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GSA celebrates our three-year association with the International Year of Planet Earth.
Temporal evolution of continental lithospheric strength in actively deforming regions

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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, ~10⁸ to 10⁹ yr) and glacio-isostatic adjustment (GIA, ~10³ to 10⁴ yr) time scales. Topography and gravity field correlations indicate that lithosphere isostatic adjustment (LIA) on ~10⁸–10⁹ yr time scales occurs with most lithospheric stress supported by an upper crust overlying a much weaker ductile subcrust. 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 ≥1000 MPa and “weak” lithosphere ≤10 MPa. Barrell (1914) first showed that topographic loads on Earth’s surface were supported by a strong lithosphere overlying a buoyant, inviscid asthenosphere. Jeffrey (1952) (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.,
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 $T_e$ values of $\sim 5$–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 weakening and the response to a surface load are shown.

![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.](image)
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 (\( \eta_{\text{eff}} \)) 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 \( \eta_{\text{eff}} \) 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 \( (7\theta) \) 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 \( \eta_{\text{eff}} \) 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 \( \eta_{\text{eff}} \) being initially very low, \( \sim 10^{17} \) 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 \( \sim 2 \) 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).
The strain rate, \( \dot{\varepsilon} \), increases with increasing effective viscosity, \( \eta_{\text{eff}} \), and \( \dot{\varepsilon} \) is defined as the rate of deformation needed to deform the material at this strain rate, with \( \eta_{\text{eff}} \) being the effective viscosity (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 \( (10^{-13} - 10^{-14} \text{ s}^{-1}) \) 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 \(~1–10 \text{ yr}\) 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 \(~10^0–10^3 \text{ yr}\). 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 \((10^{05}–10^{07} \text{ Pa s}) \); 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 \(~10^6–10^7 \text{ yr}\). Figure 5, modified from Lowry et al. (2000), maps the spatial distribution of effective elastic thickness \( (T_e) \) derived in this way. It also shows sites where PS and GIA studies have constrained rheology.
in the crust and uppermost mantle. As maps of surface heat flux show (e.g., Sass et al., 1989), much of the $T_e$ 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 $T_e$ 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 $T_e$ is $\sim$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 ($10^8$ to $10^9$ yr) and longer ($10^6$ 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 $\sim10^6$ 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 $\leq 10^3$ 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 $T_e$ 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 ($\sim$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., 1990) 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 $\sim$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 (non-uniquely) 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 micro-mechanical 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 $\sim$8 orders of magnitude smaller and strain rates $\sim$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
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 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 $T_e$ 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 Hassan 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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REFERENCES CITED


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.

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★ **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.”


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
## Important Dates and Deadlines

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<td>20 May</td>
<td>Space Request Deadline</td>
<td>5–9 October</td>
<td>Technical Program</td>
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<td>Early June</td>
<td>Registration and Housing Open</td>
<td>Sun.–noon Thurs., 5–9 Oct.</td>
<td>Oral Sessions</td>
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<td>3 June</td>
<td>Abstracts Deadline</td>
<td>Sun.–Wed., 5–8 Oct.</td>
<td>Poster Sessions (full-day sessions; authors present 4–6 p.m.)</td>
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<td>14 July</td>
<td>Early Bird Registration Deadline</td>
<td>Mon., 6 Oct.</td>
<td>Group Alumni Reception</td>
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<td>2 September</td>
<td>Standard Registration and Housing Deadlines</td>
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<td>Private Alumni Receptions</td>
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<td>8 September</td>
<td>Registration Cancellation Deadline</td>
<td>Wed., 8 Oct.</td>
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<td>Mon.–Sat., 29 Sept.–4 Oct.</td>
<td>Pre-Meeting Field Trips</td>
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<td>Sat., 4 Oct., 7–9 p.m.</td>
<td>GSA Presidential Address &amp; Awards Ceremony</td>
<td>Exhibit Hall Hours:</td>
<td>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.</td>
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<td>Sun., 5 Oct., 7–9 p.m.</td>
<td>Welcoming Party &amp; Exhibits Opening</td>
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<td>Sun.–Tues., 5–7 Oct.</td>
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Wonderglobe. Images produced by Reto Stöckli. Used with permission from NASA.
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.

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
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.

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

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.

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 circumscription–Gulf of Mexico region and the application of hydrogeology to the management of those resources.

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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 Geomorphology Div.; S06 Soil & Water Management & Conservation; S11 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 Soil Physics; 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

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 deffering 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  
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  
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.  
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.  

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

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.; 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.

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
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.

Future GSA Annual Meetings

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<td>2009</td>
<td>Portland, Oregon, USA</td>
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<td>2010</td>
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<td>2011</td>
<td>Minneapolis, Minnesota, USA</td>
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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.eppl; 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
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

Cospersoned 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

Cospersoned 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?

Cospersoned 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

Cospersoned by Paleontological Society; Gulf Coast Association of Geological Societies

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

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

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

Cospersoned 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

Cospersoