for Sedimentary Geology (SEPM); Gulf Coast Association of Geological Societies*
Scientific Category: Limnogeology; Sediments, Carbonates; Sediments, Clastic
Stan Dunagan, The Univ. of Tennessee, Martin, Tenn.; Daniel Deocampo, Georgia State Univ., Atlanta, Ga.

This session will focus on identifying key sedimentologic and/or hydrologic criteria useful in differentiating modern and ancient lacustrine, palustrine, pond, wetland, and/or spring deposits.

T23. Terrestrial Authigenic Minerals: Modern Processes and Ancient Deposits
Cosponsored by *GSA Limnogeology Div.; Sedimentary Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Limnogeology; Geochemistry; Mineralogy/Crystallography
Daniel Deocampo, Georgia State Univ., Atlanta, Ga.; Daniel Larsen, Univ. of Memphis, Memphis, Tenn.

This session highlights (1) the geochemistry and mineralogy of modern terrestrial environments that produce authigenic minerals; (2) occurrences of ancient deposits containing authigenic minerals; and (3) related applications to paleohydrology and paleoenvironmental reconstruction.

T24. Lakes in Extreme Environments: Earth and Beyond
Cosponsored by *GSA Limnogeology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Limnogeology; Geomicrobiology; Geochemistry
David B. Finkelstein, Univ. of Tennessee, Knoxville, Tenn.; Thomas R. Kulp, USGS, Menlo Park, Calif.

This session will explore paleoclimate-, geomicrobiology-, and geochemistry-based studies of lakes in extreme environments as potential extraterrestrial or early-earth analogs. Topics will include geochemical and isotopic signatures of waters, microbes, mineral facies, and redox gradients.

T25. Terrestrial Response to Climate Variability during the Medieval Warm Period: Lakes, Tree Rings, and Human Adaptation
Cosponsored by *GSA Limnogeology Div.; GSA Quaternary Geology and Geomorphology Div.; GSA Archaeological Geology Div.*
Scientific Category: Limnogeology; Quaternary Geology; Archaeological Geology
David M. Miller, USGS, Menlo Park, Calif.; Kenneth D. Adams, Desert Research Institute, Reno, Nev.; Edward R. Cook, Lamont-Doherty Earth Observatory, Palisades, N.Y.

The Medieval Warm Period of ~1000 years ago provides an informative example of geomorphic response to rapid climate changes, as well as human adaptations. We encourage studies on the impacts of rapid climate change.

T26. Lake Cores: Climate Change and Tectonics (Posters)
Cosponsored by *GSA Limnogeology Div.; GSA Structural Geology and Tectonics Div.*
Scientific Category: Limnogeology; Sediments, Carbonates; Sediments, Clastic
Kevin M. Bohacs, ExxonMobil Upstream Research Co., Houston, Tex.; Elizabeth H. Gierlowski-Kordesch, Ohio Univ., Athens, Ohio

Lake sediments contain high-resolution archives of data on climate change as well as hydrologic change induced by tectonics. This session will highlight the newest results from lake core studies.

T27. From Mud to Mudrock: Use of Modern Depositional Settings as Analogs for the Interpretation of Ancient Mudrocks
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Sediments, Clastic; Geochemistry; Paleoclimatology/Paleoceanography
Anna M. Cruse, Oklahoma State Univ., Stillwater, Okla.; Stanley T. Paxton, USGS–Oklahoma Water Science Center, Oklahoma City, Okla.

We encourage talks highlighting the sedimentology, geochemistry, and stratigraphy of modern and/or ancient mud-prone depositional settings. The forum will focus on new models for the occurrence and geochemistry of mud and mudrocks.

T28. Permian and Triassic Terrestrial Biotic Responses to Global Perturbations
Cosponsored by *GSA Sedimentary Geology Div.; The Paleontological Society; Society for Sedimentary Geology (SEPM); Gulf Coast Association of Geological Societies*
Scientific Category: Sediments, Clastic; Geochemistry; Paleontology, Paleoecology/Taphonomy
Robert A. Gastaldo, Colby College, Waterville, Maine; William A. DiMichele, National Museum of Natural History, Washington, D.C.; Isabel P. Montanez, Univ. of California, Davis, Calif.; Neil Tabor, Southern Methodist Univ., Dallas, Tex.

This session will provide comprehensive and interdisciplinary approaches to understanding latest Paleozoic terrestrial response(s) across the unidirectional trend from "icehouse" to "hothouse" through the sedimentological, geochemical, and paleontological records of continental basins.

T29. Recent Advances in Deepwater Sedimentology: Science Driven by the Search for Natural Resources
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Sediments, Clastic; Stratigraphy; Geomorphology
Stephen M. Hubbard, Univ. of Calgary, Calgary, Alberta; David R. Pyles, Colorado School of Mines, Golden, Colo.

Over the past two decades, the search for energy resources in frontier regions has revealed the need for improved knowledge of sediment transport processes in the deep sea. This session will focus on the application of modern, ancient, and flume data toward the development of improved depositional system models.

T30. River-Dominated Continental Margin Processes: Modern and Ancient
Cosponsored by *GSA Sedimentary Geology Div.; Gulf Coast Section SEPM, GSA Quaternary Geology and Geomorphology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Sediments, Clastic; Stratigraphy; Geomorphology
Janok P. Bhattacharya, Univ. of Houston, Houston, Tex.; Liviu Giosan, Woods Hole Oceanographic Institution, Woods Hole, Mass.; Timothy M. Dellapena, Texas A&M Univ., Galveston, Tex.; Meade A. Allison, Univ. of Texas, Austin, Tex.

This session will integrate knowledge from modern oceanographic studies with data from ancient sedimentary systems to examine cross- and along-margin sediment dynamics in regions dominated by sedimentary fluxes from large and small rivers.

T31. The Future of Sedimentary Geology: Student Research (Posters)
Cosponsored by *Society for Sedimentary Geology (SEPM); Gulf Coast Association of Geological Societies*
Scientific Category: Sediments, Carbonates; Stratigraphy; Sediments, Clastic
Daniel Larsen, Univ. of Memphis, Memphis, Tenn.

Our students are the future intellectual engine for the advancement of sedimentary geology, so this session provides a venue for students to present posters on their research in sedimentary geology.

T32. Mixed Siliciclastic-Carbonate Systems: Mixing through Time and Space
Cosponsored by *GSA Sedimentary Geology Div.; Society for Sedimentary Geology (SEPM); Gulf Coast Association of Geological Societies*
Scientific Category: Stratigraphy; Sediments, Carbonates; Sediments, Clastic
Jason M. Francis, Chevron Energy Technology Co., Houston, Tex.; André W. Droxler, Rice Univ., Houston, Tex.

The mixing of siliciclastic and carbonate sediment is an important interaction throughout geologic time. This session will bridge the gap between pure siliciclastic and carbonate systems by addressing mixing on various time and spatial scales.

T33. Mesozoic Sedimentary Basins as Archives of Mexican Magmatic History and Paleogeography
Cosponsored by *GSA Sedimentary Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Stratigraphy
Elena Centeno García, Universidad Nacional Autónoma de México (UNAM), Mexico D.F., México; Timothy F. Lawton, New Mexico State Univ., Las Cruces, N.Mex.; Ira A. Bradford, Core Laboratories, Houston, Tex.

Sedimentary basins can provide tremendous insight into arc history and regional paleogeography. This session will focus on recent studies in Mesozoic sedimentary basins of Mexico, including detrital zircon analysis, sedimentology, and volcanic stratigraphy, that have shed important new light on paleogeographic reconstructions and tectonic evolution of Mexico and the southwesternmost United States.

T34. Paleosol Records as Evidences of Environmental Change in Different Time Scales
Cosponsored by *GSA International Div.; GSA Quaternary Geology and Geomorphology Div.*
Scientific Category: Paleoclimatology/Paleoceanography; Archaeological Geology; Environmental Geoscience
Elizabeth Solleiro-Rebolledo, Universidad Nacional Autónoma de México (UNAM), Mexico D.F, México; Sergey Sedov, UNAM, Mexico D.F., México

Paleosols are an important source of paleogeographical, paleoecological, and pedo-archaeological information, which helps us to understand the evolution of biosphere-geosphere-society interactions in time and the input of paleopedogenic inheritance into the recent pedosphere.

T35. Paleozoic Oceanographic and Climatic Changes: Evidence from Seawater Geochemistry and Sedimentology Records
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Paleoclimatology/Paleoceanography; Geochemistry; Environmental Geoscience
Ganqing Jiang, Univ. of Nevada, Las Vegas, Nev.; Uwe Brand, Brock Univ., St. Catharines, Ontario

The Paleozoic witnessed important glaciations, mass extinctions, and fluctuating carbon dioxide and oxygen levels. High-resolution studies on Paleozoic paleoenvironmental and paleoclimate changes may provide critical information for understanding future climate changes and sustainable earth environments.

T36. The Astronomically Forced Sedimentary Record: From Geologic Time Scales to Lunar-Tidal History
Cosponsored by *GSA Sedimentary Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Paleoclimatology/Paleoceanography; Stratigraphy
Linda A. Hinnov, Johns Hopkins Univ., Baltimore, Md.; James G. Ogg, Purdue Univ., West Lafayette, Ind.

This session will be a unique gathering of earth-time workers, planetary scientists, stratigraphers, sedimentologists and paleoclimatologists to discuss recent advances and emerging themes in cyclostratigraphy, astronomical tuning of geologic time, and research on ancient tides.

T37. The Western Interior Seaway (Posters)
Cosponsored by *Paleontological Society; GSA Sedimentary Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Biogeography/Biostratigraphy; Stratigraphy; Paleoclimatology/Paleoceanography
Dee Ann Cooper, Univ. of Texas at Austin, Lumberton, Tex.; Roger W. Cooper, Lamar Univ., Beaumont, Tex.

This will be a multidisciplinary session devoted to all studies and aspects of the Cretaceous Western Interior Seaway and its global correlatives.

GSA Maps & Charts Series

Quaternary fault and lineament map of Owens Valley, Inyo County, eastern California

D.B. Slemmons, E. Vittori, A.S. Jayko, G.A. Carver, and S.N. Bacon, 2008

This study investigates the active tectonic setting of the Owens Valley graben in the area of the great 1872 earthquake rupture along the Owens Valley fault zone. The area is critical for understanding the tectonics of the southern Walker Lane at the boundary between the Sierra Nevada block and Basin and Range Province. The report compiles known mapped Quaternary faults, provides a context for identifying fault sections, and rationale for delineating major structural blocks in the graben. Many new Late Pleistocene and Holocene faults, particularly west of the 1872 Owens Valley rupture are identified by special low-sun-angle photography. These structures accommodate part of the late Quaternary strain within the eastern California seismic belt.

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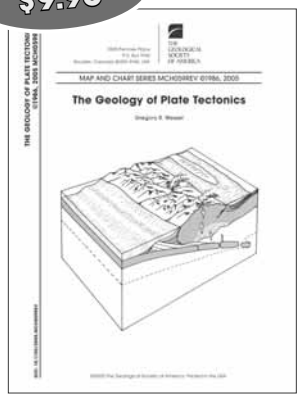

The Geology of Plate Tectonics

by Gregory R. Wessel

This chart belongs in every geology classroom and lab! Printed in full-color, it attempts to organize the types of plate boundaries and displays them in a useful graphic form. The chart describes geologic features with each type. Sheet is 36" × 53" (folded only).

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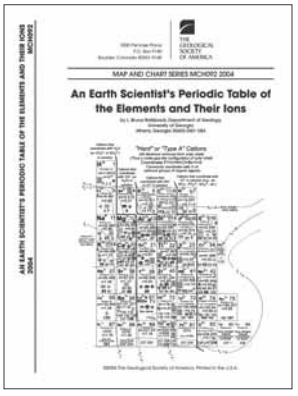

An Earth Scientist's Periodic Table of the Elements and Their Ions

by L. Bruce Railsback

An Earth Scientist's Periodic Table of the Elements and Their Ions is a new periodic table designed to contextualize trends in geochemistry, mineralogy, aqueous chemistry, and other natural sciences. First published as an insert in the September 2003 issue of *Geology*, this version is updated and supersized—36" × 76"!

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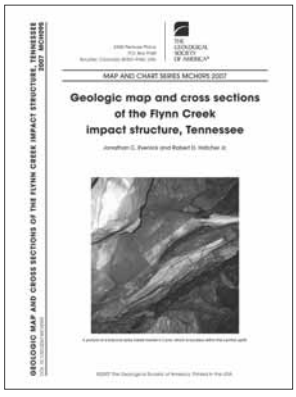

Geologic map and cross sections of the Flynn Creek impact structure, Tennessee

compiled by Jonathan C. Evenick and Robert D. Hatcher Jr., 2007

The Flynn Creek impact structure is located in northeastern central Tennessee, on the northeast flank of the Nashville dome. Remapping the structure has better delimited the depositional history and impact structure evolution. The structure contains many features characteristic of complex impact structures: concentric normal faults, central uplift, shatter cones, impact breccia, and a modern internal drainage system. In addition, it contains some distinctive impact-related compressional structures, such as thrust faults and buckle folds in the modified crater rim.

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T38. Gulf of Mexico Coastal Plain Paleontology
Cosponsored by *Paleontological Society; Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Biogeography/Biostratigraphy; Paleontology, Paleoecology/Taphonomy; Paleontology, Diversity, Extinction, Origination
Louis G. Zachos, Univ. of Texas, Austin, Tex.; Ann Molineux, Univ. of Texas, Austin, Tex.

The session will cover any aspect of paleontology (stressing Cenozoic marine faunas, both vertebrate and invertebrate) of the deposits exposed in the Gulf of Mexico coastal plain, including the region from Yucatán to Florida.

T40. After the Last Ammonite and before the First Horse: Patterns of Ecological and Climatic Change during the Paleocene
Cosponsored by *Paleontological Society; Denver Museum of Nature & Science*
Scientific Category: Paleontology, Diversity, Extinction, Origination; Paleoclimatology/Paleoceanography; Paleontology, Biogeography/Biostratigraphy
Kirk R. Johnson, Denver Museum of Nature & Science, Denver, Colo.; Ian Miller, Denver Museum of Nature & Science, Denver, Colo.

This session focuses on Paleocene climate and biota, emphasizing integration of terrestrial and marine records, utilizing recent advances in geochronology, with the goal of synthesizing disparate datasets to understand patterns of ecological and climatic change.

T41. Recoveries from Mass Extinction: Patterns, Processes, and Comparisons
Cosponsored by *Paleontological Society; Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Diversity, Extinction, Origination; Paleontology, Phylogenetic/Morphological Patterns; Paleoclimatology/Paleoceanography
Peter J. Harries, Univ. of South Florida, Tampa, Fla.; Richard J. Twitchett, Univ. of Plymouth, Plymouth, UK

This session will focus on biotic recovery from mass extinctions that punctuate the Phanerozoic history of life. The emphasis will be on detailing and comparing the biotic responses to different events against the backdrop of environment change that characterizes these important intervals.

T42. Breaking the Curve: Historical Development, Current State, and Future Prospects for Understanding Local and Regional Processes Governing Global Diversity
Cosponsored by *Paleontological Society; Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Diversity, Extinction, Origination; Paleontology, Biogeography/Biostratigraphy; Paleontology, Paleoecology/Taphonomy
Leigh M. Fall, Texas A&M Univ., College Station, Tex.; Jocelyn Sessa, Penn State Univ., University Park, Pa.; Austin J.W. Hendy, Yale Univ., New Haven, Conn.; Thomas D. Olszewski, Texas A&M Univ., College Station, Tex.

This session will provide an overview of progress on the analysis of global diversity with a specific emphasis on how regional- and community-scale processes governing the structure of communities can influence diversity patterns in the fossil record.

T43. Field and Quantitative Paleontology, Micropaleontology, and Taxonomy: A Memorial to Roger L. Kaesler
Cosponsored by *Paleontological Society; Society for Sedimentary Geology (SEPM); Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Diversity, Extinction, Origination; Paleontology, Phylogenetic/Morphological Patterns; Paleontology, Paleoecology/Taphonomy
Julie B. Retrum, Univ. of Kansas, Lawrence, Kans.; Stephen T. Hasiotis, Univ. of Kansas, Lawrence, Kans.

This session in memory of Roger L. Kaesler encourages papers in all aspects of micropaleontology, invertebrate quantitative paleontology, and taxonomy as inspired by Kaesler's innovations in these fields and the *Treatise of Invertebrate Paleontology*.

T44. Deep Time Earth Life Observatories (DETELOs): Focusing on Critical Transitions in the History of Life
Cosponsored by *Paleontological Society; Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Diversity, Extinction, Origination; Paleontology, Biogeography/Biostratigraphy; Paleoclimatology/Paleoceanography
David J. Bottjer, Univ. of Southern California, Los Angeles, Calif.; Lisa E. Park, Univ. of Akron, Akron, Ohio

DETELOs will facilitate major advances in understanding critical transitions in the history of life through integration of paleontological, geochemical, biological, stratigraphic, and other information into a comprehensive temporal and spatial framework.

T45. Living Soil in Deep Time
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Diversity, Extinction, Origination; Precambrian Geology; Quaternary Geology
Gregory J. Retallack, Univ. of Oregon, Eugene, Oreg.; Nathan D. Sheldon, Royal Holloway Univ. of London, Egham, Surrey, UK

Life in soils was active well back into the Precambrian. Throughout Earth's history, life on land played an important role in global change, such as atmospheric oxidation and onset of ice ages.

T46. Leaving Traces—Making Marks: In Honor of H. Allen Curran
Cosponsored by *Paleontological Society; Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Paleoecology/Taphonomy; Sediments, Clastic; Sediments, Carbonates
Neil Tibert, Univ. of Mary Washington, Fredericksburg, Va.; Bosiljka Glumac, Smith College, Northampton, Mass.

Like the way organisms leave lasting traces in the geological record, Al Curran has inspired generations of students and colleagues who will gather to celebrate his accomplishments as a paleontologist, sedimentary geologist, and geoscience educator.

T47. Sclerochronological Archives from Rivers to the Sea: Documentation, Interpretation, and Utility
Cosponsored by *Paleontological Society*
Scientific Category: Paleontology, Paleoecology/Taphonomy; Geochemistry; Paleoclimatology/Paleoceanography
David H. Goodwin, Denison Univ., Granville, Ohio; David P. Gillikin, Vassar College, Poughkeepsie, N.Y.; David H. Kesler, Rhodes College, Memphis, Tenn.

This session highlights new sclerochronological research from freshwater and estuarine systems by focusing on elemental, isotopic, and structural data preserved in calcareous skeletons.

T48. Exploring the Role of Endobenthic Organisms in Enhancing Porosity and Permeability of Sedimentary Aquifers and Reservoirs
Cosponsored by *Paleontological Society; National Ground Water Association; GSA Sedimentary Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Paleoecology/Taphonomy; Hydrogeology; Sediments, Carbonates
Kevin J. Cunningham, USGS, Ft. Lauderdale, Fla.; H. Allen Curran, Smith College, Northampton, Mass.

Endobenthic organisms and bioturbation within sedimentary substrates will be explored for insights into biogenically enhanced porosity/permeability and new methods for measuring and evaluating its physical characteristics, with emphasis on groundwater aquifers and petroleum reservoirs.

T49. What Good Are (Fossil) Plants Anyway? New Methods for Investigating Old Problems
Cosponsored by *Paleontological Society; Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Paleoecology/Taphonomy; Paleoclimatology/Paleoceanography; Geochemistry
Caroline A.E. Stromberg, Univ. of Washington, Seattle, Wash.; Matthew J. Kohn, Boise State Univ., Boise, Idaho

This session will discuss new developments in using fossil plants and their proxies for interpreting paleoecologies, paleoclimates, and landscape evolution. Contributions are encouraged that use tissue morphology, fossil assemblages (micro- and megafossils), paleopedology, and/or geochemistry.

T50. Quantifying the Early Evolution of Life: Numerical Approaches to the Evaluation of Precambrian-Cambrian Animals and Ecosystems
Cosponsored by *Paleontological Society; Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Paleoecology/Taphonomy; Paleontology, Diversity, Extinction, Origination; Paleontology, Phylogenetic/Morphological Patterns
Marc Laflamme, Queen's Univ., Kingston, Ontario; Stephen Q. Dornbos, Univ. of Wisconsin, Milwaukee, Wis.

This session will focus on a broad spectrum of numerical studies on the early animal fossil record, in addition to displaying how modern biological and ecological techniques are increasingly used in the study of early life.

T51. Neontological Solutions to Paleontological Problems: Actualistic Studies of the Morphology, Behavior, and Ecology of Modern Analogs for Ancient Organisms
Cosponsored by *Paleontological Society; Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Paleoecology/Taphonomy; Paleontology, Phylogenetic/Morphological Patterns
Daniel I. Hembree, Ohio Univ., Athens, Ohio; Brian F. Platt, Univ. of Kansas, Lawrence, Kans.; Jon J. Smith, Kansas Geological Survey, Lawrence, Kans.

This session will cover a broad range of experimental research involving modern organisms and their application to paleontologic problems. Topics include organism-substrate interactions, microbial activity, taphonomy, morphology, organism behavior, functional morphology, biomechanics, and kinematics.

T52. Paleontological and Sedimentological Consequences of Calcite and Aragonite Sea Dynamics
Cosponsored by *Paleontological Society; Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Paleoecology/Taphonomy; Sediments, Carbonates; Geochemistry
Paul D. Taylor, Natural History Museum, London, UK; Mark A. Wilson, College of Wooster, Wooster, Ohio; Noel P. James, Queen's Univ., Kingston, Ontario

This session will investigate how secular alternations between times of calcite and aragonite seas impacted the evolution of biomineralized skeletons, fossil taphonomy, and carbonate facies through geologic time.

T53. The Sedimentation of Organic Particles: Practical Applications
Cosponsored by *GSA Sedimentary Geology Div.; American Association of Stratigraphic Palynologists Inc. (AASP); Society for Sedimentary Geology (SEPM); GSA Coal Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Paleoecology/Taphonomy; Sediments, Clastic; Coal Geology
Francine McCarthy, Brock Univ., St. Catharines, Ontario; Thomas D. Demchuk, ConocoPhillips, Houston, Tex.

Papers are solicited on any aspect of the study of organic particles leading to a qualitative or quantitative understanding of the behavior of organic particles in various depositional environments and their application to geologic studies.

T54. Integrative Systematic Paleontology for a New Century: Advancing Evolutionary, Phylogenetic, Biogeographic, and Ecologic Theory with Specimen-Based Studies
Cosponsored by *Paleontological Society*
Scientific Category: Paleontology, Phylogenetic/Morphological Patterns; Paleontology, Diversity, Extinction, Origination; Paleontology, Biogeography/Biostratigraphy
Alycia L. Stigall, Ohio Univ., Athens, Ohio; Jonathan Hendricks, Univ. of Kansas, Lawrence, Kans.

This session emphasizes the continued importance of systematic research that integrates primary data derived from fossil specimens (including their geological context) for the purpose of reconstructing phylogenetic, paleobiogeographic, and/or paleoecological patterns and events within and among clades.

T55. Phylogenetic Perspectives on Assembling the Tree of Life in Deep Time
Cosponsored by *Paleontological Society; Gulf Coast Association of Geological Societies*
Scientific Category: Paleontology, Phylogenetic/Morphological Patterns; Paleontology, Diversity, Extinction, Origination; Paleontology, Paleoecology/Taphonomy
Colin D. Sumrall, Univ. of Tennessee, Knoxville, Tenn.; Christopher Brochu; Talia Karim, Univ. of Iowa, Iowa City, Iowa

This session will explore paleontological perspectives of understanding organic evolution using phylogenetic approaches. Topics include addressing paleobiological questions with phylogenetic information, phylogeny reconstruction from multiple datasets, and synthesizing paleontological and molecular divergence time.

T56. Spatial and Temporal Evolution of Transform Faults
Cosponsored by *GSA Structural Geology and Tectonics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geophysics/Tectonophysics/Seismology; Structural Geology; Geomorphology
Alexander Robinson, Univ. of Houston, Houston, Tex.; Michael Murphy, Houston, Tex.; Gary Axen, New Mexico Tech, Socorro, N.Mex.; John Dewey, Univ. of Houston, Houston, Tex.

Transform faults worldwide show variations in distribution of strain and their evolution. This session brings together observational and theoretical perspectives on issues concerning strain pattern, style, and evolution as recorded by geologic, geomorphic, and geophysical investigations.

T57. Evolution of the Lithosphere and Upper Mantle in the Western U.S.
Cosponsored by *GSA Geophysics Div.*
Scientific Category: Geophysics/Tectonophysics/Seismology; Tectonics; Geochemistry
Alan Levander, Rice Univ., Houston, Tex.; Cin-Ty Lee, Rice Univ., Houston, Tex.; Adrian Lenardic, Rice Univ., Houston, Tex.; Fenglin Niu, Rice Univ., Houston, Tex.

This session will be an interdisciplinary examination of what we are learning about the evolution of the different provinces in the western United States from geochemical, seismological, geological, geodetic, and geodynamic perspectives.

T58. Geophysics in the Shallow Subsurface: Contributions to Studies in Agriculture, Water Resources, Geotechnical Engineering, and Surficial Geology
Cosponsored by *GSA Geophysics Div.; Environmental and Engineering Geophysical Society*
Scientific Category: Geophysics/Tectonophysics/Seismology; Environmental Geoscience; Hydrogeology
Bruce D. Smith, USGS, Lakewood, Colo.; Jeffrey G. Paine, Jackson School of Geosciences–Univ. of Texas, Austin, Tex.; John R. Jansen, Aquifer Science and Technology, Waukesha, Wis.

This intersocietal session gathers researchers who have applied or developed geophysical methods that focus on near-surface issues in hydrogeology, soil science, agriculture, resource management, geotechnical engineering, and surficial geology.

T59. EarthScope: Bringing Geology and Geophysics Together to Study the 4-D Evolution of the Lithosphere
Cosponsored by *GSA Geophysics Div.; GSA Structure and Tectonics Div.; GSA Geoinformatics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geophysics/Tectonophysics/Seismology; Geoinformatics; Tectonics
Anne Trehu, Oregon State Univ., Corvallis, Oreg.; G. Randy Keller, Univ. of Oklahoma, Norman, Okla.; Ben van der Pluijm, Univ. of Michigan, Ann Arbor, Mich.

A major goal of EarthScope is the construction of 4-D models of the structure and evolution of Earth's crust and lithospheric mantle beneath

North America. This session will catalyze integrated studies and provide a forum for recent results.

T60. Combining Geophysics and Geology: The George P. Woollard Award Session
Cosponsored by *GSA Geophysics Div.*
Scientific Category: Geophysics/Tectonophysics/Seismology
Catherine M. Snelson, New Mexico Institute of Mining and Technology, Socorro, N.Mex.; Kevin Mickus, Missouri State Univ., Springfield, Mo.

This session honors the recipient of the Woollard award for outstanding contributions in geophysics to geology. The recipient will give the keynote talk to a session focused on combining geophysics and geology to solve geologic problems.

T61. Aspects of the Tectonic Setting and Structural History of Shale Basins that Lead to Unconventional Reservoir Rock
Cosponsored by *GSA Structural Geology and Tectonics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Structural Geology; Tectonics; Sediments, Clastic
Julia F. W. Gale, Univ. of Texas, Austin, Tex.; Terry Engelder, Penn State Univ., University Park, Pa.

This session will explore the differences in tectonic setting of shale basins and will investigate how it is manifest in burial history and structures that allow for the development of unconventional reservoirs in shale.

T62. Recent Advances in the Study of the Laramide Orogeny and Related Processes in Mexico and the Southern United States
Cosponsored by *GSA Structural Geology and Tectonics Div.; GSA Geophysics Div.*
Scientific Category: Structural Geology; Tectonics; Petrology, Metamorphic
Mariano Cerca, Universidad Nacional Autónoma de México (UNAM), Queretaro, México; Martin Valencia, UNAM–ERNO, Hermosillo, Sonora, México; Gabriel Chávez-Cabello, Universidad Autónoma de Nuevo León, San Nicolás de Los Garza, México

Laramide orogeny: Understanding Late Cretaceous–Early Cenozoic contractional deformation, magmatism, metamorphism, and metallogenesis in Mexico and neighboring areas.

T63. Foreland Basins: Their Tectonic Setting, Structural Geology, Sedimentology, and Economic Significance
Cosponsored by *GSA Structural Geology and Tectonics Div.*
Scientific Category: Structural Geology; Tectonics; Stratigraphy
Ibrahim Çemen, Oklahoma State Univ., Stillwater, Okla.; James Puckette, Oklahoma State Univ., Stillwater, Okla.; Darwin Boardman, Oklahoma State Univ., Stillwater, Okla.

Many research groups have been studying foreland basins in different parts of the world. This session will bring these groups together and provide a formal discussion on important issues related to foreland basins.

T64. Lithospheric Structure and Geologic Evolution of the Gulf of Mexico Passive Margin
Cosponsored by *GSA Geophysics Div.; GSA South-Central Section; GSA Structural Geology and Tectonics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Tectonics; Geophysics/Tectonophysics/Seismology; Petrology, Igneous
Elizabeth Y. Anthony, Univ. of Texas, El Paso, Tex.; Stephen S. Gao, Univ. of Missouri, Rolla, Mo.; Robert J. Stern, Univ. of Texas at Dallas, Richardson, Tex.

Geology and geophysics of the Gulf of Mexico and surrounding region: Nature of crust and upper mantle; Triassic and Jurassic rifting and spreading; modification of continental lithosphere and formation of oceanic lithosphere during rifting; rift flank uplift, subsidence, and sedimentary responses.

T65. Late Jurassic to Recent Geodynamic Evolution of the Caribbean Region
Cosponsored by *GSA Geophysics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Tectonics; Geophysics/Tectonophysics/Seismology; Stratigraphy
Sandra J. Wyld, Univ. of Georgia, Athens, Ga.; James E. Wright, Univ. of Georgia, Athens, Ga.

The geodynamic evolution of the Caribbean region, from its origins in the breakup of Pangea to its complex current tectonics, continues to be a topic of widespread and active research, multidisciplinary interest, and ongoing controversy. Houston provides an ideal venue for bringing together the diverse group of earth scientists working on this region. We solicit presentations on all aspects of the geodynamic and tectonic evolution of the Caribbean plate, its fringing arc systems, and adjacent provinces.

T66. Caribbean–North America Plate Boundary Region: Arc Evolution, Timing of Collisions and Exhumation, Strike-Slip Tectonics and Paleogeography
Cosponsored by *GSA Structural Geology and Tectonics Div.; GSA International Div.*
Scientific Category: Tectonics; Geophysics/Tectonophysics/Seismology; Stratigraphy
Uwe Martens, Stanford Univ., Stanford, Calif.; Roberto Molina-Garza, Universidad Nacional Autónoma de México (UNAM), Querétaro, México; Luigi Solari, UNAM, Mexico D.F., México

This session is devoted to understanding ancient and current plate interactions leading to subduction and arc development, collisions and sutures, sea-floor spreading, strike-slip tectonics, and paleogeography in the region where the North America and Caribbean plates have interacted in the past. We encourage contributions establishing correlations of the plate boundary region with circum-Caribbean areas, such as southern Mexico and northern South America.

T67. Geologic Maps, Digital Geologic Maps, and Derivatives from Geologic Maps (Posters)
Cosponsored by *GSA Structural Geology and Tectonics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Structural Geology; Geoscience Education; Tectonics
Ralph F. Crawford, The Geologic Mapping Institute, Atlanta, Ga.; Michael W. Higgins, The Geologic Mapping Institute, Clayton, Ga.

Geologic maps are the fundamental tool of the science of geology. Most geologic research is ultimately based on the geologic map. This poster session will stimulate scientific discussion.

T68. Brittle Deformation and Diagenesis as Coupled Processes
Cosponsored by *GSA Structural Geology and Tectonics Div.; GSA Geophysics Div.; GSA Sedimentary Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Structural Geology; Sediments, Clastic; Geoscience Education
Stephen Laubach, Univ. of Texas, Austin, Tex.; Peter Eichhubl, Univ. of Texas, Austin, Tex.

Brittle deformation, chemical change, and mass transport are coupled processes in the upper crust. Abstracts are solicited that approach these topics using a combined structural-diagenetic approach, including field and microscale observations and physical and numerical modeling.

T69. Constraints on Fault Evolution from Geologic, Geomorphic, and Geophysical Records
Cosponsored by *GSA Structural Geology and Tectonics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Structural Geology; Geophysics/Tectonophysics/Seismology; Geomorphology
Andrew Meigs, Oregon State Univ., Corvallis, Oreg.; Alex Densmore, Durham Univ., Durham, UK; Kenneth Fowler, ExxonMobil Corp., Houston, Tex.

Fault evolution impacts seismic hazard assessment, natural resource development, and crustal evolution. Investigators working with new subsurface, surface, geophysical, and modeling approaches are encouraged to contribute their perspective on fault growth.

T70. Structural Modeling—Impacts on Hydrocarbon Recovery and Uncertainty Analysis
Cosponsored by *GSA Structural Geology and Tectonics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Structural Geology; Tectonics; Economic Geology
Clare E. Bond, Midland Valley Exploration, Glasgow, UK; Alan D. Gibbs, Midland Valley Exploration, Glasgow, UK; Zoe K. Shipton, Univ. of Glasgow, Glasgow, UK

Structural framework models created from equivocal geological data have a high risk for hydrocarbon exploration. This session explores techniques for structural analysis and modeling to create viable structural models and assess hydrocarbon play potential.

T71. Extensional Tectonics in the Central Basin and Range Province: Interplay between Science and Society in Assessments of Strain Rates, Seismic Hazards, Groundwater Reserves, and Mineral Resources
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Structural Geology; Tectonics; Geophysics/Tectonophysics/Seismology
James A. Carpenter, R Lacy Inc., Longview, Tex.; Christopher David Walker, Columbia Univ., Houston, Tex.

Integration of cross-disciplinary research in the central Basin and Range Province with an emphasis on the interface between extensional tectonics, geological hazards, resource distribution, and population growth in the Las Vegas–St. George urban corridor.

T72. Scaling, Spatial Arrangement, and Fractals in Structural Geology
Cosponsored by *GSA Structural Geology and Tectonics Div.*
Scientific Category: Structural Geology; Economic Geology; Tectonics
Orlando J. Ortega, Shell Int'l, Houston, Tex.

Size scaling and patterns of spatial arrangement are of fundamental concern to structural geology. Abstracts are solicited that approach these topics using combined process and statistical approach and physical and numerical modeling.

T73. Advances in Discontinuum Numerical Modeling in the Study of Earth Structure and Deformation
Cosponsored by *GSA Structural Geology and Tectonics Div.*
Scientific Category: Structural Geology; Geophysics/Tectonophysics/Seismology; Volcanology
Julia K. Morgan, Rice Univ., Houston, Tex.; Patrick J. McGovern, Lunar and Planetary Institute, Houston, Tex.; David Sparks, Texas A&M Univ., College Station, Tex.

Discontinuum numerical methods (e.g., DEM, SPH, LSM) are used increasingly to obtain unique perspectives of earth structure and deformation. This session will showcase the broad range of applications of these methods and the insights gained from them.

T74. Mathematical Models of Folding: Recent Advances, Applications, and Future Directions
Cosponsored by *GSA Structural Geology and Tectonics Div.; GSA Geophysics Div.*
Scientific Category: Structural Geology; Tectonics; Geophysics/Tectonophysics/Seismology
Stuart Hardy, ICREA–Univ. de Barcelona, Barcelona, Spain; Chris A. Guzofski, Houston, Tex.; David D. Pollard, Stanford Univ., Stanford, Calif.; John H. Shaw, Harvard Univ., Cambridge, Mass.

This session aims to attract contributions from research in the field of mathematical modeling of folding, including kinematic- and mechanics-based forward and restorative modeling approaches. A particular focus will be placed on novel modeling techniques and the application of fold models to case (seismic, field, and analogue) studies.

T75. Modes of Lithospheric Extension: Oceanic and Continental Core Complexes
Cosponsored by *GSA Structural Geology and Tectonics Div.; GSA Geophysics Div.; GSA International Div.*
Scientific Category: Structural Geology; Tectonics; Geophysics/Tectonophysics/Seismology
Yildirim Dilek, Miami Univ., Oxford, Ohio; Elena A. Miranda, California State Univ., Northridge, Calif.

Core complexes are characterized by domal bathymetric/topographic highs composed of lower crustal and upper mantle rocks and represent highly extended terranes in oceanic spreading environments, subduction zones, continental rifts, and continental collision zones. This session will provide a venue for discussions on comparative structural, thermochronologic, petrologic, geochemical, and geophysical studies of lithospheric extension in continental and oceanic core complexes.

T76. Gondwana-Laurentia Terrane Transfers During the Pangean and Rodinian Supercontinent Cycles
Cosponsored by *GSA Geophysics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Tectonics; Geochemistry; Precambrian Geology
Paul A. Mueller, Univ. of Florida, Gainesville, Fla.; David A. Foster, Univ. of Florida, Gainesville, Fla.; William A. Thomas, Univ. of Kentucky, Lexington, Ky.

This session will explore the origins of terranes with Laurentian and Gondwanan affinities within the greater Grenvillian, Appalachian, and other circum-Atlantic systems associated with the Rodinian Pangean supercontinent cycles.

Houston 2008 Guest Program

Guest Hospitality Suite Hours

Sun.–Wed., 5–8 Oct., 8 a.m.–5:30 p.m., Thurs., 9 Oct., 8 a.m.–noon

Spouses, family members, and friends of meeting attendees:
Make plans to participate on 5–9 October, and get ready to have fun in Houston!

We encourage you to accept this invitation to register for our Guest Program at the 2008 Joint Annual Meeting.

The guest or spouse registration fee of only US$80 per person (US$90 after 14 July and US$95 after 2 Sept.) applies to nongeologist spouses, family members, and friends of professional and/or student registrants at the 2008 Joint Annual Meeting. The guest registration fee is required for entrance to the Exhibit Hall and covers guest activities and seminars (to be listed in the June *GSA Today*), as well as refreshments in the Guest Hospitality Suite. The guest registration fee will NOT provide access to all technical sessions; however, guests can get a visitor's badge, allowing them to attend a specific presentation. Registration for the Guest Program begins in June.

Formal tours (also to be listed in the June *GSA Today*) will be offered at an additional cost. Fees for the formal tours cover the cost of professional tour guides, round-trip transportation, admission fees, and gratuities. Reservations for all tours will be accepted on a first-come, first-served basis, and because the tour operator requires a final guarantee weeks in advance, most tours have attendance minimums and maximums. Please be prepared to sign up early to guarantee your spot. Tours may be canceled if minimum attendance is not met.

Questions? Please contact Becky Sundeen, bsundeen@geosociety.org.

T77. Recent Advances in the Understanding of Adirondack and Southern Grenville Province Tectonics: In Honor of James McLelland
Cosponsored by *GSA Structural Geology and Tectonics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Tectonics; Petrology, Metamorphic; Structural Geology
Graham B. Baird, Univ. of Northern Colorado, Greeley, Colo.; Catherine Shrady, St. Lawrence Univ., Canton, N.Y.; Bruce Selleck, Colgate Univ., Hamilton, N.Y.

This session is in honor of James McLelland and his career-long contributions to Adirondack geology. It will focus on recent work in the Adirondacks and Southern Grenville Province, with particular emphasis on current tectonic models.

T78. From the Forearc to the Foreland: Contrasting Tectonics, Paleogeography, and Paleoenvironments of the North American Cretaceous
Cosponsored by *GSA Geophysics Div.; GSA Structural Geology and Tectonics Div.; GSA Sedimentary Geology Div.; Society for Sedimentary Geology (SEPM); Gulf Coast Association of Geological Societies*
Scientific Category: Tectonics; Sediments, Clastic; Stratigraphy
Claudia Schroder-Adams, Carleton Univ., Ottawa, Ontario; James Haggart, Geological Survey of Canada, Vancouver, British Columbia

Widespread Cretaceous tectonic activity in western North America created extensive sedimentary basins with variable infill histories flanking both sides of the Cordillera. The session will assess depositional histories, paleogeography, and paleoclimate of the Cretaceous basins.

T79. The Himalayan Orogen and Rise of the Tibetan Plateau: An Earth Systems Approach to the Tectonic and Landscape Evolution of Asia
Cosponsored by *GSA International Div.; GSA Quaternary Geology and Geomorphology Div.; GSA Sedimentary Geology Div.; GSA Structural Geology and Tectonics Div.; GSA History of Geology Div.; GSA Geophysics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Tectonics; Structural Geology; Geomorphology
Paul T. Robinson, Dalhousie Univ., Halifax, Nova Scotia; Yildirim Dilek, GSA History of Geology Div. and History of Earth Science Society, Oxford, Ohio

This session brings earth scientists together to examine the geodynamic evolution of the Himalayan Mountains and the Tibetan Plateau, to discuss current models and theories on the dynamic feedbacks between the atmosphere, the biosphere, and the crust and mantle during their evolution, and to explore new avenues for research in Asia.

T80. Antarctic Science in the International Polar Year—Geologic Evolution of the Antarctic Peninsula: Changes in Tectonics, Biota, and Climate over Time
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Tectonics; Paleoclimatology/Paleoceanography; Paleontology, Paleoecology/Taphonomy
Eugene W. Domack, Hamilton College, Clinton, N.Y.; Amy Leventer, Colgate Univ., Hamilton, N.Y.

This session highlights new geologic developments and discoveries in the Antarctic Peninsula at all time scales, including tectonic, continental margin and biotic evolution, and records of global change, from the marine and terrestrial realms.

T81. Continental and Marine Fold and Thrust Belts
Cosponsored by *GSA Structural Geology and Tectonics Div.; IUGS Task Group on Structural Geology and Tectonics; Gulf Coast Association of Geological Societies*
Scientific Category: Tectonics; Structural Geology; Geophysics/Tectonophysics/Seismology
Hermann Lebit, Marathon Oil Co., Houston, Tex.; Luke A. Jensen, Shell International Exploration and Production, Inc., Houston, Tex.; Terry Pavlis, Univ. of Texas, El Paso, Tex.; Rob Butler, Univ. of Aberdeen, Aberdeen, UK

This session aims to compare and contrast continental fold and thrust belts with their increasingly explored marine equivalents by integrating academic and industry perspectives. Fold-and-thrust belt boundary conditions, tectonostratigraphic architectures, kinematics, and mechanics will be presented via a multidisciplinary approach.

T82. Southwest Pacific Cenozoic Tectonics and Comparisons with Other Orogenic Belts
Cosponsored by *GSA International Div.; GSA Structural Geology and Tectonics Div.; GSA Geophysics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Tectonics; Structural Geology; Geophysics/Tectonophysics/Seismology
John Wakabayashi, California State Univ., Fresno, Calif.; Yildirim Dilek, GSA History of Geology Div. and History of Earth Science Society, Oxford, Ohio

Southwest Pacific Cenozoic tectonic history is considered the benchmark for orogenic belt development. We seek presentations on the southwest Pacific and other orogenic belts to compare the “best modern analog” to assembled mountain belts.

T83. Mid- to Lower Crustal Deformation Processes: Strain, Kinematics and Relationships to Upper Crustal Structures
Cosponsored by *GSA Structural Geology and Tectonics Div.; GSA Geophysics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Tectonics; Structural Geology; Neotectonics/Paleoseismology
Sharon Mosher, Univ. of Texas–Jackson School of Geosciences, Austin, Tex.; Richard D. Law, Virginia Tech, Blacksburg, Va.

This session will explore the interaction and genetic relationships between ductile flow in the mid- to lower crust and the formation of upper crustal brittle structures, including the impact of kinematics and strain.

T84. Exhumation of Continental Ultrahigh-Pressure Terranes
Cosponsored by *GSA Structural Geology and Tectonics Div.; UNESCO International Lithosphere Program Task Force IV: Ultra-Deep Continental Crust Subduction; Gulf Coast Association of Geological Societies*
Scientific Category: Tectonics; Structural Geology; Petrology, Metamorphic
Jane A. Gilotti, Univ. of Iowa, Iowa City, Iowa; William C. McClelland, Univ. of Idaho, Moscow, Idaho

Ultrahigh-pressure (UHP) metamorphism is widely recognized in collisional orogens, but exhumation mechanisms remain enigmatic. This session examines the rates, structures, and possible tectonic scenarios for exhumation of UHP terranes.

T85. Magmatic and Tectonic Processes at Ultraslow Mid-Ocean Ridges
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Tectonics; Petrology, Igneous; Volcanology
Jonathan E. Snow, Univ. of Houston, Houston, Tex.

This session examines the geology of ultraslow-spreading ridges and their relationship to both nonvolcanic continental rifting and faster seafloor spreading.

T86. Reconciling Geologic and Geodetic Rates of Deformation
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; GSA Geophysics Div.; GSA Structural Geology and Tectonics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Neotectonics/Paleoseismology; Geophysics/Tectonophysics/Seismology; Geomorphology
Kurt L. Frankel, Georgia Institute of Technology, Atlanta, Ga.; Richard A. Bennett, Univ. of Arizona, Tucson, Ariz.; Frank J. Pazzaglia, Lehigh Univ., Bethlehem, Pa.

This session will focus on comparing rates of deformation over time scales of tens to millions of years based on measurements from GPS, InSAR, Quaternary geochronology (e.g., cosmogenic nuclides, OSL, ^{14}C, etc.), thermochronology, and high-resolution imagery.

T87. Magnetism of Sedimentary Rocks and Sediments
Cosponsored by *GSA Geophysics Div.; GSA Sedimentology Div., GSA Limnogeology Div., GSA Structural Geology and Tectonics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geophysics/Tectonophysics/Seismology; Stratigraphy; Structural Geology
Kenneth P. Kodama, Lehigh Univ., Bethlehem, Pa.; John W. Geissman, Univ. of New Mexico, Albuquerque, N.Mex.; R. Douglas Elmore, Univ. of Oklahoma, Norman, Okla.

The paleomagnetism and mineral magnetic properties of sediments and sedimentary rocks provide a rich variety of information about the geologic past. The many applications of the magnetism of these materials to understand past geologic and environmental processes will be explored.

T88. Evolution of Simple Granite Systems (Haplogranites) and Rhyolites: A 50th Anniversary Perspective of the Tuttle and Bowen Studies
Scientific Category: Petrology, Experimental; Petrology, Igneous; Geochemistry
Bruce William Chappell, Univ. of Wollongong, Wollongong, Australia; Francois Holtz, Univ. of Hannover, Hannover, Germany; David London

2008 is the 50th Anniversary of the classic experimental study on granite and rhyolite compositions by Tuttle and Bowen. This session discusses the contribution of those and later studies to understanding origins of those rocks.

T89. Origin of the Alkaline Magmatism of the Coast of the Gulf of Mexico and the Rio Grande Rift
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Petrology, Igneous; Geochemistry; Volcanology
Juan Alonso Ramírez Fernández, Universidad Autónoma de Nuevo León, Linares, México; Fernando Velasco Tapia, Universidad Autónoma de Nuevo Leon, Linares, México

The aim of the session is to present the latest developments on the origin of the alkaline magmatism and its relationship to the geodynamic processes that occurred during the Tertiary.

T90. Whole Earth Systems Science: New Perspectives on the "Rock Cycle" from the Deep Earth to the Atmosphere to Life
Cosponsored by *Geochemical Society; Gulf Coast Association of Geological Societies*
Scientific Category: Petrology, Igneous; Paleoclimatology/Paleoceanography; Geophysics/Tectonophysics/Seismology
Cin-Ty Lee, Rice Univ., Houston, Tex.; Andreas Luttge, Rice Univ., Houston, Tex.; Adrian Lenardic, Rice Univ., Houston, Tex.; Gerald Dickens, Rice Univ., Houston, Tex.

This session takes a new look at the "rock cycle" by stressing the concept of whole earth systems, wherein interdisciplinary tools (petrology, geochemistry, geophysics, biogeochemistry) are used to understand the links between Earth's deep interior, exosphere, and biosphere.

T91. Strengthening Links between Metamorphic Conditions and Time: New Advances in High-Temperature Geochronology and Tracing *P-T-t* Paths of Metamorphic Terranes
Cosponsored by *Mineralogical Society of America*
Scientific Category: Petrology, Metamorphic; Geochemistry; Tectonics
Thomas J. Lapen, Univ. of Houston, Houston, Tex.; Andrew Kylander-Clark, Univ. of California, Santa Barbara, Calif.; Erik Scherer, Univ. Münster, Münster, Germany

This session will highlight advances in geochronology and thermobarometry with a focus on the *P-T-t* evolution of metamorphic terranes. Contributions focusing on novel methods for determining the timing and rates of tectonometamorphic processes are encouraged.

T92. Discovering Petrologic Truth in Minerals: In Honor of Bernard W. Evans
Cosponsored by *Mineralogical Society of America*
Scientific Category: Petrology, Metamorphic; Mineralogy/Crystallography; Petrology, Igneous
Ronald Frost, Univ. of Wyoming, Laramie, Wyo.; Donna L. Whitney, Univ. of Minnesota, Minneapolis, Minn.

This session honors the career of Bernard W. Evans, the recipient of this year's Roebling Medal, and focuses on studies of mineral composition and structure, with applications to phase equilibria and metamorphic or igneous petrogenesis.

T93. Environmental Mineralogy
Cosponsored by *Mineralogical Society of America; Gulf Coast Association of Geological Societies*
Scientific Category: Mineralogy/Crystallography; Environmental Geoscience; Geochemistry
Peter J. Heaney, Penn State Univ., University Park, Pa.; Jeffrey E. Post, Smithsonian Institution, Washington, D.C.

Minerals can be the source of toxic metals or acid wastes, but they also can act as natural cleansers. This session will explore mineral physics and chemistry in mediating soil reactions of environmental importance.

T94. Nano-Phases and Nano-Structures in Earth Environments
Cosponsored by *Mineralogical Society of America; GSA Geobiology and Geomicrobiology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Mineralogy/Crystallography; Geochemistry; Geomicrobiology
Huifang Xu, Univ. of Wisconsin, Madison, Wis.; Yifeng Wang, Sandia National Laboratories, Albuquerque, N.Mex.

This session encompasses interdisciplinary investigations across field observations, laboratory studies, and theoretical modeling of nano-phases and nanopores in Earth environments in areas of size- and texture-dependent chemical reactivity/stability, magnetism, and their interactions with the biosphere.

T95. Mineralogic and Petrologic Mapping of Planetary Surfaces: The G.K. Gilbert Award Session
Cosponsored by *GSA Planetary Geology Div.*
Scientific Category: Planetary Geology
Herbert V. Frey, NASA, Greenbelt, Md.; Ronald Greeley, Arizona State Univ., Tempe, Ariz.

This session, dedicated to planetary spectroscopy and mineralogy, honors the winner of the Planetary Geology Division's G.K. Gilbert Award for Outstanding Achievement. The recipient will give a keynote talk.

T96. Planetary Pummeling: Cataclysmic Bombardment of the Solar System as Catastrophe, Catalyst, Cauldron, and Crucible
Cosponsored by *GSA Planetary Geology Div.*
Scientific Category: Planetary Geology; Precambrian Geology; Geochemistry
Stephen Mojzsis, Univ. of Colorado, Boulder, Colo.; Barbara Cohen, NASA–Marshall Space Flight Center, Huntsville, Ala.

This session explores the evidence, timing, and mechanism for cataclysmic bombardment of the solar system and its geologic effects on nascent Earth, including evidence in terrestrial rocks and effects on terrestrial systems (biosphere, hydrosphere, and lithosphere).

T97. Terrestrial Impact Structures: Origin, Structure, and Evolution
Cosponsored by *GSA Planetary Geology Div.; International Continental Scientific Drilling Program (ICDP); GSA Sedimentary Geology Div.; GSA Structural Geology and Tectonics Div.; GSA Geophysics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Planetary Geology; Structural Geology; Petrology, Metamorphic
Christian Koeberl, Univ. of Vienna, Vienna, Austria; Jared R. Morrow, San Diego State Univ., San Diego, Calif.

This session welcomes contributions on any aspect of the study of terrestrial impact craters, from their formation to structure, from ejecta to shock deformation, from geological to biological effects, and also includes comparative planetology.

T98. Terrestrial Impact Craters as Windows into Planetary Crusts
Cosponsored by *GSA Planetary Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Planetary Geology; Structural Geology
John G. Spray, Univ. of New Brunswick, Fredericton, New Brunswick; Lucy M. Thompson, Univ. of New Brunswick, Fredericton, New Brunswick

Impact structures provide windows into deeper levels of planetary crusts. Presentations are encouraged that explore impact melt sheets as bulk crust compositions and central uplifts as deeper crustal samplings of Earth, its Moon, and Mars.

T99. The Geology of Small Volcanic Vents and Their Associated Vent Fields throughout the Solar System
Cosponsored by *GSA Planetary Geology Div.*
Scientific Category: Volcanology; Planetary Geology
Jacob Bleacher, NASA–Goddard Space Flight Center (GSFC), Laurel, Md.; Scott Hughes, Idaho State Univ., Pocatello, Idaho

This session will discuss small volcanic vents and vent fields that occur on Earth and other planetary bodies as a basis for the interpretation of processes responsible for small-vent field development throughout the solar system.

T100. From Magma Oceans to Basalts: Igneous Differentiation on Earth, the Moon, Mars, and Beyond
Cosponsored by *Geochemical Society; Gulf Coast Association of Geological Societies*
Scientific Category: Petrology, Igneous; Planetary Geology; Geochemistry
Justin Filiberto, Lunar and Planetary Institute, Houston, Tex.; Allan Treiman, Lunar and Planetary Institute, Houston, Tex.

This session contrasts basic magmatism among terrestrial planets from their earliest differentiation through recent volcanism.

T101. Geological and Geophysical Remote Sensing Applications for Earth, the Moon, and Mars
Cosponsored by *GSA Structural Geology and Tectonics Div.; GSA Geophysics Div.; GSA Planetary Geology Div.; GSA Engineering Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Planetary Geology; Economic Geology; Engineering Geology
Dean Riley, The Aerospace Corporation, Chantilly, Va.; Wendy Calvin, Univ. of Nevada, Reno, Nev.

This session will include papers on the current and future uses of ground, airborne, and satellite, multispectral, hyperspectral, SAR, and LIDAR instruments for applications related to geological hazards, lithologic and alteration mapping, environmental health, environmental impact monitoring, planetary geology, and engineering geology.

T102. Water-Rock Interaction on Mars: Spacecraft Data, Meteorites, Models, and Analogs
Cosponsored by *Mineralogical Society of America; Lunar and Planetary Institute*
Scientific Category: Planetary Geology; Geochemistry; Mineralogy/Crystallography
Allan H. Treiman, Lunar and Planetary Institute, Houston, Tex.; Bradley L. Jolliff, Washington Univ., St. Louis, Mo.

Rocks on Mars and on Earth interact with aqueous fluids and yield similar to spectacularly different mineralogies and chemistries. This session will explore martian rock alteration and its contrasts with the terrestrial experience.

T103. Glacial and Periglacial Processes and Landforms on Mars
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; GSA Planetary Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Planetary Geology; Geomorphology; Hydrogeology
Jeffrey S. Kargel, Univ. of Arizona, Tucson, Ariz.

International Mars exploration has discovered landforms and other indications of the presence and geomorphic activity of ice on Mars. This session will include presentations and discussions of evidence for glacial and periglacial activity on Mars.

T104. The Role of Field Geology and Geophysics in the Return to the Moon
Cosponsored by *GSA Planetary Geology Div.; Field Exploration and Analysis Team (FEAT)*
Scientific Category: Planetary Geology; Petrology, Igneous; Geophysics/Tectonophysics/Seismology
Mark Helper, Univ. of Texas, Austin, Tex.; Arthur Snoke, Univ. of Wyoming, Laramie, Wyo.

This session brings together field geoscientists and those involved in planning for the return to the Moon to examine the role of field geology and geophysics, both human and robotically assisted, in lunar surface science.

T105. Preparations for the New Era of Lunar Science: Laboratory Measurements and New Insights into the Moon
Cosponsored by *GSA Planetary Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Planetary Geology; Remote Sensing/Geographic Info System

Noah Petro, NASA-GSFC, Greenbelt, Md.; Rachel Klima, Brown Univ., Providence, R.I.; Ryan Zeigler, Washington Univ., St. Louis, Mo.

A discussion of the current analysis of lunar samples and analogues as well as other preparations for the data returned by various instruments that will be or are currently orbiting the Moon.

T106. Current Research Issues in Lunar Stratigraphy

Cosponsored by *GSA Planetary Geology Div.; AAPG Astrogeology Committee*

Scientific Category: Planetary Geology; Stratigraphy; Structural Geology

William A. Ambrose, Univ. of Texas, Austin, Tex.; David A. Williams, Arizona State Univ., Tempe, Ariz.

This session is a review of unresolved problems in lunar stratigraphy and the need for an improved understanding of lunar surface and subsurface materials and processes in support of exploration and human habitation.

T107. Engineering Geology of the Lunar Regolith

Cosponsored by *GSA Planetary Geology Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Planetary Geology; Engineering Geology; Geology and Health

David A. Kring, Lunar and Planetary Institute, Houston, Tex.; Wendell Mendell, NASA–Johnson Space Center, Houston, Tex.

A NASA outpost on the Moon requires new geological assessments of the lunar regolith to ensure stability during outpost installation and to mitigate the effects of dust lofted by landing rockets and other processes.

T108. Living on a Dusty Moon

Cosponsored by *GSA Planetary Geology Div.; GSA Geology and Health Div.*

Scientific Category: Planetary Geology; Geology and Health; Engineering Geology

Sarah K. Noble, NASA-JSC, Houston, Tex.; Doug Rickman, NASA, Huntsville, Ala.; Doug Stoeser, USGS, Denver, Colo.

A discussion of the intersection between geology, engineering, and health as we learn to live on the Moon. Topics include new techniques for sample analysis, toxicology, forensic geology, engineering performance, and simulant development.

T109. Titan Geology: A New Frontier

Cosponsored by *GSA Planetary Geology Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Planetary Geology; Geomorphology; Geochemistry, Organic

D.M. Burr, Carl Sagan Center, SETI Institute, Mountain View, Calif.; J.W. Barnes, NASA–Ames Research Center, Moffett Field, Calif.

Titan has clouds, rain, rivers, lakes, cryovolcanoes, and aeolian dunes. These phenomena give Titan a terrestrial-style geomorphology, although by terran standards the materials are exotic; thus, Titan provides a unique opportunity for comparative geologic studies.

T110. Analog Sites and Field Exercises for Training Planetary Field Geologists
Cosponsored by *GSA Planetary Geology Div.; GSA Geoscience Education Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Planetary Geology; Geoscience Education; Geomorphology
W. Brent Garry, Smithsonian Institution, Washington, D.C.; Jacob E. Bleacher, NASA-GSFC, Greenbelt, Md.

This session will discuss the geology of analog sites and field exercises that can be used to train today's students and the next generation of planetary field geologists when NASA returns to the Moon.

T111. Modeling and Simulation of Dangerous Phenomena and Innovative Techniques for Hazard Evaluation, Mapping, and Mitigation
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Engineering Geology; Environmental Geoscience; Geoinformatics
Giulio G.R. Iovine, CNR (Italian National Research Council), Rende (CS), Italy; Michael F. Sheridan, Univ. at Buffalo, Buffalo, N.Y.; Manuel Pastor, Centro de Estudios de Técnicas Aplicadas CEDEX, Madrid, Spain

Dangerous natural and man-made phenomena affect people and properties in many parts of the Earth. Innovative hazard modeling, evaluation, and mapping techniques for predicting triggering conditions and development of dangerous phenomena will be discussed in this session.

T112. Landslide Inventories, Landslide Hazards, Databases, and Mapping: Status of Information and Progress toward a Shared Standard (Posters)
Cosponsored by *GSA Engineering Geology Div.; GSA Quaternary Geology and Geomorphology Div.; GSA Geology and Society Div.; Association of American State Geologists; Gulf Coast Association of Geological Societies*
Scientific Category: Engineering Geology; Geomorphology; Public Policy
Helen L. Delano, Middletown, Pa.; Lynn M. Highland, Denver, Colo.; Laura M. Vaugeois, Washington Dept. of Natural Resources, Olympia, Wash.

The session is designed to gather and share information on landslide inventory, database, and mapping projects including status, progress, details of data structure, and distribution methods, intended audiences, and uses of landslide data.

T113. Natural Hazards Assessment, Evaluation, and Mitigation using HAZUS-MH
Cosponsored by *GSA Engineering Geology Div.; GSA Geology and Society Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Engineering Geology; Public Policy
Norman S. Levine, College of Charleston, Charleston, S.C.; Eric Anderson, Charleston, S.C.; Briget C. Doyle, College of Charleston, Charleston, S.C.

Research and case studies using FEMA's HAZUS-MH hazards assessment and evaluation tool. The session looks at assessments of hurricane, flood, or earthquake hazards, including methods of improving the data or base layers used in HAZUS-MH.

T114. Advances in GIS-Based Runoff and Erosion Modeling in Low-Gradient Environments: Case Studies and New Methods
Cosponsored by *GSA Engineering Geology Div.*
Scientific Category: Engineering Geology; Environmental Geoscience; Hydrogeology
Norman S. Levine, College of Charleston, Charleston, S.C.; Timothy J. Callahan, College of Charleston, Charleston, S.C.

Case studies and new GIS-based methodologies for runoff and erosion modeling in low-gradient environments. The session will focus on techniques for use on the coastal plain region and other low-gradient regions.

T115. Geovisualization and GIS Techniques Applied in Engineering Geology
Cosponsored by *GSA Engineering Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Engineering Geology; Remote Sensing/Geographic Info System; Geoinformatics
Shane J. Prochnow, Baylor Univ., Waco, Tex.; Vincent S. Cronin, Baylor Univ., Waco, Tex.

This session aims to showcase the integration of geovisualization and GIS techniques that aid interpretation of natural phenomena for applications in engineering geology, hydrogeology, hydrology, and geomorphology.

T116. Shales, Claystones, and Mudstones: Characterization Methods and Engineering Problems
Cosponsored by *GSA Engineering Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Engineering Geology
Abdul Shakoor, Kent State Univ., Kent, Ohio; Paul Santi, Colorado School of Mines, Golden, Colo.

The session will include papers on geologic characteristics, engineering properties, and engineering problems associated with shales, claystones, and mudstones. It will also include papers dealing with performance of engineering structures located in or on these rocks.

T117. Problem Geologic Units in Slope Stability
Cosponsored by *GSA Engineering Geology Div.; GSA Geology and Society Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Engineering Geology; Geomorphology; Geoscience Information/Communication
Paul Santi, Colorado School of Mines, Golden, Colo.; Scott Burns, Portland State Univ., Portland, Oreg.

Certain formations are involved in an unusual number of slope stability problems and are recognized regionally as "bad actors." This session will explore the geologic and engineering characteristics of these units, with appropriate case studies.

T118. Engineering Geology of Streams, Lakes, and Reservoirs
Cosponsored by *GSA Engineering Geology Div.*
Scientific Category: Engineering Geology; Geomorphology; Quaternary Geology
Peter M. Allen, Baylor Univ., Waco, Tex.; Vincent S. Cronin, Baylor Univ., Waco, Tex.

Careful observations of stream systems, lakes, and reservoirs using old and new methods are yielding important insights (and better models) that are relevant at development scale. We seek case studies and new modeling strategies.

T119. The Science of Oil Shale
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Geochemistry, Organic; Environmental Geoscience; Engineering Geology
Alicia Sánchez, Chevron Energy Technology Co., Los Alamos, N.Mex.; John Kaszuba, Los Alamos National Laboratory, Los Alamos, N.Mex.

Oil shale is the archetypical interdisciplinary problem, requiring geology, geochemistry, engineering, environmental, and even life-science

perspectives. This session will address oil shale research from these interdisciplinary perspectives and promote communication between academia and industry.

T120. Organic Geochemical approaches to Studying the Evolution of Photosynthetic Life through Time
Cosponsored by *Paleontological Society*
Scientific Category: Geochemistry, Organic; Paleontology, Diversity, Extinction, Origination; Paleontology, Phylogenetic/Morphological Patterns
Robin Kodner, Harvard Univ., Cambridge, Mass.; Amy E. Kelly, MIT, Cambridge, Mass.

We encourage contributions using biomarkers from photosynthetic organisms from all time periods, with an emphasis on how biomarkers have broadened our understanding of the evolution of photosynthetic life through time.

T121. Hypersaline Ecosystems and Paleosalinity
Cosponsored by *Paleontological Society; Gulf Coast Association of Geological Societies*
Scientific Category: Geochemistry, Organic; Paleontology, Paleoecology/Taphonomy; Geomicrobiology
Courtney H. Turich, Skidaway Institute of Oceanography, Savannah, Ga.; Amy E. Kelly, MIT, Cambridge, Mass.

This session is designed for people who study body or chemical fossils of hypersaline tolerant organisms or modern hypersaline environments.

T122. Soil Geochemistry: Databases and Applications at Regional to Continental Scales
Cosponsored by *Geochemical Society; Gulf Coast Association of Geological Societies; GSA Geology and Health Div.*
Scientific Category: Geochemistry; Environmental Geoscience; Geology and Health
David B. Smith, USGS, Denver, Colo.; Andrew Rencz, Geological Survey of Canada, Ottawa, Ontario; Juan Carlos Salinas, Servicio Geológico Mexicano, Pachuca, Hidalgo, México

This session focuses on presentations of results from soil geochemical studies being conducted at broad geographical scales (regional to continental) and the interpretation of these results in terms of processes acting at these scales.

T123. Real-Time, In-Field Geochemical Analysis: Current Capabilities and Future Prospects (Posters)
Cosponsored by *International Association of GeoChemistry; Gulf Coast Association of Geological Societies*
Scientific Category: Geochemistry; Environmental Geoscience; Planetary Geology
Nancy J. McMillan, New Mexico State Univ., Las Cruces, N.Mex.; Russell S. Harmon, Research Triangle Park, N.C.; April L. Ulery, New Mexico State Univ., Las Cruces, N.Mex.

A long-term goal in analytical geochemistry has been a capability for real-time analysis in the field. This capability is being realized gradually by technological developments in instrumentation over the past decade. This session will highlight current and emerging analytical technologies for real-time, field-portable geochemical analysis.

T124. Roles of Speciation and Molecular Structure in Soil Processes
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Geochemistry; Geomicrobiology; Mineralogy/Crystallography
Owen Duckworth, North Carolina State Univ., Raleigh, N.C.; Alan T. Stone, Johns Hopkins Univ., Baltimore, Md.

This session seeks to explore fundamental relationships between environmental and biological processes and the chemical properties of organic matter, minerals, and complexes from molecular to field scales.

T125. Fundamental Understanding of Carbonate Mineral Reactivity and Kinetics: Advances and Applications
Cosponsored by *Geochemical Society*
Scientific Category: Geochemistry; Sediments, Carbonates; Environmental Geoscience
Rolf S. Arvidson, Rice Univ., Houston, Tex.

This session encourages contributions that advance the fundamental understanding of carbonate mineral reaction kinetics and reactivity, using model, experimental, or field data, or that showcase integrated approaches to complex problems involving carbonate phases.

T126. Soils through Time: Critical-Zone Studies of Interacting Processes
Cosponsored by *Geochemical Society; GSA Quaternary Geology and Geomorphology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geochemistry; Quaternary Geology; Hydrogeology
Marjorie S. Schulz, USGS, Menlo Park, Calif.; David Stonestrom, USGS, Menlo Park, Calif.; Daniel D. Richter, Duke Univ., Durham, N.C.

This session focuses on processes shaping soil and its environs (the "critical zone") over time scales from seasonal to multimillennial. We welcome studies exploring interactions of rock, soil, water, air, and living organisms through time.

T127. Geochemical Tracers of Changes in Seawater Chemistry
Cosponsored by *Geochemical Society; Gulf Coast Association of Geological Societies*
Scientific Category: Geochemistry; Paleoclimatology/Paleoceanography
E. Troy Rasbury, SUNY–Stony Brook, Stony Brook, N.Y.; Franco Marcantonio, Texas A&M Univ., College Station, Tex.

This session seeks to examine processes and products from throughout the Phanerozoic and the modern to decipher the important controls on seawater chemistry and isotope ratios through time.

T128. Thermal Analysis of Geological Materials
Scientific Category: Geochemistry; Mineralogy/Crystallography; Petrology, Experimental
Kenneth Johnson, Univ. of Houston–Downtown, Houston, Tex.; Janusz Grebowicz, Univ. of Houston–Downtown, Houston, Tex.

This session will focus on recent advances in the thermal analysis of geological materials, including thermogravimetry, differential scanning calorimetry, evolved gas analysis, and dilatometry.

T129. Diffusion in Thermochronology: Measurements and Applications
Cosponsored by *GSA Structural Geology and Tectonics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geochemistry; Tectonics; Geomorphology
Peter Copeland, Univ. of Houston, Houston, Tex.; E. Bruce Watson, Rensselaer Polytechnic Institute, Troy, N.Y.

Laboratory studies quantifying the diffusivity of important nuclides in geochronology as well as field studies testing or demonstrating the potential of these data are encouraged.

EXHIBITORS

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The Joint Exhibit Hall will showcase more than 400 organizations offering the latest in scientific instrumentation; field supplies and gear; computer software and hardware; geological publications; laboratory services; gems, minerals, and fossils; and earth science program information.

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T130. Opportunities at the Interface: Minerals, Bugs, and Aqueous Solutions
Cosponsored by *Geochemical Society*
Scientific Category: Geochemistry; Geomicrobiology; Environmental Geoscience
Maria Dittrich, Eawag, Swiss Federal Institute of Aquatic Science and Technology, Kastanienbaum, Switzerland; Andreas Luttge, Rice Univ., Houston, Tex.

The session brings together colleagues interested in geochemistry, microbiology, organic chemistry, and environmental engineering to discuss new experimental and theoretical results, as well as exciting field studies in this rapidly developing interdisciplinary field.

T131. Metals and Landfills: Mobilization, Speciation, and Microbes
Cosponsored by *GSA Geobiology and Geomicrobiology Div.*
Scientific Category: Geochemistry; Hydrogeology; Geomicrobiology
Brian Mailloux, Barnard College, New York, N.Y.; Alison Keimowitz, Columbia Univ., Palisades, N.Y.

Anthropogenically deposited and naturally mobilized metals are common at landfills, yet little work has been done to understand the potential for mobilization, the speciation, and the role of microbes in controlling metal contamination below landfills.

T132. Biofilms and Biomineralization: Evidence from Ancient and Modern Systems
Cosponsored by *GSA Geobiology and Geomicrobiology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geomicrobiology; Mineralogy/Crystallography; Geochemistry
Penelope J. Boston, New Mexico Institute of Mining and Technology, Socorro, N.Mex.; Leslie A. Melim, Western Illinois Univ., Macomb, Ill.

This session will focus on biofilm characterization in modern and ancient geologic systems, such as reefs, hot springs, caves, methane seeps, soils, and others. Particular emphasis will be given to biomineralization processes mediated by biofilms.

T133. Microbialites: A 3.5-Billion-Year Record of Microbe-Sediment Interactions
Cosponsored by *GSA Geobiology and Geomicrobiology Div.; GSA Sedimentary Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geomicrobiology; Sediments, Carbonates; Paleontology, Paleoecology/Taphonomy
Jack D. Farmer, Arizona State Univ., Tempe, Ariz.

Microbial communities are known to control a broad array of sedimentary processes. This session will explore ways that microorganisms have contributed to basic sedimentary processes over a broad range of environments, from Precambrian to modern.

T134. Novel Usage of Complementary Techniques to Characterize Low-Temperature Biogeochemical Environments
Scientific Category: Environmental Geoscience; Geochemistry; Geomicrobiology
Lachlan C.W. MacLean, Penn State Univ., University Park, Pa.; Sean A. Crowe, McGill Univ., Montreal, Quebec

To fully understand low-temperature environments requires the use of a diverse array of high-resolution analytical techniques. This session will showcase studies that use complementary techniques to characterize the biogeochemical interactions that occur in natural systems.

T135. Military Geology in the 21st Century
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Environmental Geoscience; Geology and Health; History of Geology
Russell S. Harmon, Research Triangle Park, N.C.; Christopher Gellasch, Fort Lewis, Wash.

This session addresses applications of military geology across time and around the world, spanning a broad spectrum from effects of terrain on military operations, to using geologic tools and methods in military engineering, to the impact of military activities on terrain from an environmental perspective.

T136. Sulfates in the Solar System
Cosponsored by *GSA Geobiology and Geomicrobiology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geomicrobiology; Planetary Geology; Geochemistry
Stephen E. Grasby, Natural Resources Canada, Calgary, Alberta; Penny Morris, Univ. of Houston–Downtown, Houston, Tex.

This session explores sulfates on Earth and elsewhere with an emphasis on identifying the roles of microbes in formation and deposition and the physical and geochemical evidence of life within sulphate deposits.

T137. Environmental Impact of Pharmaceuticals and Personal Care Products
Cosponsored by *GSA Engineering Geology Div.; GSA Geology and Health Div.*
Scientific Category: Environmental Geoscience; Geology and Health; Public Policy
Syed E. Hasan, Univ. of Missouri, Kansas City, Mo.

This session will inform earth scientists about the presence of pharmaceuticals and personal care products (PPCPs) in the waste stream and its impact on the environment.

T138. New Strategies for Survival and Transport of Pathogens in Soils, Surface Waters, and Aquifers
Cosponsored by *GSA Hydrogeology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Environmental Geoscience; Hydrogeology; Geology and Health
Melissa Lenczewski, Northern Illinois Univ., DeKalb, Ill.; Jean McLain, USDA, Maricopa, Ariz.; Kimberly Cook, USDA, Bowling Green, Ky.

This session will examine the fate and transport of pathogens in the environment related to sources, transport, controls on mobility, and detection in soils and water.

T139. Sources, Transport, Fate, and Toxicology of Trace Elements in the Environment
Cosponsored by *International Association for GeoChemistry; GSA Hydrogeology Div.*
Scientific Category: Environmental Geoscience; Geochemistry; Geology and Health
LeeAnn Munk, Univ. of Alaska, Anchorage, Alaska; W.B. Lyons, The Ohio State Univ., Columbus, Ohio; David T. Long, Michigan State Univ., East Lansing, Mich.

Environmental geochemistry of trace elements in the environment is an important field of research that spans many Earth environments. This topic is relevant in terms of understanding the processes that release, transport, and uptake trace elements. Ultimately, the goal is to make linkages between trace elements derived from the environment and toxicology of these elements in the environment

T140. Sigma Gamma Epsilon Undergraduate Research (Posters)
Cosponsored by *Sigma Gamma Epsilon*
Scientific Category: Environmental Geoscience; Stratigraphy; Petrology, Igneous
Richard Ford, Weber State Univ., Ogden, Utah; Donald Neal; Charles Mankin, Oklahoma Geological Survey, Norman, Okla.

The goal of this session is to highlight recent and ongoing undergraduate research in the geosciences in a student-friendly forum. Those posters, authored by members of SGE, will be judged for two best-poster awards.

T141. The Changing Role of Geoarchaeology in Environmental and Cultural Resource Management
Cosponsored by *GSA Archaeological Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Archaeological Geology; Environmental Geoscience; Public Policy
Andrea K.L. Freeman, Univ. of Calgary, Calgary, Alberta; David Cremeens, GAI Consultants, Monroeville, Pa.

This session will explore the way in which changes in the energy industry and in environmental policy have affected the methods used in environmental and cultural resource management, the workforce employed, and the resources impacted.

T142. Soils as Components of Archaeological Landscapes
Cosponsored by *GSA Archaeological Geology Div.; GSA Quaternary Geology and Geomorphology Div.; S05 Pedology; Gulf Coast Association of Geological Societies*
Scientific Category: Archaeological Geology; Geomorphology; Quaternary Geology
Rolfe D. Mandel, Univ. of Kansas, Lawrence, Kans.; E. Arthur Bettis, Univ. of Iowa, Iowa City, Iowa; Vance T. Holliday, Univ. of Arizona, Tucson, Ariz.

The session will address the use of soils in archaeological investigations. Topics will range from how soils can be used to reconstruct archaeological landscapes to how they provide physical and chemical evidence of human occupation.

T143. The Origin of Mima Mounds and Similar Micro-Relief Features: Multidisciplinary Perspectives
Cosponsored by *GSA Archaeological Geology Div.; GSA Quaternary Geology and Geomorphology Div.; S05 Pedology; Gulf Coast Association of Geological Societies*
Scientific Category: Archaeological Geology; Geomorphology; Quaternary Geology
Donald L. Johnson, Univ. of Illinois, Urbana, Ill.; Rolfe D. Mandel, Univ. of Kansas, Lawrence, Kans.

The proposed topical session will focus on the origin of Mima mounds and similar micro-relief features. The latest findings from geomorphological, pedological, geoarchaeological, and biological investigations will be presented.

T144. Geochemical and Geoarchaeological Analysis of Shell Middens: Climate, Ecology, and Culture
Cosponsored by *GSA Archaeological Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Archaeological Geology; Paleoclimatology/Paleoceanography; Paleontology, Biogeography/Biostratigraphy
C. Fred T. Andrus, Univ. of Alabama, Tuscaloosa, Ala.; Bernd Schöne, Univ. of Mainz, Mainz, Germany

Data derived from shell middens are employed to address diverse topics, including climate change, paleoecology, and site formation processes. This session will facilitate interdisciplinary discussion of this increasingly important approach to understanding human-environment interaction.

T145. From Quaternary Geology and Physical Volcanology to Geoarchaeology and Paleoanthropology: A Memorial to Harold E. Malde
Cosponsored by *GSA Archaeological Geology Div.; GSA Quaternary Geology and Geomorphology Div.; U.S. Geological Survey; Gulf Coast Association of Geological Societies*
Scientific Category: Archaeological Geology; Quaternary Geology; Volcanology
Joshua M. Feinberg, Univ. of Minnesota, Minneapolis, Minn.; Robert Jarrett, USGS, Lakewood, Colo.; Joseph Liddicoat, Barnard College, New York, N.Y.

This interdisciplinary session in memory of Harold Malde encourages papers in Quaternary geology and geomorphology, physical volcanology, geoarchaeology, and environmental geology to provide an opportunity for presentation of new research inspired by Hal's multifaceted career.

T146. Hypogenic Karst: Shedding Light on Once Poorly Understood Hydrologic and Morphologic Features
Cosponsored by *National Cave and Karst Research Institute; Gulf Coast Association of Geological Societies*
Scientific Category: Geomorphology; Hydrogeology; Engineering Geology
Lewis A. Land, New Mexico Institute of Mining and Technology, Carlsbad, N.Mex.; Geary Schindel, Edwards Aquifer Authority, San Antonio, Tex.

Hypogenic karst is an important, newly developed paradigm for characterizing and interpreting karst aquifers, morphologies, and economic deposits formed by ascending groundwater. Papers will cover both theoretical and applied topics.

T147. Innovative Methods for Investigating Flow and Transport in Karst Systems
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Hydrogeology; Environmental Geoscience; Geochemistry
Barbara Mahler, Austin, Tex.; Pierre-Yves Jeannin, La Chaux-de-Fonds, Switzerland

Karst aquifers represent a vital yet vulnerable water resource that poses many challenges to hydrologists. Presentations of innovative methods for investigating karst using diverse approaches, including geochemistry, geophysics, statistics, and modeling, are encouraged.

T148. Management and Protection of Regional Karst Aquifers
Cosponsored by *GSA Hydrogeology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Hydrogeology; Public Policy; Environmental Geoscience
Eve L. Kuniansky, USGS, Norcross, Ga.; Lynne S. Fahlquist, USGS, Austin, Tex.

Karst aquifers underlie ~20% of Earth's surface and supply ~25% of the world's drinking water. Their management and protection is essential for sustainable potable water supplies.

T149. Groundwater Arsenic: A Global Environmental Health Problem and Sustainable Mitigation
Cosponsored by *GSA Hydrogeology Div.; GSA Geology and Society Div.; GSA Geology and Health Div.; GSA International Div.; Geochemical Society; International Association of Hydrogeologists; International Society of Groundwater Sustainable Development*

Scientific Category: Hydrogeology; Environmental Geoscience; Geology and Health
Prosun Bhattacharya, Royal Institute of Technology (KTH), Stockholm, Sweden; Abhijit Mukherjee, Univ. of Texas, Austin, Tex.; D. Kirk Nordstrom, USGS, Boulder, Colo.; Jochen Bundschuh, Royal Institute of Technology (KTH), Stockholm, Sweden; Mohammad Alauddin, Wagner College, Staten Island, N.Y.

The global occurrence of arsenic in groundwater in different geological settings is the most formidable environmental crisis in the contemporary world. This session will deal with the occurrence, mobility, biogeochemical cycling, epidemiological, socio-economic effects, and sustainable mitigation of arsenic.

T150. Plant-Based Strategies for Hydraulic Control, Monitoring, Attenuation, and Remediation of Contaminants in Soil and Groundwater
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Hydrogeology; Environmental Geoscience; Geomicrobiology
Brian J. Andraski, USGS, Carson City, Nev.; James E. Landmeyer, USGS, Columbia, S.C.; Edwin P. Weeks, USGS, Lakewood, Colo.; Steven A. Rock, U.S. Environmental Protection Agency, Cincinnati, Ohio

This multidisciplinary session brings together a broad range of scientists studying the role and use of plants to identify, contain, and remediate environmental contamination. Presentations on monitoring techniques, case studies, and modeling are encouraged.

T151. Uranium In-Situ Leach (ISL) Mining: Possible Effects on Surrounding Groundwater Quality and Adequate Post-Mining Restoration Techniques
Cosponsored by *GSA Hydrogeology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Hydrogeology; Geochemistry; Environmental Geoscience
Raymond H. Johnson, USGS, Denver, Colo.; L. Rick Arnold, USGS, Denver, Colo.; Tanya Gallegos, USGS, Denver, Colo.

With the latest boom in uranium mining, the public needs the latest scientific information on possible impacts to groundwater quality in areas with uranium ISL mining and current techniques for post-mining groundwater restoration.

T152. In Situ Approaches for Measuring Biodegradation Potential and Rates in Subsurface Environments
Cosponsored by *GSA Hydrogeology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Hydrogeology; Geomicrobiology
Isabelle Cozzarelli, USGS, Reston, Va.; Michelle Lorah, USGS, Baltimore, Md.

This session presents novel in situ experimental approaches to documenting and quantifying transformation reactions in a variety of hydrogeologic environments. Interdisciplinary approaches using a combination of geochemical and microbiological measurements to document biogeochemical reactions and biodegradation are especially encouraged.

T153. Isotopic Tracers in Deep Groundwater Basins
Cosponsored by *GSA Hydrogeology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Hydrogeology; Geochemistry; Environmental Geoscience
Jean E. Moran, Lawrence Livermore National Laboratory, Livermore, Calif.; Glen Snyder, Rice Univ., Houston, Tex.

Deep groundwater basins often host complex flow and transport systems, ranging from active throughflow to highly compartmentalized. How can the stable and radiogenic isotopic composition of such waters be used to characterize their hydrologic history?

T154. Managed Underground Storage of Recoverable Water
Cosponsored by *GSA Hydrogeology Div.; GSA Geology and Society Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Hydrogeology; Geochemistry; Geomicrobiology
William S. Logan, National Academy of Science, Washington, D.C.; Jean M. Bahr, Univ. of Wisconsin, Madison, Wis.

This session seeks to bring together hydrogeologists, aqueous geochemists, and other geoscientists to discuss novel techniques and physical and geochemical challenges for the recharge of water into the subsurface for subsequent recovery.

T155. Mercury Cycling, Fate, and Bioaccumulation in Coastal Zones: The Next Big Stage for Mercury Research?
Scientific Category: Hydrogeology; Marine/Coastal Science; Environmental Geoscience
David P. Krabbenhoft, USGS, Middleton, Wis.; Robert P. Mason, Univ. of Connecticut, Groton, Conn.

Methylmercury contamination of food webs in coastal zones is a significant international issue in need of a broader scientific understanding. This session will address mercury sources, cycling processes, and bioaccumulation at this critical land-sea interface.

T156. Challenges in Urban Stream Restoration
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Hydrogeology; Public Policy
Ronald Kaiser, Texas A&M Univ., College Station, Tex.; John R. Giardino, Texas A&M Univ., College Station, Tex.

This session will outline the biophysical, geophysical, and social science elements in urban stream restoration across a range of scales.

T157. Dealing with Water Resources in Intra-State Violent Conflicts between Central Governments and Local or Regional Communities
Cosponsored by *GSA Hydrogeology Div.; GSA Geology and Society Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Hydrogeology; Geology and Health; Environmental Geoscience
Isam E. Amin, Youngstown State Univ., Youngstown, Ohio

This session investigates water resources as a component and resolution factor of intra-state conflicts, which are typically caused by ethnic, cultural, and religious differences between the conflicting parties as well as scarcity of natural resources.

T158. Balancing the Needs of Human and Natural Systems through the Sustainable Use of Water Resources
Cosponsored by *GSA Hydrogeology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Hydrogeology
Mark Rains, Univ. of South Florida, Tampa, Fla.; Thomas Crisman, Univ. of South Florida, Tampa, Fla.

This session will provide a forum for researchers addressing complex and interconnected issues as they seek to balance limited water resources to sustain coupled human and natural environments.

T159. Impacts of Large-Scale Land Use Change on Water Resource Sustainability

Cosponsored by *GSA Hydrogeology Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Hydrogeology

Bridget R. Scanlon, Univ. of Texas, Austin, Tex.; David A. Stonestrom, Menlo Park, Calif.; Marios A. Sophocleous, Univ. of Kansas, Lawrence, Kans.

This session focuses on impacts of land-use change on water resources. Impacts related to deforestation, afforestation, food and biofuel production, carbon sequestration, etc., will be approached through field studies, remote sensing, historic analysis, and modeling.

T160. Hydrogeophysics: Characterization and Monitoring of Subsurface Parameters and Processes

Cosponsored by *GSA Hydrogeology Div.; GSA Geophysics Div.*

Scientific Category: Hydrogeology; Environmental Geoscience; Geophysics/Tectonophysics/Seismology

Kamini Singha, Penn State Univ., University Park, Pa.; Fred Day-Lewis, Office of Ground Water–Water Resources Division, Storrs, Conn.; Adam Pidlisecky, Univ. of Calgary, Calgary, Alberta

With this session, we seek to bring together hydrologists and geophysicists to promote communication on the advancements in, challenges facing, and promising new directions in hydrogeophysics, the study of geophysical measurements of hydrologic processes.

T161. Non-Darcian Flow and Non-Fickian Transport in Porous and Fractured Media

Cosponsored by *GSA Hydrogeology Div.*

Scientific Category: Hydrogeology; Environmental Geoscience

Hongbin Zhan, Texas A&M Univ., College Station, Tex.; Guanhua Huang, China Agricultural Univ., Beijing, China

This section seeks new theoretical and experimental advancements in non-Darcian flow and non-Fickian transport in porous and fractured media covering a broad range of scales.

T162. Advances in Surface Water–Groundwater Interactions: Investigations of Rivers, Lakes, and Wetlands

Cosponsored by *GSA Hydrogeology Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Hydrogeology; Limnogeology; Environmental Geoscience

M. Bayani Cardenas, Univ. of Texas, Austin, Tex.; Audrey Hucks Sawyer, Univ. of Texas, Austin, Tex.; Brad D. Wolaver, Univ. of Texas, Austin, Tex.

This session focuses on the hydrology and hydrogeology of surface water–groundwater interactions in rivers, lakes, wetlands, and estuaries. Interdisciplinary research based on field observations as well as numerical and analogue laboratory studies are welcome.

T163. Groundwater Flow in Coastal Ecosystems

Cosponsored by *GSA Hydrogeology Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Hydrogeology; Marine/Coastal Science; Geochemistry

Alicia M. Wilson, Univ. of South Carolina, Columbia, S.C.; William P. Anderson, Appalachian State Univ., Boone, N.C.

Groundwater flow and transport influence natural coastal ecosystems on land and in the coastal ocean. This session will focus on field and modeling studies of fresh and saline groundwater flow and transport in coastal systems.

T164. Hydropedology of Hillslopes

Scientific Category: Hydrogeology; Geomorphology; Quaternary Geology

J. Bruce J. Harrison, New Mexico Tech, Socorro, N.Mex.; Brad Wilcox, Texas A&M Univ., College Station, Tex.

Numerous empirical and model-based studies of hillslope hydrology have improved our understanding of these complex systems. However, robust models of soil distribution on hillslopes are lacking, limiting our ability to predict soil hydrologic properties.

T165. Deconvoluting Hydrostratigraphic Nomenclature: The Need for Nomenclatural Guidelines within the North American Code on Stratigraphic Nomenclature

Cosponsored by *GSA Hydrogeology Div.; North American Commission on Stratigraphic Nomenclature; GSA Sedimentary Geology Div.; Florida Geological Survey; Gulf Coast Association of Geological Societies*

Scientific Category: Hydrogeology; Stratigraphy

Thomas M. Scott, Florida Geological Survey, Tallahassee, Fla.; Randall C. Orndorff, USGS, Reston, Va.

The North American Commission on Stratigraphic Nomenclature is enthusiastic about adding a hydrostratigraphic nomenclature section to the North American Code on Stratigraphic Nomenclature. This session provides a forum to discuss nomenclatural standardization.

T166. Fault Seals or Conduits? Insights from Hydrologic and Petroleum Systems

Cosponsored by *GSA Hydrogeology Div.; GSA Structural Geology and Tectonics Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Hydrogeology; Structural Geology; Engineering Geology

Victor F. Bense, Univ. of East Anglia, Norwich, UK; Mark Austin Person, Indiana Univ., Bloomington, Ind.

In recent years, petroleum and hydrologic studies have revealed that faults exhibit complex behavior, acting as barriers, conduits, or conduit-barrier systems for fluid migration. Fault properties are impacted, for example, by the in situ stress state and deformation mechanisms such as sand-clay smearing and cataclasis. Significant advancements in this field of research have occurred in recent years by studying faults in deep and shallow systems. We welcome contributions from hydrology and petroleum-based studies that consider the hydraulic properties of faults as inferred from fluid flow data, field, and quantitative studies.

T167. Combined Use of Groundwater and Optimization Models to Address Groundwater Management Challenges: Case Studies and Innovative Solution Approaches

Cosponsored by *GSA Hydrogeology Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Hydrogeology

Paul M. Barlow, USGS, Northborough, Mass.; David P. Ahlfeld, Univ. of Massachusetts, Amherst, Mass.

This session will focus on recent applications of combined groundwater and optimization models to groundwater management problems. Presentations on innovative formulation and solution approaches for groundwater-optimization modeling also are sought.

T168. Recent Advances in Stream-Aquifer Interaction—Experimental and Modeling Approaches

Cosponsored by *Gulf Coast Association of Geological Societies*

Scientific Category: Hydrogeology

Dongmin Sun, Univ. of Houston, Clear Lake, Houston, Tex.; Hongbin Zhan, Texas A&M Univ., College Station, Tex.

This session seeks recent advances in experimental and modeling studies on stream-aquifer interaction.

T169. Water Resources of Central America: Water Availability and Water Quality
Cosponsored by *GSA Hydrogeology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Hydrogeology
Anne E. Carey, The Ohio State Univ., Columbus, Ohio; Jose Alfredo Mendoza, Universidad Nacional Autónoma de Nicaragua (UNAN-Managua), Managua, Nicaragua

Availability of clean water is a limiting resource in much of the world, including Central America. This session seeks both talks and posters presenting research in all areas of Central American water resources and water quality.

T170. From San Salvador and Beyond: A Tribute to Don and Kathy Gerace and the Development of the Gerace Research Centre
Cosponsored by *Paleontological Society; GSA Sedimentary Geology Div.; GSA Hydrogeology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Hydrogeology; Sediments, Carbonates; Paleontology, Paleoecology/Taphonomy
Lisa E. Park, The Univ. of Akron, Akron, Ohio; Thomas A. Rothfus, The College of the Bahamas, Fort Lauderdale, Bahamas

This session will be an interdisciplinary survey of the major scientific findings from research done on San Salvador Island, Bahamas, and the critical role that Donald and Kathy Gerace have played in developing the research center on the island.

T171. The Gulf of Mexico as a Geologic Laboratory: Making New Links in Depositional Systems from the Coastal Plain to Deep Water
Cosponsored by *GSA Sedimentary Geology Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Economic Geology; Sediments, Clastic; Structural Geology
Russell F. Dubiel, USGS, Denver, Colo.; Angela McDonnell, Bureau of Economic Geology, Univ. of Texas, Austin, Tex.

This session focuses on basin analysis, sequence stratigraphy, salt tectonics, and reservoir characterization of new models of clastic deposition that integrate depositional systems on the coastal plain with newly recognized deep-water slope and basinal-fan systems.

T172. Outdoor Classrooms for Water Resources Education
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Education; Environmental Geoscience; Hydrogeology
Susan H. Conrad, Dutchess Community College, Poughkeepsie, N.Y.; Kirsten Menking, Vassar College, Poughkeepsie, N.Y.; John A. Conrad, Poughkeepsie, N.Y.

This session will bring together K–16 educators who use the outdoors as a classroom for examination and monitoring of wells, streams, wetlands, and the atmosphere to investigate groundwater, soil, surface water, and meteorological interactions.

T173. Geology in the National Parks: Research, Mapping, and Resource Management
Cosponsored by *GSA Geology and Society Div.; National Park Service; GSA Geophysics Div.*
Scientific Category: Geoscience Education; Environmental Geoscience; Geoscience Information/Communication
Bruce Heise, National Park Service, Lakewood, Colo.; Tim Connors, National Park Service, Denver, Colo.; Melanie V. Ransmeier, National Park Service, Denver, Colo.

This session addresses the role of geoscience in the national parks. Presentations are encouraged on geologic research, geologic mapping, paleontology, coastal geology, glacier studies, and resource management in national parks, monuments, seashores, and historic sites.

T174. Teaching and Learning about Complex Earth Systems: Effective Strategies in Undergraduate Classrooms and Teacher Development Programs
Cosponsored by *GSA Geoscience Education Div.; GSA Geology and Society Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Education; Environmental Geoscience; Geoscience Information/Communication
Karen McNeal, Mississippi State Univ., Mississippi State, Miss.; Bruce Herbert, Texas A&M Univ., College Station, Tex.

This session will explore learning challenges and effective pedagogical techniques that facilitate conceptual change and understanding about complex earth systems including inquiry-, multiple representations-, data-, and technology-based methods.

T175. What Should Students be Learning in Our Geology Classrooms?
Cosponsored by *GSA Geoscience Education Div.; National Association of Geoscience Teachers; Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Education
Dexter Perkins, Univ. of North Dakota, Grand Forks, N.Dak.; Karl Wirth, Macalester College, Saint Paul, Minn.

Should we focus our classes and curricula on essential/threshold concepts or on developing thinking, metacognition, and other skills for lifelong learning? Given overcrowded curricula and professional demands, what approach should we use to achieve the right balance?

T176. The Human Connection with Planet Earth: What is it and Why is it Important?
Cosponsored by *National Association of Geoscience Teachers; GSA Geoscience Education Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Education; Geoscience Information/Communication; Public Policy
Suzanne M. Smaglik, Central Wyoming College, Riverton, Wyo.; Edward Nuhfer, California State Univ.–Channel Islands, Camarillo, Calif.

Is there a link between our curiosity about how Earth works and our desire to be connected to it? Explore ways for geoscience educators to nurture a deeper understanding of earth materials and processes.

T177. Disseminating Hands-on Geological Knowledge and Creating a Greater Awareness for the Environment: Emphasis on the Involvement of Undergraduates and K–12 Students (Posters)
Cosponsored by *GSA Geoscience Education Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Education; Geoscience Information/Communication; Environmental Geoscience
Nazrul I. Khandaker, York College (The City Univ. of New York), Jamaica, N.Y.; Stanley Schleifer, York College (The City Univ. of New York), Jamaica, N.Y.

This session is a continuation of our ongoing efforts toward providing an opportunity for undergraduates and high school students to present their research outcomes to geoscience professionals and become better acquainted with current geological and environmental issues and practices as well.

T178. Critical Perspectives on Geohazards in Latin America and the Caribbean and Their Implication for Geoscience Education Research and Practice

Cosponsored by *GSA Geoscience Education Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Geoscience Education; Geoscience Information/Communication; Quaternary Geology

Pablo A. Llerandi-Román, Grand Valley State Univ., Allendale, Mich.

This session explores the current status and potential for geohazards research, teaching, and learning in Latin American and Caribbean nations, focusing on the discussion of geoscience education research and practical approaches at all educational levels.

T179. Geocognition: Researching Student Learning in the Geosciences

Cosponsored by *GSA Geoscience Education Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Geoscience Education; Geoscience Information/Communication

Helen L. King, Higher Education Consultant, Alexandria, Va.; Julie Libarkin, Michigan State Univ., East Lansing, Mich.; Alison Stokes, Univ. of Plymouth, Plymouth, UK

Our comprehension of how students acquire knowledge, skills, and understanding about Earth, and thus progress to becoming expert geoscientists, is limited. This session will present findings from empirical research into how geoscience students learn.

T180. Paleontology through the Ages—Teaching, Learning, or Both

Cosponsored by *Paleontological Society*

Scientific Category: Geoscience Education; Paleontology, Paleoecology/Taphonomy; Paleontology, Biogeography/Biostratigraphy

Michael A. Gibson, Univ. of Tennessee, Martin, Tenn.; Elizabeth Heise, Univ. of Texas, Brownsville, Tex.

This session provides a broad perspective—through time and space—both of the teaching of paleontology and of the learning of paleontology. Moreover, it offers perspective as to what might best guide paleontology education, both formal and informal, through the twenty-first century.

T181. Geology Field Trips in Urban Settings: Making the Most of a "Paved-Over" Landscape

Cosponsored by *GSA Geoscience Education Div.; GSA Structural Geology and Tectonics Div.; GSA Geology and Society Div.; GSA Geophysics Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Geoscience Education; Remote Sensing/Geographic Info System; Environmental Geoscience

Elizabeth Nagy-Shadman, Pasadena City College, Pasadena, Calif.; Aida Awad, Maine Township High School East, Park Ridge, Ill.

Unconventional field trips in urban settings can effectively teach students about geologic features that have been altered by urban development, such as asphalt-covered active fault scarps and hydrologic systems comprised of aqueducts and dams.

T182. Teaching Petrology and Structural Geology in the 21st Century

Cosponsored by *GSA Structural Geology and Tectonics Div.; On the Cutting Edge; GSA Geoscience Education Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Geoscience Education; Structural Geology; Petrology, Igneous

Barbara J. Tewksbury, Hamilton College, Clinton, N.Y.; Jeffrey Ryan, Univ. of South Florida, Tampa, Fla.

This session will showcase innovative and effective classroom, lab, field, and GIS activities for teaching undergraduate petrology and structural geology and for integrating concepts into courses taught in other areas of the undergraduate curriculum.

T183. Best Practices in Distance Education in the Geosciences

Cosponsored by *Gulf Coast Association of Geological Societies*

Scientific Category: Geoscience Education; Geoinformatics; Geoscience Information/Communication

Jacquelyn Hams, Los Angeles Valley College, Valley Glen, Calif.; Nancy McMillan, New Mexico State Univ., Las Cruces, N.Mex.

Can geoscience classes be offered online without sacrificing content? Geoscience instructors will share successful teaching strategies for offering science classes through distance education.

T184. Advances in Using Recent and Emerging Technologies to Facilitate Learning of the Geosciences in the Classroom, Laboratory, and Field

Cosponsored by *Gulf Coast Association of Geological Societies*

Scientific Category: Geoscience Education; Geoscience Information/Communication

Thomas D. Hoisch, Northern Arizona Univ., Flagstaff, Ariz.; Mark Manone, Northern Arizona Univ., Flagstaff, Ariz.

This session presents advances in using recent and emerging technologies, such as pen-based computers, mobile wireless networks, and other technologies to enhance student learning of geosciences in the classroom, laboratory, and field.

T185. Teaching with New Tools: Visualizations, Models, Online Data, Games, and More (Posters)

Cosponsored by *National Association of Geoscience Teachers*

Scientific Category: Geoscience Education; Geoscience Information/Communication

Cathryn A. Manduca, Carleton College, Northfield, Minn.; Karin B. Kirk, Montana State Univ., Bozeman, Mont.; Susan Buhr, Univ. of Colorado, Boulder, Colo.; R. Mark Leckie, Univ. of Massachusetts, Amherst, Mass.

Technology offers new opportunities for teaching geoscience through data access, data visualization and manipulation, and virtual environments. This session will showcase our use of these new tools in geoscience education at all levels.

T186. Using GPS Technology to Bring Geoscience to the Wider Community

Cosponsored by *GSA Geoscience Education Div.; GSA Geology and Society Div.*

Scientific Category: Geoscience Education; Geoscience Information/Communication

Gary B. Lewis, Geological Society of America, Boulder, Colo.

GPS technology is being used to take people to sites of geologic interest around the planet. This session will discuss programs and opportunities for people and organizations to become involved.

T187. Research on Geoscience Teaching and Learning in Experiential Environments

Cosponsored by *National Association of Geoscience Teachers; GSA Geoscience Education Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Geoscience Education

Eric M. Riggs, Purdue Univ., West Lafayette, Ind.; Joe T. Elkins, Univ. of Northern Colorado, Greeley, Colo.

Experiential learning environments (field and laboratory) occupy an important position in geoscience education. This session highlights research advances in data-driven assessment of learning, problem solving, and curriculum design in field, laboratory, immersive, or virtual settings.

T188. Challenges and Experiences of Teaching Geosciences: Perspectives From New Instructors and Teaching Assistants
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Education
Marianne L. Stoesser, McMaster Univ., Hamilton, Ontario; John C. Maclachlan, McMaster Univ., Hamilton, Ontario

This session is intended to be a forum for the exchange of ideas and experiences related to teaching geosciences from the perspective of "early career" instructors, instructional assistants, and teaching assistants.

T189. Classroom Innovations that Facilitate Undergraduate Research in the Earth, Environmental, and Agricultural Sciences (Posters)
Cosponsored by *Council on Undergraduate Research–Geoscience Div.; National Association of Geoscience Teachers; GSA Geoscience Education Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Education
Kathy Surpless, Trinity Univ., San Antonio, Tex.; Kirsten Nicolaysen, Whitman College, Walla Walla, Wash.; Jeffrey Ryan, Univ. of South Florida, Tampa, Fla.

This session seeks to highlight new instructional approaches and innovative classroom uses of research technologies in geoscience, environmental science, and agricultural science courses.

T190. Exploring the Affective Domain in the Geosciences: Going Beyond Basic Facts and Feelings
Cosponsored by *Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Education
Jennifer A. Stempien, Univ. of Colorado, Boulder, Colo.; David McConnell, The Univ. of Akron, Akron, Ohio

Geoscience students have various interests, motivation, and attitudes, collectively considered the affective domain, that can influence cognitive performance. This session focuses on data that illustrate how the affective domain can shape the learning experience.

T191. Quantitative and Qualitative Methods and Results in Geoscience Education
Cosponsored by *GSA Geoscience Education Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Education
Anthony D. Feig, Univ. of Louisiana, Monroe, La.

This session's emphasis is on pure research or research methodology, not classroom strategies or teaching tips. Results of qualitative analysis (phenomenologic, ethnographic, etc.) or numerical analysis (ANOVA, nonparametrics, etc.) of actual data; methodology in educational research.

T192. Professional Society, Organization, Institution, and Federal Agency Achievements Supporting K–12 Teachers and Students
Cosponsored by *GSA Geoscience Education Div.; National Earth Science Teacher Association; GSA Geology and Society Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Education
Michael J. Passow, Lamont-Doherty Earth Observatory of Columbia Univ., Palisades, N.Y.

What works and what doesn't work among efforts by professional societies, organizations, educational institutions, and federal agencies to support K–12 teachers and students.

T193. Undergraduate Research as a Tool in Geoscience Pedagogy
Cosponsored by *GSA Geoscience Education Div.; Council on Undergraduate Research; National Association of Geoscience Teachers; Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Education
Linda A. Reinen, Pomona College, Claremont, Calif.; Jeannette Pope, Depauw Univ.; Andrew Wulff, Western Kentucky Univ., Bowling Green, Ky.

Many colleges and universities are turning to undergraduate research for student instruction and retention. This session seeks to highlight, compare, and share best practices of effective undergraduate research in the earth and environmental sciences.

T194. Undergraduate Research as a Transformative Process for Geoscience Faculty (Posters)
Cosponsored by *Council on Undergraduate Research; National Association of Geoscience Teachers; GSA Geoscience Education Div.*
Scientific Category: Geoscience Education
Lydia K. Fox, Univ. of the Pacific, Stockton, Calif.; Edward Hansen, Hope College, Holland, Mich.

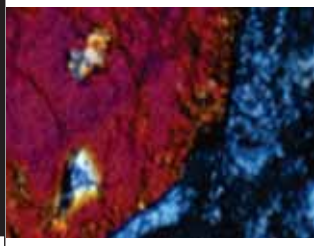
This session will highlight the ways faculty benefit scientifically and professionally from conducting research with undergraduates. Papers covering examples of such projects, as well as assessment and strategies for maximizing the benefits, are welcome.

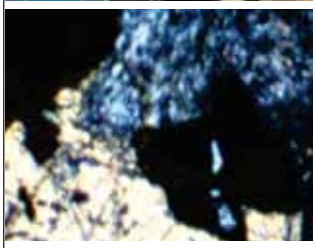
T195. International Research Experiences for U.S. Students: Best Practices, Experiences, and Projects
Cosponsored by *GSA Geology and Society Div.; GSA Geophysics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Education
Elizabeth Catlos, Oklahoma State Univ., Stillwater, Okla.; Ibrahim Çemen, Oklahoma State Univ., Stillwater, Okla.; Estella A. Atekwana, Oklahoma State Univ., Stillwater, Okla.

Discussion of active student-focused international geoscience research programs to define and develop best-practices for future success. We encourage presentations from those who facilitate student involvement in their international collaborations and research.

T196. Geologic Mapping: Digital Methods, 3-D Model Construction, Computational Applications, and Information Dissemination
Cosponsored by *GSA Engineering Geology Div.; GSA Geology and Society Div.; Association of American State Geologists; GSA Structural Geology and Tectonics Div.*
Scientific Category: Geoscience Information/Communication; Engineering Geology; Hydrogeology
A. Keith Turner, Colorado School of Mines, Golden, Colo.; Richard Berg, GSA Geology and Society Div., Champaign, Ill.; Carl W. Gable, Los Alamos National Laboratory, Los Alamos, N.Mex.; L. Harvey Thorleifson, Univ. of Minnesota, St. Paul, Minn.; David R. Soller, USGS, Reston, Va.

This session on digital geologic mapping will encompass 3-D model construction, computational applications such as groundwater models and CO_2 injection, and visualization and Web dissemination for engineering, environmental, and resource applications.





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T197. Geologic Mapping: Innovations and Interoperability (Posters)
Cosponsored by *GSA Geology and Society Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Information/Communication; Engineering Geology; Hydrogeology
Harvey Thorleifson, Univ. of Minnesota, St. Paul, Minn.; David R. Soller, USGS, Reston, Va.; Richard Berg, GSA Geology and Society Div., Champaign, Ill.; Peter Lyttle, USGS, Reston, Va.; Hazen A.J. Russell, Ottawa, Ontario

This poster session will highlight innovations in geological mapping by showing new 2-D and 3-D mapping, strategies for managing data, new methods for map publishing and Web accessibility, new applications, and how digital procedures have advanced the effectiveness of geological mapping.

T198. Libraries in Transformation: Exploring Topics of Changing Practices and New Technologies
Cosponsored by *Geoscience Information Society*
Scientific Category: Geoscience Information/Communication; Geoinformatics; Geoscience Education
Lisa Johnston, Univ. of Minnesota, Minneapolis, Minn.

Information retrieval is rapidly changing how scientific discoveries are made. This session will discuss how these changes affect the way in which geoscience information is created, disseminated, organized, accessed, used, and archived.

T199. Moving Mountains: Data Mining and Digital Repositories in the Geosciences (Posters)
Cosponsored by *Geoscience Information Society; GSA Geophysics Div.*
Scientific Category: Geoscience Information/Communication; Geoinformatics; History of Geology
Lisa Johnston, Univ. of Minnesota, Minneapolis, Minn.

Researchers in the geosciences are continuously uncovering important discoveries in their quest toward understanding our planet. We address the issues of storing and accessing the vast amounts of information from the past, present, and future.

T200. Development of Web-Optimized Geologic Map Data Layers for North America
Cosponsored by *Association of American State Geologists, United States Geological Survey*
Scientific Category: Geoscience Information/Communication
L. Harvey Thorleifson, Univ. of Minnesota, St. Paul, Minn.; David R. Soller, USGS, Reston, Va.

This session will review progress and plans toward Web-optimized geologic map data layers for North America at scales of 1:25M, 1:5M, 1:1M, and 1:100K.

T201. Geoantiquities and Unique Geological Heritage
Cosponsored by *GSA Quaternary Geology and Geomorphology Div.; GSA Geology and Society Div.; GSA Geoscience Education Div.; GSA Geoinfomatics Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geoscience Information/Communication; Quaternary Geology; Geomorphology
John F. Shroder, Univ. of Nebraska, Omaha, Neb.; Marjorie Chan, Univ. of Utah, Salt Lake City, Utah

Geoconservation seeks to protect unusual rock, fossil, and landform sites for education and research as a part of the nation's unique geological heritage. Papers on such sites will provide initial documentation for eventual preservation.

T202. Propagating Geoinformatics and Virtual Globe Resources into the K–12 Environment: Integrating Spatial Earth System Data with Classroom Science for a Future Workforce
Cosponsored by *GSA Geoscience Education Div.; GSA Geoinformatics Div.; GSA Geology and Society Div.; National Association of Geoscience Teachers*
Scientific Category: Geoinformatics; Geoscience Education; Environmental Geoscience
Cathy Connor, Univ. of Alaska Southeast, Juneau, Alaska; Anupma Prakash, Univ. of Alaska, Fairbanks, Alaska

The twenty-first century workforce will use geospatial data and virtual globes for land use planning and management. Integration of this knowledge into the K–12 environment will be essential for science teachers and their students.

T203. Geology and Health Issues in Texas, Mexico, and Beyond
Cosponsored by *GSA Geology and Health Div.; Gulf Coast Association of Geological Societies*
Scientific Category: Geology and Health; Environmental Geoscience; Geochemistry
Robert B. Finkelman, Univ. of Texas at Dallas, Richardson, Tex.

Large rural populations, diverse geology, and varied climate have resulted in a range of regional environmental health issues caused, or exacerbated, by geologic materials and processes. This session will focus on causes and potential solutions.

T204. Wastewater Recycling and Disposal in Diverse Environments: Challenges and Creative Solutions (Posters)
Cosponsored by *EarthScope: Bringing Geology and Geophysics Together to Study the 4-D Evolution of the Lithosphere*
Scientific Category: Geology and Health; Environmental Geoscience; Hydrogeology
Martin Helmke, West Chester Univ., West Chester, Pa.; Russell Losco, Lanchester Soil Consultants, West Grove, Pa.

We encourage abstracts relating to the challenges of characterizing, designing, and installing on-site sewage disposal systems in diverse geologic environments. Case studies, innovative solutions, and regulatory issues are all welcome for this session.

T205. Health and Ecosystem Effects from Dry(ing) Lakes
Cosponsored by *GSA Geology and Health Div.; GSA Hydrogeology Div.; Gulf Coast Association of Geological Societies; GSA Limnogeology Div.*
Scientific Category: Geology and Health; Hydrogeology; Limnogeology
Suzette Morman, USGS, Denver, Colo.

Dry(ing) lakes such as Owens Lake and the Aral Sea are important sources of mineral dusts. This session encourages experts to examine the effects of dusts generated from dry(ing) lakes on human health and ecosystems.

GSA Topical and Discipline Sessions

T206. Geoscience Diversity 2008: Status, Strategies, and Successful Models

Cosponsored by *GSA Geology and Society Div.; GSA Geology and Public Policy Committee; GSA Geoscience Education Div.; Gulf Coast Association of Geological Societies*

Scientific Category: Public Policy; Geoscience Education; Geoscience Information/Communication

Marilyn J. Suiter, National Science Foundation, Arlington, Va.; Roman Czujko, American Institute of Physics, College Park, Md.

A diverse workforce is more capable of providing perspectives and experience that guide our appropriate handling of geosocietal issues. What is the status of geoscience diversity? Are there successful strategies? This session will explore and share successful models.

T207. Alpine Concepts in Geology and the Evolution of Geological Thought

Cosponsored by *GSA History of Geology Div.; GSA Structural Geology and Tectonics Div.; GSA International Div.; GSA Geophysics Div.; National Association of Geoscience Teachers*

Scientific Category: History of Geology; Structural Geology; Tectonics

Yildirim Dilek, Miami Univ., Oxford, Ohio; W.G. Ernst, Stanford Univ., Stanford, Calif.; Giovanni B. Piccardo, Università degli Studi di Genova, Genova, Italy

Many concepts in modern geology, such as nappe tectonics, continental subduction, ophiolites, flysch, molasse, and high- and ultrahigh-*P* metamorphism, have their roots in alpine studies, and these concepts have led to major theories in geology over the centuries. In this session, we will examine the nature, history, significance, and current validity of alpine concepts in the evolution of geological thought and their impact on North American geology.

T208. History of the Influence of Religion on Geology and Geology on Religion

Cosponsored by *GSA History of Geology Div.; GSA Geology and Society Div.*

Scientific Category: History of Geology

Stephen M. Rowland, Univ. of Nevada, Las Vegas, Nev.

Under various cultural circumstances, the relationship between geology and religion has ranged from mutually supportive to antagonistic. Contributors are encouraged to present case studies within this spectrum, ranging from ancient times to the present.

T209. Forensic Geology

Scientific Category: Geology and Health; Environmental Geoscience; Geochemistry

Cherukupalli E. Nehru, CUNY, New York, New York

Interrelationships between forensic science, geology, and health.

SSSA-ASA-CSSA

SYMPOSIA AND SESSIONS

Come see what's happening. Abstracts deadline: 1 April 2008.

SOIL SCIENCE SOCIETY OF AMERICA

Div. S01: Soil Physics
Symposium: Measurements and Modeling of Multiphase Flow and Solute Transport: To Honor the Many Contributions of Dr. Jacob Dane
Symposium: Seeing into the Soil: Noninvasive Characterization of Biophysical Processes in the Soil Critical Zone

Sessions:
- Variably Saturated Flow in Soil and Rock? What's the Same, What's Different?
- Complexity and Scale in the Critical Zone
- Connecting the Dots: Linking Energy and Mass Balance to Soil Morphologic and Stratigraphic Processes
- Colloids and Colloid-Facilitated Transport of Chemicals in the Soil Vadose Zone
- Gas Transport and Parameters in the Soil Vadose Zone

Div. S02: Soil Chemistry
Symposium: Black Carbon in Soils and Sediments: Formation, Stabilization, Abundance, and Environmental Function

Div. S03: Soil Biology & Biochemistry
Symposium: History of Nitrogen Research: The Bremner Factor
Symposium: Microbial Energy Generation from Renewables

Div. S04: Soil Fertility & Plant Nutrition
Symposium: Global Nutrient Cycling
Symposium: Nutrient Cycling in the Production of Bioenergy Crops

Div. S05: Pedology
Symposia listed under Joint Sessions
Session:
• The WRB (World Reference Base for Soil Resources)—Concept and Applicability for Different Scales from Local Soil Survey to Global Earth Observation Systems

Div. S06: Soil & Water Management & Conservation
Symposium: Pedology, Soil Change, and Management Effects on Soil
Symposium: Research Needs to Improve Conservation Models

Div. S07: Forest, Range & Wildland Soils
Symposium: Not only Skin-Deep? Does Soil C Exist and Change below 20 cm?
Symposium: Nutrient Budgets in the Balance—What Have We Learned?

Div. S08: Nutrient Management & Soil & Plant Analysis
Symposium: Soil Testing Requirements in an Increasingly Monitored Environment
Symposium: Defining Success in Nutrient Management Plans

Div. S09: Soil Mineralogy
Symposia listed under Joint Sessions

Div. S10: Wetlands Soils
Symposium: Restored and Created Wetland Functions under Extreme Climate Events
Symposium: Stability of Peatland Soil Carbon Pools and Trace Gas Emissions to Disturbance

Div. S11: Soils and Environmental Quality
Symposia listed under Joint Sessions

AMERICAN SOCIETY OF AGRONOMY

Div. A01: Resident Education
Symposium: Getting High School Students Interested in Science

Div. A02: Military Land Use & Management
Symposium: Maintaining Rural Islands in a Sea of Urbanization
Sessions:
- Mitigating invasive species impacts on military lands
- Subsurface sensing and identification

Div. A03: Agroclimatology & Agronomic Modeling
Symposium: Crop and Soil Modeling, Instrumentation, Remote Sensing, and Precision Agriculture: A Symposium in Honor of John Norman
Symposium: Modeling and Genomics of Crop Phenology
Session:
- Scale and Accuracy in Estimating Water Balance

Div. A04: Extension Education
Symposium: Impact on Agriculture of the Declining Ogallala Aquifer
Sessions:
- Adoption of Sensor Technologies by Growers
- Effective Presentations—Avoiding Death by PowerPoint

Div. A05: Environmental Quality
Symposium: Biogeochemistry of Relationships among Soil Nutrients, Organic Carbon, and Water Quality
Symposium: Soils as a Critical Component of Sustainable Development and Society

Div. A06: International Agronomy
Symposium: Biofuels for Developing Countries—Opportunities and Risks
Symposium: Getting the Word Out: New Models of Community Engagement for Developing and Extending Agricultural Knowledge

Div. A07: Agricultural Research Station Management
Symposium: Crop Production vs. Demand of Different Crops

Div. A08: Integrated Agricultural Systems
Symposium: The Role of Carbon and Energy Budgets in Organic Systems
Symposium: Meeting the Demand for Food, Feed, Fiber, and Biofuels: Impacts and Production Practices

Div. A09: Professional Practitioners
Symposium: Nitrogen Management in Cotton Production
Symposium: The Changing Face of Fertilizer BMPs

Div. A10: Bioenergy and Agroindustrial Systems (Provisional)
Symposium: Sustainability of Bioenergy Feedstock Production Systems

Div. A11: Biometry (Provisional)
Symposium: New Statistical Techniques for the Analysis of Agricultural Experiments

CROP SCIENCE SOCIETY OF AMERICA

Div. C01: Crop Breeding & Genetics
Symposium: Training the Next Generation of Plant Breeders *(half-day symposium)*
Symposium: Breeding for Resistance to Abiotic Stress

Div. C02: Crop Physiology and Metabolism
Symposium: Drought Resistance and Water-Use Efficiency: Experiments and Models

NASA Space Center, Houston.

Div. C03: Crop Ecology, Management & Quality
Symposium: Accelerated Yields: Meeting Increasing Demands
Symposium: Advanced Statistical Procedures for Production Agronomists

Div. C04: Seed Physiology, Production & Technology
Symposium: Distance Learning Educational Opportunities in Seed Science and Technology

Div. C05: Turfgrass Science
Symposium: Using New Technologies to Improve Extension Education
Symposium: The Future of Water: Regulation and Restrictions and Their Impact on Water Utilization

Div. C06: Forage and Grazinglands
Symposium: Challenges to Transforming Forages into Bioenergy Crops
I: Forage Germplasm Resources for Bioenergy Crops
II: Managing Forage Crops for Optimal Bioenergy Yield and Quality
Symposium: Assessing the Multi-Functionality of Grasslands—Future Research Priorities to Address Global Change

Div. C07: Genomics, Molecular Genetics & Biotechnology
Symposium: Medical Agriculture
Symposium: Functional Genomics, Proteomics, and Bioinformatics for Crop Improvement

Div. C08: Plant Genetic Resources
Symposium: Nontraditional Uses for Plant Genetic Resources
Symposium: Potential Effects of Climate and Sea-Level Change on Unique Plant Genetic Plant Resources from Both High-Latitude and Low-Elevation Regions

Z SERIES—SPECIAL SESSIONS

Z01: SSSA-ASA-CSSA Special Sessions *(Invited abstracts only)*
- Department Heads Roundtable
- WACSES Luncheon
- SSSA-ASA-CSSA Graduate Student Lounge
- SSSA-ASA-CSSA Graduate Student Social

Z02: ACS530 Early Career Member *(Invited abstracts only)*
- Managing People and Team Building
- Writing Manuscripts for Publication
- Grant Writing Navigation
- SSSA-ASA-CSSA Early Career Member Social
- NSF Poster Session
- Soils Priority Setting
- Promoting Sustainability through Use of Metrics, Policy, and Education (COSA)

Z03: Water Availability and Use for Biofuel Crop Feedstock and Production *(Invited abstracts only)*

Z04: S205.1 Council on the History, Philosophy, and Sociology of Soils
- Historical Links between Soil Science and Geology

Z05: Minority Student Poster Contest

Submitting An Abstract

Deadline: 3 June 2008

❶ To begin submission, go to https://www.acsmeetings.org/programs/technical/.

❷ The non-refundable abstract submission fee is US$20 for students and US$35 for all others.

❸ Abstracts must be 300 words or less. Do not include the title or authors in the abstract.

❹ Credit card payment must be made at time of submittal or your paper will not be considered for the meeting.

❺ Use the printable receipt option: Print your receipt and retain for your records—receipts will not be available from GSA Headquarters.

Presentation Modes

Select your preferred mode of presentation: oral, poster, or either (no preference). Please note: Program organizers will do their best to accommodate your preferred mode; however, they will override your original mode selection if they feel your paper would fit well in a particular session with other compatible abstracts. The decision of the program organizers is final.

Papers for discipline sessions may be submitted in either oral or poster mode. Papers for topical sessions are to be submitted only in the mode noted in the session description. If a topical abstract is submitted in the incorrect mode, the abstract will be automatically transferred to a discipline session.

Oral Mode: This is a verbal presentation before a seated audience. The normal length of an oral presentation is 12 minutes, plus three minutes for discussion.

Poster Mode: Poster sessions will be scheduled for one full day, and posters are to be posted for the entire day. The presenter is provided with one horizontal, free-standing display board ~8' wide × ~4' high. Precise measurements will appear in the speaker guide, which will be posted on the Web in August. Speakers must be at their poster booths from 4 to 6 p.m., and this will be followed by a reception.

You may present up to TWO volunteered abstracts at the Annual Meeting, as long as one of these abstracts is a poster presentation. This limitation does not apply to, nor does it include, invited contributions to keynote symposia or topical sessions.

Speaker Equipment: The following equipment is provided in each Technical Session room at no charge to speaker: a desktop PC with a Windows XP 2003 operating system, an LCD projector and screen, a laser pointer, a podium with light and microphone, and a speaker timer.

JTPC TO FINALIZE PROGRAM IN LATE JUNE

The Joint Technical Program Committee (JTPC) selects abstracts and determines the final session schedule. All authors will be notified in early July. The JTPC includes representatives from those GSA Associated Societies and Divisions participating in the technical program, and GSA Council approved the JTPC technical program chairs.

SCIENTIFIC CATEGORIES

Determine if your paper would fit in one of the topical sessions. If it doesn't, please submit your abstract for inclusion in the GSA general discipline sessions, as follows:

Archaeological Geology
Coal Geology
Economic Geology
Engineering Geology
Environmental Geoscience
Geochemistry
Geochemistry, Organic
Geoinformatics
Geology and Health
Geomicrobiology
Geomorphology
Geophysics/Tectonophysics/Seismology
Geoscience Education
Geoscience Information/Communication
History of Geology
Hydrogeology
Limnogeology
Marine/Coastal Science
Mineralogy/Crystallography
Neotectonics/Paleoseismology
Paleoclimatology/Paleoceanography
Paleontology, Biogeography/Biostratigraphy
Paleontology, Diversity, Extinction, Origination
Paleontology, Paleoecology/Taphonomy
Paleontology, Phylogenetic/Morphological Patterns
Petrology, Experimental
Petrology, Igneous
Petrology, Metamorphic
Planetary Geology
Precambrian Geology
Public Policy
Quaternary Geology
Remote Sensing/Geographic Info System
Sediments, Carbonates
Sediments, Clastic
Stratigraphy
Structural Geology
Tectonics
Volcanology

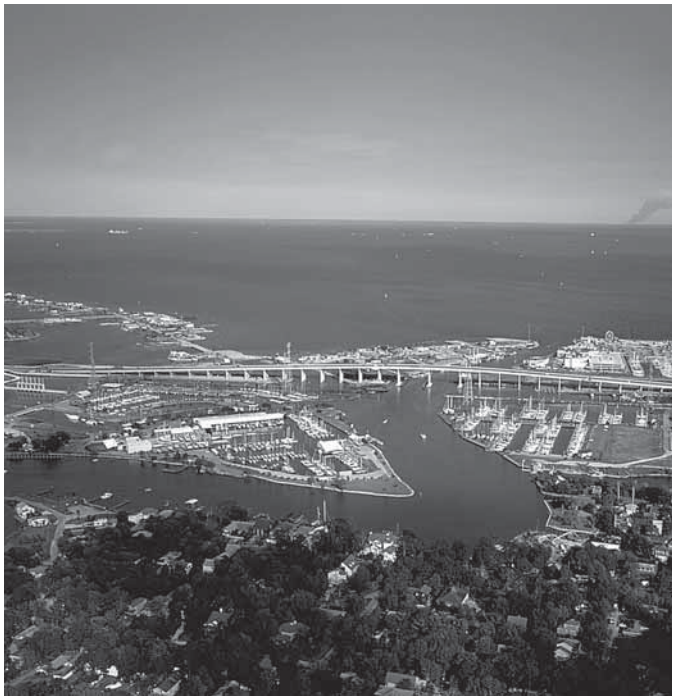
Field Trips

HOUSTON 2008 JOINT ANNUAL MEETING

As you plan your trip to Houston, you may want to budget extra time for a field trip and encourage your friends and colleagues to do the same. Take advantage of this unique occasion to learn about groundbreaking research in the region and explore classic field locations, and have fun!

This year's field trip chair is Gary Moore, lagarto@wt.net, of the Houston Geological Society. Please feel free to contact him or Eric Nocerino at GSA Headquarters, enocerino@geosociety.org, for more information. If you have questions about a particular trip, please contact the trip leaders directly.

The following trips have been selected to demonstrate the wide variety of scientific interests represented at this meeting. Trips range from excursions to rare sites and formations to tours of cutting-edge oil, gas, climate, agronomic, and soil science facilities. Take this opportunity to learn more about astroblemes, moon rocks, coastal depositional processes, karst aquifers, soil morphology, stromatolites and thrombolites, lignite and salt mining, advances in fertilizer and crop technology, geophysical research facilities, the Balcones Fault System, and Big Bend National Park. About one-half of the trips are single and half-day excursions to locations around the Houston-Galveston region. Others span several days and travel to often-overlooked destinations around Texas, Oklahoma, Louisiana, New Mexico, and Mexico.



The Houston bay area. Image courtesy Greater Houston Convention and Visitors Bureau.

PREMEETING

The Southern Extension of the Western Interior Seaway: Geology of Big Bend National Park and Trans-Pecos, Texas. Mon.–Sat., 29 Sep.–4 Oct., Roger W. Cooper, Lamar Univ., Beaumont, Tex., +1-409-755-7244, rogerwcooper@yahoo.com; Dee Ann Cooper.

Platform-Basin Transition and Sequence Stratigraphy of the Permian Rocks, Guadalupe Mountains, West Texas, and Southeastern New Mexico. Wed.–Sat., 1–4 Oct., Michael C. Pope, Washington State Univ., Pullman, Wash., +1-509-335-5989, mcpope@wsu.edu; James R. Markello.

Sequence Stratigraphy and Reservoir Characteristics of the Booch Sandstones, McAlester Formation (Desmoinesian), Arkoma Basin, Oklahoma. Thurs.–Fri., 2–3 Oct., Neil H. Suneson, Mewbourne College of Earth and Energy, Univ. of Oklahoma, Norman, Okla., +1-405-325-3031, nsuneson@ou.edu; Dan T. Boyd; Rick Andrews.

Characterization and Interpretation of Soils and Geologic Formations with Carbonates, Gypsum, and Other Soluble Salts. Thurs.–Sat., 2–4 Oct., Wayne Hudnall, Texas Tech Univ., Lubbock, Tex., +1-806-742-4490, wayne.hudnall@ttu.edu; Lynn Loomis.

Fluvial Systems of East-Central Texas: Responses to Climate and Sea-Level Change over the Past Two Glacial-Interglacial Cycles. Thurs.–Sat., 2–4 Oct., Mike Blum, Louisiana State Univ., Baton Rouge, La., +1-225-578-5735, mike@geol.lsu.edu.

Sedimentology and Structure of Terrestrial to Shallow Marine Outcrops of the Pennsylvanian Mingus Formation, Mineral Wells, Texas. Thurs.–Sat., 2–4 Oct., Janok P. Bhattacharya, Univ. of Houston, Houston, Tex., +1-713-743-4720, jpbattacharya@uh.edu, Russell K. Davies; Karen D. McGowen.

The Texas Grenville Orogen, Llano Uplift, Texas. Thurs.–Sat., 2–4 Oct., Sharon Mosher, Jackson School of Geosciences–Univ. of Texas at Austin, +1-512-471-4135, mosher@mail.utexas.edu; Jamie Levine; Mark Helper.

Examination of a Vertisol Climosequence across the Texas Coast Prairie and its Implications for Interpreting Vertic Paleosols in the Geologic Record. Fri.–Sat., 3–4 Oct., Lee C. Nordt, Baylor Univ., Waco, Tex., +1-254-710-2195, lee_nordt@baylor.edu; Steven G. Driese; Jonathan Wedenfield.

Fault Zone Deformation in Cretaceous Carbonates of Central Texas. Fri.–Sat., 3–4 Oct., David A. Ferrill, Southwest Research Institute, San Antonio, Tex., +1-210-522-6082, dferril@swri.org; Alan P. Morris; Chris Zahm.

Birding the Upper Texas Coast. Sat., 4 Oct., Cyn-Ty Lee, Rice Univ., Houston, Tex., +1-713-348-5084, ctlee@rice.edu.

Geology and Hurricane Rita Effects on the Chenier Plain, Southwestern Louisiana. Sat., 4 Oct., Donald E. Owen, Lamar Univ., Beaumont, Tex., +1-409-835-5848, deowen@my.lamar.edu; Richard A. Ashmore.

Geomorphic and Hydrochemical History of the Edwards Aquifer at Inner Space Cavern. Sat., 4 Oct., Jay Banner, Univ. of Texas at Austin, +1-512-471-5016, banner@mail.utexas.edu; George Veni.

History of Oil and Gas Exploration in Southeast Texas. Sat., 4 Oct., Neal Immega, n_immega@swbell.net.

Hands-on at IODP's Gulf Coast Repository—Authentic Scientific Ocean Drilling Samples and Data for Earth Systems Science Inquiry. Sat., 4 Oct., Leslie Peart, Joint Oceanographic Institutions, Washington, D.C., +1-202-232-3900, lpeart@joiscience.org; Kristen St. John; Debbie Thomas; John Firth.

Sedimentology and Stratigraphy of Modern Coastal Plain Depositional System. Sat., 4 Oct., John Anderson, Rice Univ., Houston, Tex., +1-713-348-4884, johna@rice.edu; J. Michael Boyles; Mark Thomas.

The Origin of the Sandy Mantle and Mima Mounds of the East Texas Gulf Coastal Plain: Geomorphological, Pedological, and Geoarchaeological Perspectives. Sat., 4 Oct., Rolfe D. Mandel, Univ. of Kansas, Lawrence, Kans., +1-785-864-2171, mandel@kgs.ku.edu; Donald L. Johnson; Charles D. Frederick.

DURING THE MEETING

A Field Exercise on Groundwater Flow Using Seepage Meters and Mini-Piezometers. Sun., 5 Oct., David R. Lee, Chalk River Laboratories, Chalk River, Ontario, leed@aecl.ca; Donald O. Rosenberry.

Texas Coastal Systems: K–12 Teachers' Trip to Galveston Island and the Brazos River. Sun., 5 Oct., Alison Henning, Rice Univ., Houston, Tex., +1-713-446-6417, ahenning@rice.edu.

Turfgrass Tour. Sun., 5 Oct., Kurt Steinke, Texas A&M Univ., College Station, Tex., +1-979-862-1412, ksteinke@ag.tamu.edu.

Kirk Bryan Trip—Coastal Geomorphology and Change along the Upper Texas Coast. Tues., 7 Oct., Chris Houser, +1-979-862-8421, chouser@geog.tamu.edu; Jim Gibeaut; Rick Giadrino; Doug Sherman.

Geological and Geophysical R&D in the Oil and Gas Industry: A Tour of ExxonMobil and Shell Research Labs. Tues., 7 Oct., Steve Naruk, Shell International E&P, Houston, Tex., +1-713-245-7249, steve.naruk@shell.com; Peter Vrolijk; Lori Summa.

Hockley Salt Mine I & II. Tues., 7 Oct., Jeff McCartney, jmccartney@unitedbrine.com.

Come Look at the Rocks: The University of Texas Bureau of Economic Geology, Houston Research Center. Tues., 7 Oct., Beverly Blakeney DeJarnett, Bureau of Economic Geology, Houston Research Center, Houston, Tex., +1-713-983-9420, bev.dejarnett@beg.utexas.edu.

Dealing with Active Gulf Coast Growth Faults. Wed., 8 Oct., Carl E. Norman, +1-713-461-7420, dod895@aol.com.

NASA behind the Scenes Moon Rock Tour. Wed., 8 Oct., Charles Sternbach, carbodude@pdq.net.

From Oil Fields to Cornfields, and a Lot More. Wed., 8 Oct., Michael Stewart, International Plant Nutrition Institute, San Antonio, Tex., +1-210-764-1588, mstewart@ipni.net; Ron Olson, Harold Reetz.

Rice Tec and Oilfields to Corn Fields and a Lot More. Wed., 8 Oct., Steve Norberg, Oregon State Univ., Ontario, Oreg., +1-541-881-1417, steve.norberg@oregonstate.edu; Mike Stewart.

POSTMEETING

Environments of Deposition of Texas Lignites: The Good, the Bad, the Ugly. Thurs., 9 Oct., Christopher Mathewson, Texas A&M Univ., College Station, Tex., +1-979-845-2488, mathweson@geo.tamu.edu.

The Formation and Future of the Galveston-Follets-Bolivar Barrier System. Thurs., 9 Oct., John Anderson, Rice Univ., Houston, Tex., +1-713-348-4884, johna@rice.edu; Antonio Rodriguez.

Revisiting Central Texas Late Cambrian Wilberns Stromatolites and Thrombolites. Thurs.–Sat., 9–11 Oct., Andre Willy Droxler, Rice Univ., Houston, Tex., +1-713-348-4885, andre@rice.edu; Jason M. Francis; Wayne Ahr.

Soils and Geomorphology of the Texas Gulf Coastal Plain and Texas Shoreline with Special Emphasis on Hydrology and Coastal Erosion. Thurs.–Sat., 9–11 Oct., C.T. Hallmark, Texas A&M Univ., College Station, Tex., +1-979-845-4678, hallmark@tamu.edu; Susan Casby-Horton.

Galveston Beach. Image courtesy Greater Houston Convention and Visitors Bureau.

The Edwards Aquifer of South-Central Texas. Thurs.–Sat., 9–11 Oct., Geary M. Schindel, Edwards Aquifer Authority, San Antonio, Tex., +1-210-222-2204, gschindel@edwardsaquifer.org; John Hoyt; Steven B. Johnson; Charles Kreitler; E. Calvin Alexander; George Veni; Ronald Green.

The Lower Cretaceous Edwards Formation of Central Texas. Thurs.–Sat., 9–11 Oct., Peter Rose, prose@roseassoc.com.

The Sierra Madera Astrobleme, Pecos County, Texas. Thurs.–Sat., 9–11 Oct., David A. Kring, Lunar and Planetary Institute, Houston, Tex., +1-281-486-2119, kring@lpi.usra.edu.

Upper Cambrian through Lower Ordovician Rocks of the Llano Region. Thurs.–Sun., 9–12 Oct., Emilio Mutis-Duplat, Univ. of Texas, Odessa, Tex., +1-915-552-2243, mutis_e@utpb.edu.

The Sedimentology, Neoichnology, and Preservation Potential of Fluvial-Deltaic and Barrier Island Shoreline Depositional Facies: A Field Trip to the Modern Coastal Shoreline from Freeport to Galveston, Texas. Fri.–Sat., 10–11 Oct., James R. Garrison, Jr., Texas A&M Univ., Corpus Christi, Tex., jgarrison@stx.rr.com; Bo Henk.

Searching for the Mojave-Sonora Megashear in Northeastern Mexico. Fri.–Sun., 10–12 Oct., Gary G. Gray, ExxonMobil Upstream Research Company, Houston, Tex., +1-713-431-4149, gary.g.gray@exxonmobil.com; Timothy F. Lawton; Justin Murphy.

Short Courses

HOUSTON 2008 JOINT ANNUAL MEETING

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Early Registration Deadline: 2 September 2008

Registration information, prices, and course descriptions will be published online at
https://www.acsmeetings.org/programs/short-courses
and in the June *GSA Today*. For additional information, contact Jennifer Nocerino, jnocerino@geosociety.org.

PROFESSIONAL COURSES

Estimating Rates of Groundwater Recharge
4 Oct., Sat., 8 a.m.–5 p.m. Rick Healy, USGS; Bridget Scanlon, Univ. of Texas

Geopressure and Pore Pressure Prediction Fundamentals
4 Oct., Sat., 8 a.m.–5 p.m. Selim S. Shaker, Geopressure Analysis Services Inc.

How to QC and Interpret What Your Petrophysicist Gives You
4 Oct., Sat., 8 a.m.–5 p.m. Elizabeth Fisher, Hess Corp.; Jeff Baldwin, Fugro-Jason

Seismic Amplitude Interpretation
4 Oct., Sat., 8 a.m.–5 p.m. Fred Hilterman, Geokinetics Inc.

Introduction to Geographic Information Systems (GIS) Using ArcGIS for Geological and Environmental Science Applications
4–5 Oct., Sat.–Sun., 8 a.m.–5 p.m. Ann Johnson, ESRI; Mike Price, ESRI; Willy Lynch, ESRI

Seal Analysis Workshop
4–5 Oct., Sat., 8 a.m.–5 p.m.; Sun., 8 a.m.–4 p.m. William C. Dawson, Chevron; William R. Almon, Chevron

Ethics for Geoscientists
5 Oct., Sun., 12–1 p.m. Chris Mathewson, Texas A&M

Parameter Estimation and Uncertainty Analysis Course
9–10 Oct., Thurs., 5 p.m.–9 p.m.; Fri., 8 a.m.–5 p.m. Matthew Tonkin, SS Papadopulos & Associates; John Doherty, Watermark Numerical Computing

FACULTY AND GRADUATE STUDENT COURSES

Brittle Deformation of Crustal Rocks: Insights from Experimentation and Microstructural Studies
2–4 Oct., Thurs., 5–9 p.m.; Fri., 8 a.m.–5 p.m.; Sat., 9 a.m.–5 p.m. Frederick Chester, Texas A&M; Dave Wiltschko, Texas A&M; Judith Chester, Texas A&M; Steve Laubach, Univ. of Texas. *Course to be held at Texas A&M–College Station.*

3-D Visualization in Teaching and Research
3 Oct., Fri., 8 a.m.–5 p.m. Bill Keach, Brigham Young Univ.–Energy and Geoscience Institute, Univ. of Utah; John McBride, Brigham Young Univ.

Sequence Stratigraphy for Graduate Students
3–4 Oct., Fri.–Sat., 8 a.m.–5 p.m. Art Donovan, BP Upstream Technology Directorate; K.M. Campion, ExxonMobil Upstream Research

Education Research I: Conducting Qualitative Geoscience Education Research
4 Oct., Sat., 8 a.m.–noon. Julie Sexton, NSF Center for Learning and Teaching in the West, Colorado State Univ.

Hands-on Tools for Earth Science Inquiry: The Learning with Data Workshop
4 Oct., Sat., 8 a.m.–noon. William Prothero, Jr., Univ. of California at Santa Barbara (emeritus); Sabina Thomas, Baldwin Wallace College

Teaching Darwin
4 Oct., Sat., 8 a.m.–noon. Leo F. Laporte, Univ. of California at Santa Cruz

Using Authentic NASA Earth and Planetary Science Data for Inquiry in Courses for Future Science Teachers
4 Oct., Sat., 8 a.m.–noon. Tim Slater, Univ. of Wyoming; Rick Pomeroy, Univ. of California at Davis; Stephanie Shipp, Lunar and Planetary Institute; Stephanie Slater, Univ. of Wyoming; Lin Chambers, NASA

Multi- and Hyperspectral Remote Sensing for Geologic Applications
4 Oct., Sat., 8 a.m.–5 p.m. William Farrand, Space Science Institute; John Mars, USGS

Starting Out in Undergraduate Research and Education: A Professional Development Workshop for Young Faculty
4 Oct., Sat., 8 a.m.–5 p.m. Jeffrey Ryan, Univ. of South Florida; Lydia Fox, Council on Undergraduate Research; Jill Singer, Council on Undergraduate Research

Teaching Petrology and Structural Geology in the 21st Century
4 Oct., Sat., 8 a.m.–5 p.m. Barbara Tewksbury, Hamilton College; Yvette D. Kuiper, Boston College; Jeffrey Ryan, Univ. of South Florida

Beyond the Content: Teaching Scientific and Citizenship Literacy in the Geosciences
4 Oct., Sat., 9 a.m.–5 p.m. Erin Campbell-Stone, Univ. of Wyoming; James Myers, Univ. of Wyoming

Making the Case for Tenure: A Workshop for Early Career Faculty
4 Oct., Sat., 9 a.m.–5 p.m. Kristen St. John, James Madison Univ.; Heather Macdonald, College of William and Mary

The Use of GPS, LiDAR, and InSAR Data to Learn about Plate Tectonics, Crustal Deformation, Isostasy, and Ice Flow: A Short Course for Faculty at Two- and Four-Year Institutions
4 Oct., Sat., 9 a.m.–5 p.m. Helmut Mayer, UNAVCO; Susan C. Eriksson, UNAVCO; Shelley Olds, UNAVCO

Writing and Evaluating Geoscience Concept Inventory Questions
4 Oct., Sat., 9 a.m.–5 p.m. Julie Libarkin, Michigan State Univ.; Steven W. Anderson, Univ. of Northern Colorado

An Introduction to Improving Your Teaching by Conducting Science Education Research in Your Classroom
4 Oct. Sat., 1–5 p.m. Tim Slater, Univ. of Wyoming; Julie Libarkin, Michigan State Univ.; Stephanie Slater, Univ. of Wyoming

Education Research II: Conducting Quantitative Geoscience Education Research
4 Oct., Sat., 1–5 p.m. Julie Sexton, NSF Center for Learning and Teaching in the West, Colorado State Univ.; James J. Dugan, Research and Development Center for the Advancement of Student Learning, Colorado State Univ. and Poudre School District

Visualization in Geoscience Education: The Power of Immersive Environments
4 Oct., Sat., 1–5 p.m. Alison Stokes, Experimental Learning in Environmental and Natural Sciences Centre for Excellence in Teaching and Learning (EL CETL); Helen King, Independent Consultant

Your First Steps in the Profession and the Future
4 Oct., Sat., 1–5 p.m. Robert A. Stewart, LFR Inc.; Raymond Talkington, Geosphere Environmental Management Inc.

Introduction to the Petroleum Geology of Deepwater Settings
4–5 Oct., Sat.–Sun., 8 a.m.–5 p.m. Paul Weimer, Univ. of Colorado

Teaching Field Methods in Geology Using Rugged Tablet Computers, GPS, and Digital Data
5 Oct., Sun., 8 a.m.–5 p.m. Mark Manone, Northern Arizona Univ.; Peter Knoop, Univ. of Michigan

The WRB (World Reference Base for Soil Resources)—An International Soil Classification System
5 Oct., Sun., 8:30 a.m.–12:30 p.m. Peter Schad, Technische Univ. München; Erika Micheli, Szent Istvan Univ.

Teaching Introductory Geoscience Using Lecture Tutorials
5 Oct., Sun., 1–5 p.m. Karen Kortz, Community College of Rhode Island and Univ. of Rhode Island; Jessica Smay, San José City College

Fundamentals of Seismic Structural Analysis and Hydrocarbon Entrapment Analysis for Graduate Students
9–10 Oct., Thurs.–Fri., 9 a.m.–5 p.m. Peter Vrolijk, ExxonMobil Upstream Research Co.; Peter Hennings, Conoco-Phillips; Franco Corona, ExxonMobil; Steve Davis, ExxonMobil

Structural and Stratigraphic Concepts Applied to Basin Exploration
9–10 Oct., Thurs.–Fri., 9 a.m.–5 p.m. Lori L Summa, ExxonMobil Exploration Co.; Bob Stewart, ExxonMobil Exploration Co.

K–12 TEACHER COURSES

Professional Development in Earth Science for Teachers Grades 3–8 (K–12 Welcome)
3 Oct., Fri., 8 a.m.–4:30 p.m. Janie Schuelke, Consultant

Discovering Plate Boundaries for Middle and High School Teachers
3 Oct., Fri., 1–5 p.m. Dale Sawyer, Rice Univ.

ALLIED & ASSOCIATED SOCIETIES

An Introduction to Petroleum Geology for Students
3 Oct., Fri., 8 a.m.–5 p.m. Stephen L. Bend, Univ. of Regina

Epigenic and Hypogenic Karst: Recognizing Each and Their Implications in Research and Management
4 Oct., Sat., 8 a.m.–noon. George Veni, National Cave and Karst Research Institute; Kevin Stafford, New Mexico Institute of Mining and Technology

Where We Are Going?—Major Research Topics and New Research across Paleontology
4 Oct., Sat., 8 a.m.–5 p.m. Patricia H. Kelley, Univ. of North Carolina–Wilmington; Richard K. Bambach, Smithsonian National Museum of Natural History

Introduction to Petroleum Geology for Faculty
4–5 Oct., Sat.–Sun., 8 a.m.–5 p.m. Stephen L. Bend, Univ. of Regina

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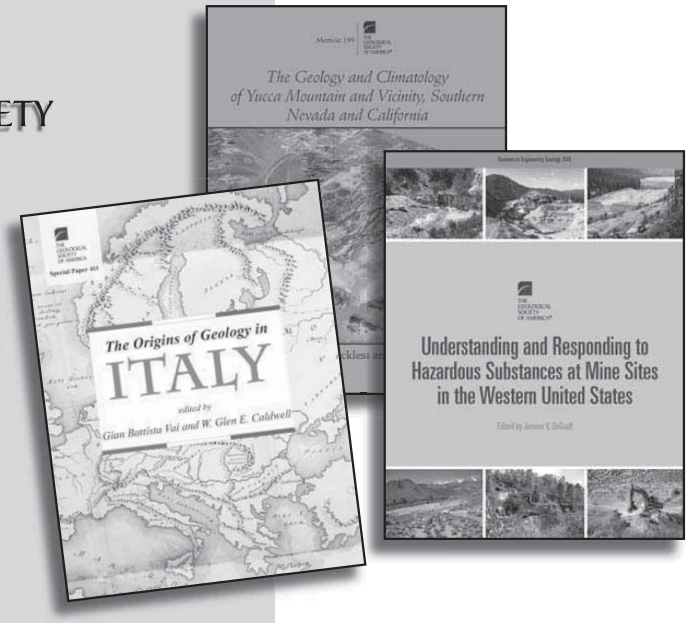

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GSA Mentor Programs

Find full program descriptions at
www.geosociety.org/science/.
For additional information, contact Jennifer Nocerino
jnocerino@geosociety.org.

WOMEN IN GEOLOGY

Sun., 5 Oct., noon–1:30 p.m.

SUBARU

This new mentoring program, sponsored by Subaru, will address the issues faced by women in geology. This social hour begins with a few key women speakers, followed by a relaxing forum for socializing, sharing ideas, and meeting other women in geology. Appetizers will be provided. Registration is not required.

GEOLOGY IN GOVERNMENT

Mon., 6 Oct., 11:30 a.m.–1 p.m.

FREE lunch for undergraduate and graduate students. This popular annual event features a select panel of mentors representing various government agencies who will invite questions from students, offer advice about preparing for a career, and comment on the prospects for current and future job opportunities within their agencies. Registration is not required.

GEOLOGY IN INDUSTRY

Tues., 7 Oct., 11:30 a.m.–1 p.m.

FREE lunch for undergraduate and graduate students. This event features a select panel of mentors representing various industries who invite questions from the students, offer advice about preparing for a career in industry, and comment on the prospects for current and future job opportunities within their companies. Registration is not required.

JOHN MANN MENTORS IN APPLIED HYDROGEOLOGY PROGRAM

This program underwrites the cost for up to 25 students to attend the distinguished Hydrogeology Division Luncheon and Awards Presentation. **Eligible students are those who have (1)** checked the box on their membership application indicating their professional interest in hydrology/hydrogeology, AND **(2)** registered for the 2008 Joint Annual Meeting **by 2 Sept. 2008.** The lucky ticket recipients will have the chance to meet with some of the nation's most distinguished hydrogeologists. Tickets will be awarded to the first 25 students who respond to an **e-mail invitation**, based on the eligibility criteria above. Date TBA. **Registration required**.

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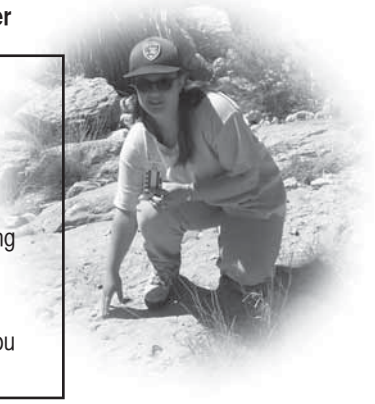

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GSA EMPLOYMENT SERVICE CENTER

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At our upcoming joint annual meeting in ***Houston on 5–9 October 2008,*** GSA's **Employment Service Center** will team up with the Soil Science Society of America–American Society of Agronomy–Crop Science Society of America's **Career Placement Center** to offer extraordinary opportunities for job seekers and employers.

Both centers will be in the same location and served by one joint registration area. However, each center will manage its own interview schedules, résumé databases, and job postings. As with previous annual meetings, job seekers and employers will continue to receive the same high quality of service. Please join us and take advantage of this wonderful opportunity.

Sign up for either one and reap the benefits of both!

For GSA's center, go to
www.geosociety.org/Employment_Service/.
For the Soil Science Society of America–American Society of Agronomy–Crop Science Society of America's center, go to
https://www.careerplacement.org/.

There's more…

The American Association of Petroleum Geologists Student Expo, 8–9 October 2008, coincides with our meeting.

Go to **http://studentexpo.info/** for details.

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Registration

Houston 2008 Registration Information

IMPORTANT DEADLINES

Early Registration: 14 July
Standard Registration: 2 September
Cancellation: 8 September

Online registration begins in early June. Check the June *GSA Today* and www.geosociety.org in early June for more information. A single-day registration fee will be available onsite.

REGISTRATION FEES

All fees are in U.S. dollars	Early Bird	Standard	Late/Onsite
	June–14 July	by 2 Sept.	after 2 Sept.
Prof. Member—full meeting	$320	$375	$450
Prof. Member—two days	$225	$250	$325
Prof. Member >70—full meeting	$255	$280	$340
Prof. Member >70—two days	$200	$225	$250
Prof. Nonmember—full meeting	$415	$495	$595
Prof. Nonmember—two days	$270	$325	$400
Student Member—full meeting	$115	$140	$175
Student Member—two days	$110	$125	$150
Student Nonmember—full meeting	$150	$175	$225
Student Nonmember—two days	$125	$140	$165
High School & SASES* Student	$50	$50	$50
K–12 Teacher—full meeting	$50	$60	$65
Field Trip or Short Course Only	$40	$45	$50
Guest or Spouse	$80	$90	$95

Each meeting registrant will recieve a copy of the *Abstracts with Programs* on CD-ROM (Field Trip– or Short Course–only and guest registrants excluded). The 2008 Section Meeting Abstracts are also included on the CD.
*Students of Agronomy, Soils and Environmental Sciences

STUDENT TRAVEL FUND

You can make a difference!

Contribute to the Student Travel Fund via your registration form and make it possible for more students to attend the 2008 Joint Annual Meeting in Houston! 100% of the contributions received will go to help fund student travel.

LODGING

It's going to be a packed meeting in Houston with all the societies attending, so we strongly recommend you make your hotel reservations early!

The 2008 Joint Annual Meeting headquarters hotel is the new Hilton Americas Houston. Most activities will take place at the George R. Brown Convention Center in Houston and the Hilton Americas Houston. Houston offers high quality, affordable hotels near the convention center. The Joint Annual Meeting societies have booked rooms at eleven hotels, offering special convention rates starting at US$129.00 per night. Additional housing information will be included in the June *GSA Today* as well as on the meeting Web site, **www.acsmeetings.org/2008/** beginning in June.

5K FUN RUN/WALK

Hosted by
The American Society of Agronomy
Tuesday, 7 October 2008, 6:45 a.m.
Cost: US$20

All attendees, guests, and friends are invited to join us for the 2008 Joint Annual Meeting 5K Fun Run/Walk! The run/walk will take place at Buffalo Bayou, on the west side of downtown. The Bayou's jogging and walking trails are within 1 mile of convention hotels. Meet at 6:30am for check-in; the run/walk begins at 6:45am. Participation t-shirts and refreshments will be provided at the completion of the race.

Panel Seeks Input on GSA Water Resources Position Statement

Please submit your comments and suggestions regarding the content of the following *position statement draft* by **11 April 2008** to David M. Diodato at either ddiodato@TheHydrogeologist.com or +1-703-235-4473. Go to www.geosociety.org/postions/ to learn more.

Access to a safe and reliable supply of fresh water is vital to life and critical to economic security. Humans, agriculture, energy, and ecosystems all depend on the fresh water stored in surface-water bodies and groundwater. Changing population demographics, natural variability of the hydrologic cycle, and the impacts of climate change pose significant challenges to ensuring that water of sufficient quantity and quality is available where and when it is needed. Worldwide, energy production and agriculture are the largest current users of fresh water resources, and future needs will be greater. Increased biofuels and oil sands production increase water demand and may significantly degrade water quality. Inadequate water supply can lead to human disease and death, drought, fire, landscape and ecosystem degradation, habitat and species loss, and severe socioeconomic disruption. Mitigation of present-day water shortages and management of future water resources requires broad, sustained effort and active collaboration of scientists, engineers, managers, policy makers, and the public.

In nature, water resources are distributed in geologically and topographically defined hydrologic basins. Hydrologic systems are often coupled—water flows between surface water and groundwater. For example, a stream may lose water to an underlying aquifer in a highland and gain water from an aquifer in a lowland. For months at a time, the water flowing in many perennial streams and rivers is dominantly groundwater discharge. Reservoirs constructed on rivers nationwide provide stable water supplies and lessen the impacts of the natural variability of the hydrologic cycle, including droughts and floods. However, in many regions, surface-water resources are absent or insufficient, and populations throughout North America rely exclusively on a safe and reliable supply of groundwater. Whether relying on surface water, groundwater, or a combination, every region of the United States faces ongoing challenges in ensuring a safe and reliable supply of fresh water.

Scientists, engineers, and managers seek to better understand, assess, and manage water resources. They must also strive to share their knowledge with the public and to understand the public's information needs and concerns. An additional burden on policy makers and the legal system is to be cognizant of the natural distribution and variability of water resources and to actively identify sustainable approaches when laws, compacts, or treaties are not consistent with that natural distribution or variability of water resources.

Implementation

Ensuring water resources availability requires a public-private partnership that (1) enhances data collection, management, and accessibility; (2) improves fundamental scientific understanding and analyses; (3) increases stakeholder involvement; and (4) broadens education and outreach.

New hydrologic data are needed to improve water resource assessments and management and to reduce uncertainty where data are sparse. Current hydrologic data and monitoring capabilities must be maintained, and new data sets and collection capabilities (e.g., using satellites) must be developed. Data collection should occur at the frequency and scale needed to support model analyses and decision-making and be automated to the maximum practical extent. Data collection and management should be organized by hydrologic basins and be readily accessible.

Improved fundamental understanding of the quantity, quality, distribution, and use of water resources will lead to more reliable and useful water resource assessment and management tools. Improved representation of geological, biological, and ecological systems—including underlying physical and chemical processes and their interactions—is required. More complete understanding is needed in the areas of climate change, the role of soil moisture in the hydrologic cycle, and surface-water–groundwater interaction. Risk-based analyses yielding quantitative uncertainty estimates can optimize data acquisition and enhance the scientific and socioeconomic basis of decision making for water resources management.

Water resource professionals and stakeholders must collaborate to identify information needs and to jointly develop water resource management plans. Stakeholders include water managers, water users, policy makers, regulators, and the public. Place-based science with stakeholder involvement increases professional and stakeholder understanding and can reduce bias and enhance decision making.

Public education, a critical enabling element of effective water resource management, is needed to foster partnership and collaboration among local, state, and federal governments; educational and research institutions; energy, industrial, and agricultural users; and the public. Media outreach and education may enhance the effectiveness of communications.

Background

Humans need water to sustain life. In the absence of water, ecosystems and economies collapse—such collapses are preserved in prehistoric and geologic records. In recent years, in drought-stricken Somalia, people have been killed for their water wells. In the United States, drought is a routine annual occurrence, varying only in intensity and locale, and more severe and prolonged droughts are forecast. For example, the National Oceanic and Atmospheric Administration estimates that by 2050 the average moisture conditions in the southwestern United States will rival the worst conditions observed in major droughts of the 20th century—even without considering the effects of global warming. Shifting population centers and changes in energy and agricultural production are placing increased demands on

hydrologic systems—demands those systems may be unable to meet. Averting foreseeable and severe consequences of water shortages requires a sustained, focused, and collaborative effort among scientists, engineers, and stakeholders.

Subject to both short-term changes in weather and to long-term changes in climate, the hydrologic cycle has a natural variability that is tempered by storage in hydrologic basins composed of one or more surface-water and groundwater flow systems. Sometimes spanning geopolitical boundaries, geologically and topographically defined hydrologic basins are a natural facet of water resources assessment and management. Global climate change will continue to diminish the availability of safe and reliable water supplies in both surface water and groundwater, and increased drought and increased flooding are foreseeable hydrologic consequences. Prediction of the magnitude, timing, and location of hydrologic impacts of global climate change is hampered by current incomplete understanding of complex feedback mechanisms that control interactions of the atmosphere, the hydrosphere, the biosphere, and the land surface. Water-sensitive ecosystems can serve as sentinel sites and, if studied and monitored, help to improve the understanding of the processes and risks of climate change.

Water quality is threatened by a growing list of environmental pollutants, and water-related disease is the leading cause of death in the world. Degraded water quality often results from reduced water quantity. Cost-effective and reliable hydrologic monitoring technologies are available; yet, the lack of comprehensive and reliable data from many groundwater and surface-water hydrologic systems in the United States and around the world hampers water resources assessment and management. To improve the reliability and reduce the uncertainty of scientific analyses supporting water resources management and policy decisions, existing data must be enhanced and new data must be collected at spatial and temporal scales relevant for analysis and decision making.

Access to safe and reliable water resources is an international issue. For example, the current Australian drought, the worst in that nation's history, poses severe political and economic challenges for the world's third leading grain exporter, where the harvest has fallen by 35%. On the African continent, Lake Chad, once the world's sixth largest lake, is now less than one-twentieth of its extent in the 1960s. Lake Tanganyika, the world's third largest lake, has dropped five feet in five years, severely impacting central Africa and affecting the flow of the Nile River, a lifeline for more than 100 million people.

Sustaining present population growth and socioeconomic development and mitigating foreseeable severe water-related impacts requires development and implementation of broad, outcome-oriented water resources science policies and initiatives. In turn, improved water resources science and decision making requires more and better data, increased fundamental understanding, more effective stakeholder interaction, and public education. Risk-based analyses can serve as communication tools, helping both stakeholders and decision-makers to gain increased understanding of important factors and their relative significance. Absent such analyses and the data to support them, many critical water resource decisions are based on inadequate information and limited understanding.

Boulder Reservoir, Boulder, Colorado. Photo by K.E. Asmus.

2007–2008 Congressional Science Fellow Report

Is it Really "Gridlock" if It's by Design?

Maria Honeycutt

The close of the first session of the 110th Congress brings a pause in what has been an active and often contentious period on Capitol Hill. The recess also brings me a much-needed opportunity to catch my breath and reflect on my first few months working in the office of Senator Bill Nelson (D-Fla.) as the newest GSA-USGS Congressional Science Fellow.

As I anticipated, being a native Washingtonian (yes, there really is such a thing) and a former government contractor somewhat eased my transition into the culture and frenetic pace of Capitol Hill. While I was familiar with having to produce the best work possible under ambitious deadlines, nothing truly prepares you for the first time you hear something you've written broadcast on live television. Most surprising, however, has been the extent to which this adventure has challenged many of my lifelong perceptions of my hometown and taught me how our government finds a way to function, often in spite of itself.

It seems only yesterday that I was beginning the fellowship orientation sponsored by the American Association for the Advancement of Science. The two-week session oscillated between two vastly different outlooks on Washington and the future of science, technology, and research and development in the United States. It was exciting to be immersed in the inner workings of our representative democracy and hear how scientists are contributing meaningfully to policy. At the same time, much of what we heard from speakers and former fellows described a federal government overshadowed by geopolitical and economic challenges and strong partisanship. Though certainly not intended to dampen our enthusiasm for the fellowship, the orientation provided a valuable reality check.

One of the key concepts discussed during orientation was that the federal government (especially the legislative branch) was not so much designed to create laws, but rather to prevent "bad" laws from being enacted. Of course, what constitutes a "bad" law is a matter of opinion. That said, when one considers the multitude of procedural steps and potential stumbling blocks that a bill must clear in both chambers of Congress, with the president, and (once enacted) in the courts, it seems the founders of this country wanted the lawmaking process to be difficult. In the ideal case, laws that are enacted should be well thought out and have broad support—geographically, politically, and otherwise.

After considering this take on the founders' intent, the term "gridlock in Washington" took on a completely new meaning for me. Out of the thousands of bills introduced in each Congress, only a few hundred actually become law. The vast majority of these have noncontroversial purposes; as the press like to point out, Congress is very effective at naming post offices and congratulating sports teams. When it comes to the meaty, complicated, and contentious issues of the day, the pace of progress slows considerably. Rather than seeing the lack of new laws or programs as the failure of government to do its job, one could argue that the system appears to be working as designed, preventing the imposition of ill-conceived or very narrowly supported proposals.

That's not to say that the system is working particularly well in addressing the nation's needs. In my few months on the Hill, far more time seems to be spent on procedural maneuvers to delay or stop controversial bills for political reasons rather than to engage in substantive debate. As we saw with record-breaking frequency in 2007, controversial matters rarely moved forward in the Senate unless a 60-person, bipartisan majority voted to avoid a filibuster. These days, the mere threat of a filibuster or presidential veto is often enough to stop a bill dead in its tracks. I'm not a constitutional scholar by any means, but I don't think this is what the founders had in mind.

So what does this all mean? Is Washington really gridlocked? Is it unreasonable to expect our elected leaders to make rapid progress on the problems we sent them to Washington to solve? If scoring political points has become the paramount concern, is there any real way to make headway on tough issues and ensure that sound science factors into the process? Could I, in good faith, encourage other scientists and engineers to devote more of their time to public policy matters given the challenges that now exist?

I certainly don't have answers to all of these questions today, nor may I ever. Nonetheless, as I reflect on these first few months of the fellowship, I have found many reasons to remain optimistic that our government can tackle difficult issues and that the need for scientific input on policy has seldom been greater.

As we've seen with the recent congressional action on greenhouse gas emissions and climate change, progress can be made in this system if you have the right combination of patience, persistence, and creativity. Every day, lawmakers are developing new ideas to address the causes or impacts of climate change. A multitude of bills are working their way through congressional committees, and science is key in the evaluation of

the potential effectiveness of each proposal for reducing climate change and/or its impacts.

A prime example is the Lieberman-Warner America's Climate Security Act, which was approved by the Senate Committee on Environment and Public Works in December. This complex legislation, which would establish a cap-and-trade system for greenhouse emissions, is on track to be the first comprehensive climate change bill to be considered by the full Senate. You can bet there will be many attempts to amend this bill, and some changes will likely be incorporated in hopes of securing broad support sufficient to avoid a filibuster of the final measure.

Even if the Lieberman-Warner bill does not ultimately pass the Senate, I believe its progress illustrates that the Founders' system is, for the most part, working. Though the lawmaking process is imperfect and vulnerable to political maneuvering, it is only through intense scrutiny and improvement by compromise that we give ourselves the best chance of enacting good laws. From what I've seen thus far, there's hope for us yet.

This manuscript is submitted for publication by Maria Honeycutt, 2007–2008 GSA–U.S. Geological Survey Congressional Science Fellow, with the understanding that the U.S. government is authorized to reproduce and distribute reprints for governmental use. The one-year fellowship is supported by GSA and by the U.S. Geological Survey, Department of the Interior, under Assistance Award No. 07HQGR0140. The views and conclusions contained in this document are those of the author and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. government. Honeycutt can be reached at maria_honeycutt@billnelson.senate.gov.

DON'T FORGET TO VOTE!

You should have a postcard with instructions for accessing our secure Web site and your electronic ballot. Please make your wishes known by voting for the nominees listed here.

Ballots Due:
13 April 2008

THE GEOLOGICAL SOCIETY OF AMERICA®

JULY 2008 OFFICER AND COUNCILOR NOMINEES

PRESIDENT
(July 2008–June 2009)
Judith Totman Parrish
University of Idaho
Moscow, Idaho, USA

VICE PRESIDENT
(July 2008–June 2009)
Jean M. Bahr
University of Wisconsin–Madison
Madison, Wisconsin, USA

TREASURER
(July 2008–June 2009)
Robbie R. Gries
Priority Oil & Gas LLC
Denver, Colorado, USA

COUNCILOR Position 1
(July 2008–June 2012)
Brian R. Pratt
University of Saskatchewan
Saskatoon, Saskatchewan, Canada

Víctor A. Ramos
Universidad de Buenos Aires
Buenos Aires, Argentina

COUNCILOR Position 2
(July 2008–June 2012)
Antonio Arribas Jr.
Newmont Mining Company
Castle Rock, Colorado, USA

Murray W. Hitzman
Colorado School of Mines
Golden, Colorado, USA

COUNCILOR Position 3
(July 2008–June 2012)
Janet S. Herman
University of Virginia
Charlottesville, Virginia, USA

Claudia I. Mora
University of Tennessee–Knoxville
Knoxville, Tennessee, USA

DENVER 2007 EVALUATION SURVEY RESULTS

Annual Meeting Attendees: GSA is Listening!

Christa Stratton, *GSA Marketing Manager*

RESPONDENTS:

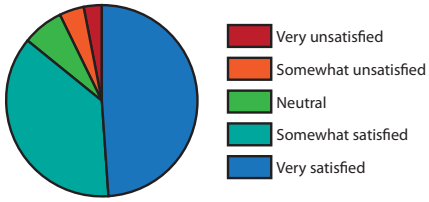
- 17% nonmembers
- 83% members

professionals	48%
students	34%
teachers	1%

Participation: The response rate was 29% (1,587 surveys were completed out of 5,391 successful e-mails).

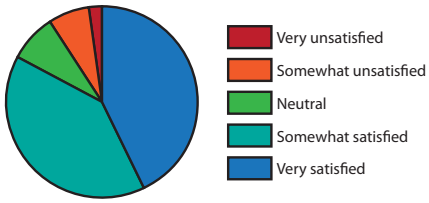
MEETING QUALITY & OVERALL PERSONAL EXPERIENCE

97% of survey respondents indicated that they would attend another GSA meeting, and 96% would recommend the GSA Annual Meeting to their colleagues.

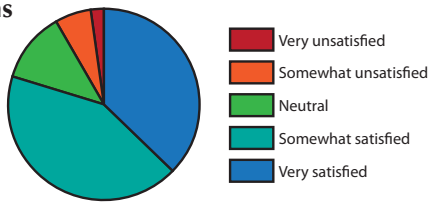


SCIENTIFIC PROGRAM

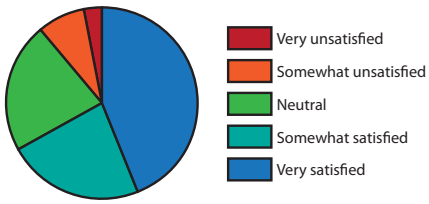
Oral Sessions



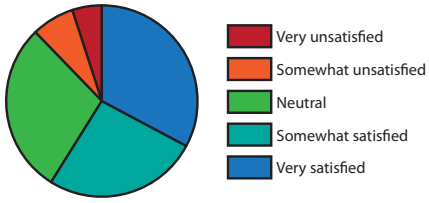
Poster Sessions



Field Trips



Short Courses



The combined "very satisfied" and "somewhat satisfied" scores for both Field Trips (67%) and Short Courses (59%) are up substantially from past years.

RESPONDING TO YOUR COMMENTS

Following are some selected survey themes with a GSA response.

Technical Session Scheduling

The master schedule of sessions is a jigsaw puzzle assembled by the Technical Program chair with input from Joint Technical Program Committee (JTPC) members. More than 230 sessions (176 oral in Denver) must fit into ~22 session rooms over four days. Consideration must also be given to conflicting Division and Associated & Allied Society events, such as business meetings, receptions, and award presentations. It is a huge job; conscientious volunteers do their best to create a cohesive and workable schedule. With more than 6,000 attendees, each with personal and varied interests, conflicts will undoubtedly occur. GSA will continue to try to do the best possible job each year.

Full Day Poster Sessions

GSA plans to leave posters up for a full day beginning with the 2008 joint meeting in Houston.

Denver: Love It or Leave It

Inevitably, the choice of the Annual Meeting city in any given year will please some, but not all, attendees. GSA Council has directed that, in general, the Annual Meeting be held on a three-year rotation in eastern North America, Denver, and western North America. City selection is cemented years ahead of the meeting date and is based on careful consideration of geographical accessibility, convention center size (number of meeting rooms) and availability, surrounding hotel space and contract flexibility, restaurant amenities, field trip possibilities, transportation networks, and overall cost.

Technical Program Start: Sunday versus Monday

Like the city, our meeting dates are reserved years in advance and are not adjustable in the short term. The technical program used to be Monday–Thursday, with special sessions held on Sunday. The switch to a Sunday–Wednesday schedule was implemented in 2002 in order to accommodate faculty members who expressed the desire to take less time off from their classroom duties to attend. A segment of attendees who work in industry echoed the same concerns. The Sunday start also better accommodates a Saturday-night stay in the destination city, which helps lower airfares. GSA meeting dates are always open to review, but 2012 would be the first year that change could be effected if the decision to change were made today.

Hotels/Convention Center/Amenities

When occasional problems occur with convention bureau staff, hotels, and caterers, GSA meeting attendees can rest assured that GSA addresses these complaints with the responsible parties. We have the same expectations as our attendees—that our business is important enough to warrant consideration and remedy. GSA's ongoing business relationship with many cities and venues extends a sphere of economic influence that encourages quick attention to needed service improvements.

Daycare

GSA reinstated a daycare option in 2006 after survey feedback told us it was an important service for many attendees. Plans are to continue this service option for parents with young children.

AV Support for Speakers

We hold our contracted providers accountable for a high standard of service. GSA changed AV vendors in 2007 after encountering problems at the Philadelphia meeting. Our current provider is aware of all of the issues and is committed to providing outstanding service in 2008 and beyond.

Technical Program Content

The GSA technical program is built from the ground up. If you don't see your science at the meeting, bring it! Submit a session proposal, call your colleagues, and participate. The GSA Annual Meeting is *your* meeting. GSA Divisions and Associated Societies work to promote participation and encourage underrepresented disciplines. Ultimately, however, the breadth of the meeting depends upon GSA Members and their colleagues to bring cutting-edge science to the geoscience community.

Once the program of sessions is in place, GSA employs an abstract review system, and a few abstracts are declined each year. Presentations will be as individual as those who present; GSA is committed to providing a forum for the vital and relevant exchange of ideas.

THANKS!

The GSA staff and Annual Program Committee appreciate your expressions of thanks and commendation in the annual meeting evaluations surveys. We want you to know that we will always strive to serve you with professionalism, using all of the resources we have at our disposal. Your suggestions are always welcome, so keep those cards and letters coming!

Section Meeting & Mentor Program Calendar

SOUTHEASTERN 10–11 April

Hilton Charlotte University Place, Charlotte, North Carolina

www.geosociety.org/sectdiv/southe/08mtg/

Local Committee chair: Andy R. Bobyarchick, +1-704-687-5998, arbobyar@uncc.edu.

Shlemon Mentor Program Luncheons:

Thurs.–Fri., 10–11 April, 11:30 a.m.–1:00 p.m.

Mann Mentors in Applied Hydrogeology Program:

Thurs., 10 April, 5–6:30 p.m.

NORTH-CENTRAL 24–25 April

Casino Aztar, Evansville, Indiana

www.geosociety.org/sectdiv/northc/08mtg/

Local committee chairs: Paul K. Doss, +1-812-465-7132, pdoss@usi.edu; John P. Szabo, jpszabo@uakron.edu.

Shlemon Mentor Program Luncheons:

Thurs.–Fri., 24–25 April, 11:30 a.m.–1:00 p.m.

Mann Mentors in Applied Hydrogeology Program:

Thurs., 24 April, 5–6:30 p.m.

Mentor programs are sponsored by the GSA Foundation.

UPCOMING DEADLINES

APRIL

Don J. Easterbrook Distinguished Scientist Award* (Quaternary Geology and Geomorphology Division)—Nominations due 2 April 2008 to Lisa L. Ely, Dept. of Geological Sciences, 400 E. University Way, Central Washington University, Ellensburg, WA 98926, USA, +1-509-963-2821, ely@cwu.edu.

Farouk El-Baz Award for Desert Research* (Quaternary Geology and Geomorphology Division)—Nominations due 2 April 2008 to Marith C. Reheis, U.S. Geological Survey, MS 980, Federal Center, P.O. Box 25046, Denver, CO 80225-0046, USA, +1-303-277-1843, mreheis@usgs.gov.

National Awards*: William T. Pecora Award, National Medal of Science, Vannevar Bush Award, and Alan T. Waterman Award—Nominations due 30 April 2008 to Grants, Awards, and Recognition, GSA, 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301-9140, USA.

MAY

History of Geology Student Award* (The History of Geology Division)—Nominations due 1 May 2008. Proposal guidelines and application forms are available on the Division Web site, http://gsahist.org; if you have questions, contact the Division secretary-treasurer, Chris Schuberth, kyanite23@verison.net.

JUNE

The Farouk El-Baz Student Research Grant—Applications due 1 June 2008. Guidelines and application forms are available at www.geosociety.org/grants/. If you have questions, please e-mail awards@geosociety.org or call +1-303-357-1028. These grant funds are administered through the GSA Foundation.

*For details, see the October 2007 *GSA Today*, visit www.geosociety.org/awards, or call +1-303-357-1028. Division named award funds are administered by GSA Foundation.

THE GEOLOGICAL SOCIETY OF AMERICA®

Your Science, Your Colleagues, Your Society: Make an Impact—Serve on a GSA Committee!

2009–2010 COMMITTEE VACANCIES
DEADLINE: 15 JULY 2008

Now is your chance to influence your Society, your science, and your colleagues. GSA invites you to volunteer or nominate one of your fellow GSA Members to serve on a Society committee or as a GSA representative to other organizations. Student Members are especially encouraged to become involved in Society activities both as committee volunteers and as nominators.

If you volunteer or make recommendations, please give serious consideration to the specified qualifications for serving on a particular committee, as outlined in this article, and be sure that your candidates are GSA Members or Fellows.

To volunteer or nominate someone else, go to **www.geosociety.org/aboutus/committees** and follow the link to our online form, or download the form and complete it on paper. If you use the paper form, please return it to Pamela Fistell, GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA; fax +1-303-357-1070. Questions? Please contact Pamela Fistell at +1-303-357-1000, ext. 0, +1-800-472-1988, ext. 0, or pfistell@geosociety.org. *Please use one form per candidate.*

Nominations received at GSA headquarters by **15 July 2008** on the official one-page or online form will be forwarded to the Committee on Nominations. The committee will present at least two nominations for each open position to the GSA Council at its fall meeting. Appointees will then be contacted and asked to serve, thus completing the process of bringing new expertise into Society affairs. **Terms begin 1 July 2009 (unless otherwise indicated).**

Academic and Applied Geoscience Relations Committee (AM, T/E)

Two member-at-large vacancies (three-year terms)

Strengthens and expands relations between GSA Members in the academic and applied geosciences. Proactively coordinates the Society's effort to facilitate greater cooperation between academia, industry, and government geoscientists. **Qualifications:** must be a member of academia, industry, or government who is committed to developing better integration of applied and academic science in our meetings, publications, short courses, field trips, and education and outreach programs.

Annual Program Committee (AM, B/E)

Two vacancies: one member-at-large, one Councilor/former Councilor (four-year terms)

Develops a long-range plan for increasing the quality of the annual meeting and other Society-sponsored meetings in terms of science, education, and outreach. Evaluates the technical and scientific programs of the annual meeting. **Qualifications:** broad familiarity with different disciplines, previous program experience, or active involvement in applying geologic knowledge to benefit society and raising awareness of critical issues.

Arthur L. Day Medal Award (T/E)

Two member-at-large vacancies (three-year terms)

Selects candidates for the Arthur L. Day Medal Award. **Qualifications:** knowledge of those who have made "distinct contributions to geologic knowledge through the application of physics and chemistry to the solution of geologic problems."

Education Committee (AM, B/E, T/E)

Three vacancies: one member-at-large, one pre-college educator (K–12), and one student representative (four-year terms)

Works with other members representing a wide range of education sectors in the development of informal, pre-college (K–12), undergraduate, and graduate earth science education and outreach objectives and initiatives. **Qualifications:** ability to work with other interested scientific organizations and science teachers' groups to develop pre-college earth science education objectives and initiatives.

Geology and Public Policy (AM, B/E, T/E)

Two member-at-large vacancies (three-year terms)

Translates knowledge of earth sciences into forms most useful for public discussion and decision making. **Qualifications:** experience with public-policy issues involving the science of geology; ability to develop, disseminate, and translate information from the geologic sciences into useful forms for the general public and for GSA Members; and familiarity with appropriate techniques for the dissemination of information.

Honorary Fellows (T/E)

Two member-at-large vacancies (three-year terms)

Selects candidates for Honorary Fellows, usually non–North Americans. **Qualifications:** knowledge of geologists throughout the world who have distinguished themselves through their contributions to the science.

Joint Technical Program Committee (T/E)

Two vacancies: one paleoceanology/paleoclimatology representative; one Precambrian geology representative (three-year terms begin 1 Jan. 2009)

Assists in finalizing the technical program of the GSA Annual Meeting: reviews abstracts or provides names of reviewers to evaluate abstracts, participates in Web-based activities in the selection and scheduling of abstracts, and participates in topical session proposal review. **Qualifications:** must be familiar with computers and the Web, be a specialist in one of the specified fields, and be available in mid-late July for the organization of the electronic technical program.

Membership (B/E)

One member-at-large vacancy (three-year term)

Contributes to the growth of GSA membership and attends to Members' changing needs. Focuses on attracting and retaining students, professionals working in industry, and those studying or working outside the United States. Reviews and makes recom-

*Extensive time commitment required • AM—Meets at the Annual Meeting • B/E—Meets in Boulder or elsewhere • T/E—Communicates by phone or electronically

mendations for Fellowship to Council. **Qualifications:** experience in benefit, recruitment, and retention programs is desired.

Minorities and Women in the Geosciences (AM)
Three member-at-large vacancies (three-year terms)

Stimulates recruitment and promotes positive career development of minorities and women in the geoscience professions. **Qualifications:** familiarity with the employment issues of minorities and women; expertise and leadership experience in such areas as human resources and education is desired.

Nominations (B/E, T/E)
Two member-at-large vacancies (three-year terms)

Recommends nominees to GSA Council for the positions of GSA Officers and Councilors, committee members, and Society representatives to other permanent groups. **Qualifications:** familiarity with a broad range of well-known and highly respected geological scientists.

Penrose Conferences and Field Forums (T/E)
Two member-at-large vacancies (three-year terms)

Reviews and approves Penrose Conference proposals and recommends and implements guidelines for the success of the conferences. **Qualifications:** past convener of a Penrose Conference or a Field Forum.

Penrose Medal Award (T/E)
Two member-at-large vacancies (three-year terms)

Selects candidates for the Penrose Medal Award. Emphasis is placed on "eminent research in pure geology, which marks a major advance in the science of geology." **Qualifications:** familiarity with outstanding achievers in the geosciences that are worthy of consideration for the honor.

Professional Development (T/E)
One member-at-large vacancy (three-year term)

Directs, advises, and monitors GSA's professional development program, reviews and approves proposals, recommends and implements guideline changes, and monitors the scientific quality of courses offered. **Qualifications:** familiarity with professional development programs or adult education teaching experience.

Publications (AM, B/E, T/E)
One member-at-large vacancy (four-year term)

Nominates candidates for editor positions, approves editorial boards, reviews the quality and health of Society publications, and explores the initiation of new ventures, including electronic publishing. **Qualifications:** extensive publications experience.

Research Grants* (B/E)
Five member-at-large vacancies (three-year terms)

Evaluates student research grant applications and selects grant recipients. **Qualifications:** should have experience in directing research projects and in evaluating research grant applications.

***Treatise on Invertebrate Paleontology* Advisory Committee (AM)**
One member-at-large (paleontologist) vacancy (three-year term)

Advises the Council, the Committee on Publications, and the *Treatise* editor on matters of policy concerning this publication. **Qualifications:** must be a paleontologist.

Young Scientist Award (Donath Medal) (T/E)
Two member-at-large vacancies (three-year terms)

Committee members investigate the achievements of young scientists who should be considered for this award and make recommendations to Council. **Qualifications:** should have knowledge of young scientists with "outstanding achievement(s) in contributing to geologic knowledge through original research which marks a major advance in the earth sciences."

GSA REPRESENTATIVES TO OTHER ORGANIZATIONS

GSA Representatives to the American Association for the Advancement of Science

Three section representative vacancies: *Section E—Geology and Geography; Section W—Atmospheric and Hydrospheric Sciences; Section X—Societal Impacts of Science and Engineering (three-year terms begin 21 Feb. 2009)*

Must be a member of the American Association for the Advancement of Science (AAAS), or be willing to join, and must represent the appropriate section background.

GSA Representative to the AGI Environmental Geoscience Advisory Committee
One GSA Representative vacancy (three-year term begins 1 Jan. 2009)

Fosters communication within the community about issues related to serving the broader international community; helps identify and focus on the highest priority environmental informational needs and issues best addressed by the geoscience community. **Qualifications:** well-acquainted with GSA programs in environmental geoscience.

North American Commission on Stratigraphic Nomenclature (AM, possibly B/E)
One GSA Representative vacancy (three-year term runs November 2009–November 2012)

Develops statements of stratigraphic principles, recommends procedures applicable to classification and nomenclature of stratigraphic and related units, reviews problems in classifying and naming stratigraphic and related units, and formulates expressions of judgment on these matters.

Liaison to the U.S. National Committee on Soil Science
One GSA Liaison vacancy (three-year term)

Should be a soil scientist and Society member.

NOTICE of Council Meeting

The next meeting of the GSA Council will be Sunday, 4 May 2008, 8 a.m.–5 p.m., and Monday, 5 May 2008, 8 a.m.–noon, at GSA Headquarters in Boulder, CO, USA.

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

*Extensive time commitment required • AM—Meets at the Annual Meeting • B/E—Meets in Boulder or elsewhere • T/E—Communicates by phone or electronically

Donna L. Russell, *Director of Operations*

Update on the Farouk El-Baz Student Research Award

The first annual Farouk El-Baz Student Research Award will be given in October at the GSA Annual Meeting in Houston. The El-Baz Student Award was established in 2006 *to encourage and support desert studies* by students either in their senior year of their undergraduate studies or at the master's or Ph.D. level.

The initial US$100,000 contribution for this award fund was generously provided by the Qatar Foundation as an endowment from which the income earned will support a US$2,500 award for two recipients annually. The Qatar Foundation for Education, Science and Community Development is a private, chartered, nonprofit organization. It was founded in 1995 by the Emir of the State of Qatar to develop centers for progressive education, research, and community welfare. It is chaired by H.H. Sheikha Mozah Bint Nasser Al-Missned, consort of the Emir of Qatar.

A special committee appointed by the GSA International Division will select the recipients based on their proposal for arid land research and a recommendation by an advisor. Applications for this award are due to GSA by **1 June 2008.**

APPLICANT REQUIREMENTS

- Student membership in The Geological Society of America (GSA); GSA offers reduced membership dues (US$6) for students from developing countries.
- Eligible applicants must be either in their senior year of their undergraduate studies or at the master's or Ph.D. level.
- A completed application plus a one-page description of proposed research under title and a letter of recommendation by university (research) advisor.

To access the application, please go to **www.geosociety.org/grants/** and click on the link under "Farouk El-Baz Student Research Grant." **All applications and supporting materials must be received at GSA by 1 June 2008.** Send supporting materials by e-mail to awards@geosociety.org, fax to +1-303-357-1070, or via post to Grants, Awards, and Recognition, Geological Society of America, 3300 Penrose Place, Boulder, CO 80301-9140, USA.

Farouk El-Baz

Dr. El-Baz, a veteran of NASA's Apollo program, is research professor and director of the Boston University Center for Remote Sensing. He is renowned for pioneering research in the applications of satellite images to study deserts worldwide, with emphasis on the location of groundwater resources. He is a member of the U.S. National Academy of Engineering and serves on its committee to identify "Grand Challenges for Engineering" in the next century. He is also a GSA Fellow.

Most memorable early geologic experience:

Sixty years later, I still feel the surge of the turquoise ocean within the black basaltic columns framing Fingal's Cave on Scotland's Isle of Staffa.

—Ian W. Dalziel

Support GSA Programs

Donate now!

1. **Enclosed is my contribution in the amount of $**_____
2. Please credit my contribution to the:
   - ❑ Greatest Need
   - ❑ Other:_____Fund
   - ❑ I've named GSA Foundation in my Will *(please contact me)*
3. _____ Name
   _____ Address
   _____ City / State / Zip
   _____ Phone
4. Mail to: GSA Foundation • P.O. Box 9140 • Boulder, CO 80301

or donate online at **www.gsafweb.org** cut out or copy

Extended Deadline for Antoinette Lierman Medlin Awards!

Deadline to apply: 15 May 2008

GSA's Coal Geology Division announces the availability of the Antoinette Lierman Medlin Scholarship in Coal Geology for the 2008–2009 academic year. The scholarship provides full-time students who are involved in coal geology research with financial support for their project for one year.

For information on this award and to learn how to apply, go to the Coal Geology Division Web site, **www.uky.edu/KGS/coal/GSA/**. The application and letters of support should still be sent to the Medlin committee chair, Ron Affolter, U.S. Geological Survey, P.O. Box 25046, MS 939, Denver Federal Center, Denver, CO 80225-0046, USA, fax: +1-303-236-0459, affolter@usgs.gov. Applicants will be notified of the scholarship committee's decision in June 2008.

The Kerry Kelts Research Awards of the Limnogeology Division

Application deadline: 10 August 2008

The application process for the Kerry Kelts Research Awards of the Limnogeology Division is now open. These awards for undergraduate or graduate student research are named in honor of Kerry Kelts, a visionary limnogeologist and inspiring teacher. Up to three awards of US$350 each for use in research related to limnogeology, limnology, and paleolimnology are available. Application for this award is simple: it consists of a summary of the proposed research, its significance, and how the award will be used (five-page maximum). Please send your summary as a PDF file along with your name and a short (two-page maximum) CV to the chair of the Limnogeology Division, Michael Rosen, **mrosen@usgs.gov, by 10 August 2008.** Awards will be announced at the Limnogeology Division Business Meeting and Reception at the 2008 Joint Annual Meeting in Houston in October.

We hope to increase the amount of the awards in succeeding years. If you are interested in supporting this program, please send your donations, designated for the Kerry Kelts Research Awards of the Limnogeology Division, to GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA.

CALL FOR APPLICATIONS

and Nominations for *GSA Bulletin* Co-Editors

GSA is soliciting applications and nominations for the position of science co-editor for *GSA Bulletin*.

The editor will serve a four-year term beginning 1 January 2009 as part of a two- or three- editor team. Expertise in one or more of the following areas is desirable in order to best complement the continuing editor's strengths, but fields are flexible: hydrogeology, sedimentology, neotectonics, geomorphology, geochemistry, paleoclimatology, climatology, surface processes, surface-atmosphere interactions, geophysics, oceanography, geobiology, or geomicrobiology.

Duties include ensuring stringent peer review and expeditious processing of manuscripts, making final acceptance or rejection decisions after considering recommendations of reviewers and associate editors, maintaining excellent journal content through active solicitation of diverse and definitive manuscripts, selecting an active board of associate editors, and reporting to the GSA Committee on Publications on manuscript topic trends and issues.

GSA provides the co-editor with a small stipend and pays for office expenses, such as postage, telephone, and Internet service. The co-editor will work out of his or her current location at work or home—no move is necessary.

To be considered, please submit your curriculum vitae and a brief letter describing why you are suited for the position. To nominate another, submit a letter of nomination along with the individual's written permission and CV. Send nominations and applications to Jeanette Hammann, GSA Publications, P.O. Box 9140, Boulder, CO 80301, USA, jhammann@geosociety.org, by 1 June 2008.

www.geosociety.org

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GSA Committees: Progress through Service
The GSA Investments Committee

Did you know that GSA has money invested with hedge funds in the Bahamas and Cayman Islands? Were you aware that some of GSA's endowment is invested with private equity managers? Who said that money management has to be boring?

What the Committee Does

The 7–10 voting GSA Members that make up GSA's Investments Committee are responsible to Council (and the membership) for overseeing GSA's investment portfolio and making policy, change, and investment recommendations.

GSA uses a professional money management firm for guidance. Innovest Portfolio Solutions in Denver, with extensive experience in money management for nonprofit organizations, has been GSA's advisor for the past 13 years.

The committee's investment policy guidelines require that funds be managed to expect a return of inflation plus 5.25% with a high probability of success and reasonable levels of risk over long time periods (i.e., >5 years). Since the mid-1990s, we have exceeded this goal by about 2.5%, which is attributable to a balanced asset allocation of domestic and international mutual funds (stocks and bonds); absolute return strategies (two hedge fund-of-funds); bank loan funds; a commodities fund; and a new investment in an exchange-traded private equity fund-of-funds.

GSA's Portfolio

GSA is not allowed to purchase or hold individual marketable securities or other investments. This means that if GSA receives a bag of gold coins, or a house, it must be sold as soon as prudently possible and proceeds invested in the portfolio with asset allocations recommended by the Investments Committee and approved by Council.

The combined investment portfolio is a blended account that includes two large bequeaths (R.A.F. Penrose in 1931—US$3.9 million—and Joseph Pardee—US$2.3 million in 1993—plus gains), as well as numerous grants, bequeaths, and donations from generous and caring members. In 2007, the combined GSA–GSA Foundation portfolio had a value of over US$33 million. More than half this money is restricted (i.e., can only be used for specific purposes as designated by the donor); the remainder is unrestricted, to be used by the Society for the maximum benefit of the membership.

Examples of GSA Foundation (GSAF) restricted funds include the Women and Minorities Fund, the Shlemon Mentor Program in Applied Geology, the Young Scientist Award (Donath Medal), and the Lipman Research Fund.

Since the start of the GSAF in 1980, most donations have gone to it, not the Society. The one large exception was the Pardee donation in 1993. Today, all donations are strongly encouraged to go to GSAF because it is set up to effectively administer the funds and provide proper donor relations and stewardship.

GSAF investments support many GSA programs, most according to specific donor wishes. The Society does receive some unrestricted funds from the Foundation, generally based on GSA's Council-approved needs list, and GSA Council has determined that GSA must, at all times, have invested unrestricted funds equal to at least one year of Society expenses (~US$10 million in fiscal year 2008). Investment balances are affected only by market conditions and GSA stewardship.

How the Money is Used

It is reasonable to ask, "Why does GSA need US$33 million of investments?" The purposes of GSA's investment portfolio are as follows:

- To support specific GSA programs as designated by the donors, such as using the Pardee Fund in support of the Research Grants Program;
- To support and strengthen the Society in carrying out its mission: Projects that are beneficial to the long-term health of the Society, the profession, and humankind include scanning back issues of books and journals, covering start-up costs for electronic publishing and a new electronic publication (*Geosphere*), and creating the new outreach office in Washington, D.C.;
- To support the maintenance and preservation of the Society's physical assets; and
- To provide a "rainy day" fund to cover the Society in case of a disaster.

It is not the purpose of the investment portfolio to support routine operations of the Society, such as the general and administrative overhead.

These are some of the many reasons for GSA Members to begin or continue to support GSA through the GSAF. We must continually build the endowment to offset inflation and to provide for growth. A list of funds into which people may contribute can be found on the GSAF Web site: **www.gsafweb.org.**

Serving on the Committee

The Investments Committee is always in need of younger and newer members who have an interest in financial matters and are available to serve 4-year terms. One does not need to be an expert in finance or business: Good sense goes a long way, and we have an excellent financial advisor. The Investments Committee is one of the GSA committees upon which GSA and the GSAF are based. Women are especially needed, because all the current committee members are men.

John E. Costa, *U.S. Geological Survey (emeritus)*
Chair, Investments Committee

Classified Rates—2008

Ads (or cancellations) must reach the GSA Advertising office no later than the first of the month, one month prior to issue. Contact Advertising Department: advertising@geosociety.org; +1.800.472.1988 x1053; +1.303.357.1053. Complete contact information, including mailing and email address, must be included with all correspondence. Rates are in U.S. dollars.

Classification	Per Line for 1st month	Per line each addt'l month (same ad)
Positions Open	$8.00	$7.75
Opportunities for Students		
First 25 lines	$0.00	$4.20
additional lines	$4.20	$4.20
Fellowship Opportunities	$8.00	$7.75
Situations Wanted	$3.60	$3.60

To estimate cost, count 54 characters per line, including all punctuation and blank spaces. Actual cost may differ if you use capitals, centered copy, or special characters.

Positions Open

POSTDOCTORAL RESEARCH SCIENTIST STANFORD ROCK FRACTURE PROJECT STANFORD UNIVERSITY

The Stanford Rock Fracture Project has an opening for a Postdoctoral Research Scientist to participate in a project on characterizing the basic architecture of a reservoir analog. We are interested in a candidate with a Ph.D. in Structural Geology with a focus on brittle deformation, preferably faults and their damage zones in sedimentary rocks. Ability in detailed mapping of outcrop-scale features, recognizing their distribution pattern, and inferring and rationalizing their formation mechanisms is desirable. Additional experience in petrophysical properties of fault rocks, 3D visualization techniques, and geomechanical modeling would be given priority.

The position is for one year but may be extended for another year depending on the availability of funding. The annual base salary is US$42K. Applications will be reviewed until the position is filled. Vita and other supporting material should be sent to Atilla Aydin at aydin@stanford.edu. EOE.

GEOLOGY LABORATORY SUPERVISOR WASHINGTON AND LEE UNIVERSITY

The Washington & Lee Geology Department invites applications for a full-time, permanent Supervisor of our analytical laboratories. The new Laboratory Supervisor will primarily maintain, oversee, and facilitate the use of our analytical laboratories and field equipment in service of both our teaching and research missions. Additional responsibilities will include assisting the development and implementation of laboratory assignments in Geology classes, design of sampling/analytical methods, data quality assurance, upkeep of the samples and equipment in the teaching laboratories, teaching assistance, and other department tasks as needed. We seek an earth scientist with a Master's degree who is organized, self-motivated and skilled in the use of modern analytical equipment and procedures for the collection of geological data. Additional experience with field equipment, GIS, and computing is preferred. Applications, including a cover letter describing experience with analytical instrumentation, computers, field equipment, etc., a résumé, contact information for three referees, and a Washington and Lee University Application for Employment, should be sent to the Human Resources office via email to jobs@wlu.edu. Forms can be obtained from http://humanresources.wlu.edu/forms. Review of applications will begin May 1st and continue until the position is filled. Washington and Lee is a highly selective, private liberal arts college in western Virginia. Our location in the central Appalachians facilitates a strong field curriculum to which we seek to add strength in laboratory activities. The department has excellent analytical (SEM-EDS, XRD, ICP-OES, IC), field (seismometer, gravimeter, resistivity, GPS, hydrologic) and computing (GIS, Remote Sensing, 2D/3D geophysical packages) equipment. More information can be found at http://geology.wlu.edu. Washington and Lee is an Equal Opportunity Employer. Women and minorities are encouraged to apply.

DIRECTOR OKLAHOMA GEOLOGICAL SURVEY UNIVERSITY OF OKLAHOMA

Applications are being solicited for the position of Director, Oklahoma Geological Survey (OGS). The OGS is located on the University of Oklahoma campus in Norman, Oklahoma, and is under the direction and supervision of the Board of Regents of the University of Oklahoma. Organizationally, the OGS is located within the Mewbourne College of Earth & Energy, which also includes: ConocoPhillips School of Geology & Geophysics, Mewbourne School of Petroleum & Geological Engineering and Sarkeys Energy Center. The Director of the OGS reports administratively to the Dean, Mewbourne College of Earth & Energy and, depending on qualifications and experience, will hold a faculty position within the College as an Associate or Full Professor, renewable term or tenured. Candidates should hold a doctorate or have the equivalent experience in geology, geophysics or a closely related field.

The objectives and duties of the Oklahoma Geological Survey include the following:

(a) A study of the geological formations of the state with special reference to its natural resources, including coal, oil, gas, asphalt, gypsum, salt, cement, stone, clay, lead, zinc, iron, sand, road building material, water resources and all other mineral resources.
(b) The preparation and publication of bulletins and reports, accompanied with necessary illustrations and maps, including both general and detailed descriptions of the geological structure and mineral resources of the state.
(c) The consideration of such other related scientific and economic questions that shall be deemed of value to the people of Oklahoma.

The Director of the OGS has the responsibility of overseeing activities related to geological and geophysical studies of Oklahoma and adjacent areas, preparation of reports documenting the findings of these studies, and presentation of these results to individuals and agencies as appropriate and/or required.

The position requires supervision and administration of an organization of approximately 40 staff, associated facilities including offices, labs and the Oklahoma Petroleum Information Center (OPIC), which contains an extensive collection of rock cores and samples, other well information and selected facilities for the examination of these cores and samples. It is anticipated that the Director of the OGS will work with Oklahoma universities, state and federal agencies, industry and other entities to conduct research in areas of public interest, as well as providing advice and service in the areas of geology, geophysics and natural resources. The successful candidate will have the demonstrated experience and ability to conduct these activities, while acting as the State Geologist of Oklahoma. Areas that could be considered include experience with state or national surveys, administration in academia, and/or experience in industry or research.

Review of candidates began March 1, 2008, and will continue until the position is filled. The anticipated starting date is July 1, 2008. Applicants are requested to submit a complete resume, statement of relevant experience and a list of five references who can be contacted, including names, phone numbers, e-mail addresses and complete mailing addresses. Questions or requests for additional information may be addressed to Larry R. Grillot, Dean of the Mewbourne College of Earth & Energy, and Chair of the OGS Director Search Committee, at +1-405-325-3821, or lrgrillot@ou.edu. Applications and nominations should be addressed to OGS Director Search Committee, University of Oklahoma, Sarkeys Energy Center, 100 East Boyd Street, Room 510, Norman, OK 73019-1008.

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

NEOTECTONICIST/STRUCTURAL GEOLOGIST CALIFORNIA STATE UNIVERSITY, LOS ANGELES

The Department of Geological Sciences seeks to fill a temporary full-time faculty position in neotectonics/structural geology with a starting date of September 2008 and at an initial salary commensurate with qualifications and experience. The appointment is for one year with possibility of additional appointments. Applicants must have an expertise in one or more of the following: Quaternary geology/surficial processes, structural geology, geomorphic processes, neotectonic development, history of southern California, paleoseismology, and soil development and stratigraphy. A Ph.D. or A.B.D. in geology/geophysics from an accredited institution of higher education is required. The successful applicant must demonstrate a potential for or a record of effective teaching using a variety of methodologies. A demonstrated ability and/or interest in working in a multi-ethnic, multicultural environment and proficiency in oral and written communication are also required. Duties will include teaching introductory and advanced courses at the undergraduate and graduate level. We seek applicants capable of integrating classroom and field instruction. Applicant documentation should include a statement of teaching and research interests, a detailed curriculum vita, three letters of recommendation, and transcripts from institution 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 April 30, 2008 and will continue until the position is filled. Address applications, required documentation and/or requests for information to: Dr. Pedro Ramirez, Search Committee Chair, California State University, Los Angeles, 5151 State University Drive, Los Angeles, CA 90032-8203, pramire@calstatela.edu, +1-323-343-2417. Department Web page: www.calstatela.edu/dept/geology.

DEPARTMENT OF EARTH & OCEAN SCIENCES UNIVERSITY OF BRITISH COLUMBIA DIRECTOR MINERAL DEPOSIT RESEARCH UNIT

The Board of Directors for the Mineral Deposit Research Unit (MDRU) of the Department of Earth and Ocean Sciences at the University of British Columbia (UBC) invites applications for a new Director. The Director will provide overall coordination and management of MDRU programs including research, administration, and lifelong learning. Successful operation requires extensive collaboration and liaison with corporate sponsors and industry at large and with faculty, researchers and graduate students within the Department of Earth & Ocean Sciences at UBC. Collaborative projects currently sponsor 35 graduate students and 6 post-doctoral fellows and research associates on projects around the world. For more details see the Web site: www.mdru.ubc.ca.

Applications are invited from scientists with a proven record of scientific excellence in economic geology, scientific leadership, project management, team building, and interpersonal skills. Candidates will normally have had successful careers in an industry or academic environment in a broad range of mineral deposits. A Ph.D. is required. The appointment will be for three to five years, subject to continued funding, and may be renewed by the MDRU Board of Directors. The Director carries an academic appointment within UBC (see criteria at: www.hr.ubc.ca/faculty_relations/agreements/appointmentfaculty.html#2). Salary will be commensurate with experience. The position will be available as early as September 1, 2008.

The University of British Columbia hires on the basis of merit and is committed to employment equity. All qualified persons are encouraged to apply; however, Canadians and Permanent Residents of Canada will be given priority.

Applicants should send their curriculum vitae, a statement of research interests, and the names and addresses of three referees to Dr. Paul L. Smith, Head, Department of Earth and Ocean Sciences, the University of British Columbia, 6339 Stores Road, Vancouver, British Columbia V6T 1Z4; e-mail: mdru-search@eos.ubc.ca; fax: +1-604-822-9014. The deadline for receipt of applications is May 15, 2008.

FACULTY POSITIONS EARTH AND ENVIRONMENTAL SCIENCES UTAH STATE UNIVERSITY UINTAH BASIN REGIONAL CAMPUS

As part of Utah State University's mission to make its academic programs accessible throughout the state, USU is expanding its campus in northeastern Utah. New positions in the Department of Geology and the Department of Watershed Sciences are intended to strengthen the Uintah Basin Campus' focus on issues related to energy development and the natural resources of the region.

The Unitah Basin Regional Campus (http://uintahbasin.usu.edu/) is located in Vernal, on the southern flank of the Uinta Mountains, and is the largest and fastest growing of USU's regional campuses. The campus now serves about 2,400 students, and student enrollment has tripled in recent years. Construction of a 45,000 ft^2 academic building has begun on the 133-acre Vernal campus. Construction of a dedicated research center on the same campus will begin in 2008. Teaching and electronic meetings can be coordinated between the Vernal campus and the rest of the USU system via electronic classrooms and meeting rooms. With new support from state appropriations, local government, and private donors, the campus has been authorized to hire

nine new faculty across a spectrum of disciplines and will soon offer additional baccalaureate and graduate degree programs.

Application review for the positions described here began 31 March 2008 and will continue until the positions are filled. The positions will be available August 2008. Applicants should submit a letter describing their qualifications for the position including a statement of teaching philosophy, a current curriculum vita, samples of scholarly work, and contact information for a minimum of three references. To apply, go to https://jobs.usu.edu/applicants.

Assistant Professor, Geology: The department of geology at Utah State University offers a tenure-track Assistant Professor position with an emphasis on *sedimentary systems, low temperature geochemistry, or petroleum geology*. This is a 9-month, tenure-track position. The initial appointment will be approximately 70% teaching, 25 % research, and 5% service, but may be adjusted in the future to meet changing needs of the Geology Department and the Uintah Basin Regional Campus. Minimum qualifications include a Ph.D. in Geology or related discipline at the time of appointment. A full position description may be found at www.usu.edu/geo/.

Assistant Professor, Watershed Sciences: The department of watershed sciences at Utah State University offers a tenure-track Assistant Professor position located at the USU-Uintah Basin Regional Campus with an emphasis on *watershed restoration*. Watershed restoration is a broad field, and we encourage applicants whose focus applies hydrology, geomorphology, or ecology to restoration at the stream or watershed scale. This is a 9-month, tenure-track position. The initial appointment will be approximately 60% teaching, 35 % research, and 5% service, but may be adjusted in the future to meet changing needs of the Watershed Sciences Department and the Uintah Basin Regional Campus. Minimum qualifications include a Ph.D. in Watershed Science or related discipline at the time of appointment. A full position description may be found at www.cnr.usu.edu/.

ASSISTANT PROFESSORSHIP
ANALYTICAL GEOCHEMISTRY/GEOLOGICAL SCIENCE
INDIANA UNIVERSITY–BLOOMINGTON

The Department of Geological Sciences at Indiana University–Bloomington, invites applications for a tenure-track faculty appointment at the Assistant Professor level specializing in analytical geochemistry. We seek an individual whose research centers on the use of multi-collector ICP-MS to address fundamental questions in the geosciences. Preference will be given to candidates whose interests complement existing departmental expertise in areas of isotopic and molecular geochemistry, hydrogeology and mineralogy, and strengthen and augment current research programs in studies of the evolution and history of Earth and/or planetary systems. Our instrumental laboratories for biogeochemistry and analytical and environmental geochemistry will move to a new multidisciplinary science building scheduled for completion in June 2009, which has space designated for an ICP-MS facility.

Review of applications began on March 15, 2008, and will continue until a suitable candidate is recruited. All enquiries and applications should be addressed to Simon Brassell, Professor and Chair, Department of Geological Sciences, Indiana University, 1001 E. 10th Street, Bloomington, IN 47405-1403 (simon@indiana.edu). Please submit a letter of application, and a complete vita, with contact information and the names of at least three referees. Indiana University is an equal opportunity/affirmative action employer, and encourages applications from women and minority candidates.

DIRECTOR, UNIVERSITY OF TEXAS
INSTITUTE FOR GEOPHYSICS (UTIG)
JACKSON SCHOOL OF GEOSCIENCES

The University of Texas Institute for Geophysics (UTIG), one of the three principal units in the Jackson School of Geosciences at The University of Texas at Austin, seeks nominations and applications for a fulltime position of Director. UTIG is an international leader in marine geology and geophysics, seismology, and climate research. With externally funded research expenditures of approximately $4 million annually, its staff of 74 conducts and supports a broad variety of investigations, with particular emphasis on ocean basins, plate margins, polar regions, and climate modeling. Information about UTIG and the Jackson School of Geosciences can be found at www.jsg.utexas.edu/. Several UTIG research scientists hold faculty appointments in the Department of Geological

ISES

Announcement:

A Summer School in Integrated Solid Earth Sciences (ISES)

Topic: Dates, Rates, and States

Sponsored by a grant from the National Science Foundation

Application Deadline: April 20, 2008
Decision date: May 1, 2008
Location: The Colorado College, Colorado Springs, CO
Dates of summer school: July 24 to July 31, 2008

A 7-day workshop for advanced graduate students addressing different aspects of dating of tectonic processes, the rates at which these processes happen, and response of material to those rates. A panel of experts will present active research in these topics from the perspective of multiple geological disciplines (participating faculty listed on the website). The format will involve lectures, activities, and fieldtrips. More information is posted on the website.

Topics to be addressed: Low temperature thermochronology, geodesy, geomorphology, numerical modelling, faulting, geochemistry, remote sensing, etc.

Web site & On-line application:
http://acad.coloradocollege.edu/dept/gy/ises/ISESSummerProgram.php

Applications will be accepted through April 20, 2008.
Basil Tikoff (basil@geology.wisc.edu) or Christine Siddoway (CSiddoway@ColoradoCollege.edu).

Sciences and both graduate and undergraduate students play an important role in the UTIG research mission. Should the successful candidate desire an academic appointment, he/she will be expected to possess the necessary qualifications for a senior faculty position in the Department of Geological Sciences.

The ideal candidate will have a substantial record of research and publications, experience in the administration of complex research projects and organizations, and good people management skills. Involvement in international programs and leadership in academic and professional activities are desired qualifications. The Jackson School of Geosciences is undergoing dramatic growth in programs and personnel. The UTIG Director is a member of the leadership team directing these efforts.

Applications and nominations will be accepted until the position is filled. The target date for the new Director to assume the position is September 1, 2008. All applicants must apply on-line through our application system at http://utdirect.utexas.edu/pnjobs for job posting number 080207010379; in addition, they should send a letter of application providing the applicant's perspectives on UTIG and its future directions, a resume, and the names and email and surface mail contact information for four references to Dr. Charles G. Groat, Chair, UTIG Director Search Committee, Jackson School of Geosciences, The University of Texas at Austin, P.O. Box B, Austin, TX 78713 or, electronically, to utigdirectorsearch@jsg.utexas.edu. Screening of applications will begin as they are received. This position is Security Sensitive; a criminal background check will be conducted on final candidate.

The University of Texas at Austin is an Equal Opportunity/Affirmative Action employer.

INDIANA UNIVERSITY–PURDUE UNIVERSITY FORT WAYNE (IPFW)

IPFW seeks to fill a full-time, tenure-track position at the Assistant Professor level in geology. The successful applicant for the position will have a Ph.D. and be expected to share with other faculty responsibilities for teaching introductory geology, introductory planetary geology and regional field geology. Over a multi-year cycle, the successful applicant will teach courses in structural geology, GIS, and geomorphology. Geosciences faculty are expected to maintain an active research program and to involve undergraduate students in research. IPFW's geology research program is well-supported in both equipment (e.g. thin section lab, SEM, XRD) and opportunities for new faculty.

There are four other full-time faculty in the department. IPFW is a comprehensive university. Send a letter of application, statement of teaching and research interests, curriculum vitae, copies of transcripts, and the names and contact information for three references to: Prof. J. Farlow, Search Committee Chair, Department of Geosciences, Indiana University–Purdue University Fort Wayne, 2101 East Coliseum Boulevard, Fort Wayne, IN 46805. Review of applications will begin May 1, 2008. IPFW is an equal opportunity, equal access, affirmative action employer.

Opportunities For Students

Pursue a Ph.D. in Environmental Sciences at Wright State University. The Environmental Sciences Ph.D. program at Wright State University in Dayton, Ohio invites applicants for Fall 2008 admission. The program is designed to provide skills and training to better understand and solve complex environmental problems, such as those caused by anthropogenic pollutants, invasive species, habitat fragmentation and loss of biodiversity, that can affect both human and ecosystem health. Our students receive training in preparation for careers in academia, state and federal agencies, industry, and non-profit organizations.

Through a rigorous core curriculum and dissertation research, our interdisciplinary program is designed to broadly expose students to both traditional and emerging areas of environmental sciences, and offers the ability to focus on research in a more defined area. Our program includes faculty in the departments of Biological Sciences, Earth and Environmental Sciences, Chemistry, Physics, Biochemistry and Molecular Biology, Pharmacology and Toxicology, and Mathematics and Statistics.

The program offers competitive stipends for graduate students (US$22,000 for Fall 2008) along with a waiver of tuition costs for full-time students. Applicants are also eligible for consideration to receive a prestigious Yellow Springs Instruments (YSI) Fellowship for the first year in the program, awarded to highly qualified students enrolling for Fall 2008.

Applicants are encouraged to contact program faculty in their areas of interest prior to completing the application. To apply online and to read more about our program and its curriculum, research, faculty and student profiles, please visit our program website at: http://www.wright.edu/academics/envsci/index.html

Questions regarding our program may be directed to our program office: Ms. Cathy Kempf, Administrative Specialist, 262 Diggs Laboratory, Wright State University, Dayton, OH 45435, Phone: +1-937-775-3273, FAX: +1-937-775-3485, Office Hours: 8:30 a.m.–5:00 p.m. Monday–Friday; e-mail: director.envsci@wright.edu.

Dig For Dinosaurs at the Paleontology Field Camp on the Standing Rock Sioux Reservation in South Dakota. Summer 2008—Field camps for students; www.standingrock.org or +1-701-254-2025 for more info.

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 July 1 through December 31, 2008. 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 US$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.

Short proposals (two pages, single-spaced text plus two forms and necessary figures and tables) are due by April 30, 2008. for consideration by the IRM's Review and Advisory Committee. Successful applicants will be notified in June 2008. Proposals should be sent by e-mail to 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.

Fellowship Opportunities

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 July 1 through December 31, 2008. 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.

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Field Camps

PALEONTOLOGY FIELD CAMP
STANDING ROCK SIOUX RESERVATION
SOUTH DAKOTA

Dig For Dinosaurs at the Paleontology Field Camp on the Standing Rock Sioux Reservation in South Dakota. Summer 2008—Field camps for students and non-students; www.standingrock.org or +1-701-254-2025 for more info.

GSA ANNOUNCES NEW JOURNAL

Lithosphere

The Geological Society of America is pleased to announce *Lithosphere*, a monthly journal to be launched in early 2009. *Lithosphere* will focus on tectonic processes at all scales that affect the crust and upper mantle, from the surface to the base of the lithosphere, and will highlight research that addresses how the surface, crust, and mantle interact to shape the physical and chemical evolution of the lithosphere at all spatial and temporal scales.

The journal aims to provide timely publication of interdisciplinary, multidisciplinary, and cross-disciplinary research in addition to disciplinary studies of broad tectonic interest in a format that will include:

- short research contributions (letters) that present new and innovative ideas and concepts;
- longer research articles with complete presentations of field-based and other data sets, experimental results, theoretical analyses, or numerical simulations;
- review articles—either scholarly or pedagogical—that facilitate communication among disciplines;
- brief overviews of articles in the issue that enable geoscientists from a variety of backgrounds to understand and interpret work across the broad range of topics; and
- special issues or sections devoted to a topic.

Lithosphere welcomes contributions from a wide variety of earth science disciplines, including (but not limited to) structural geology, geodynamics, tectonic geomorphology, petrology, and geochemistry, as well as results from integrative, interdisciplinary projects (e.g., Canada's Lithoprobe or EarthScope in the United States). The journal particularly encourages articles that address how complex systems in the solid earth operate and how coupling between those systems occurs.

Updated information on the science editors and editorial board members named for *Lithosphere*, submission details and links, and other news will be posted at www.gsajournals.org.

Arrowhead Golf Course southwest of Denver. Photo by Richard Grant. Denver Metro Convention & Visitors Bureau.

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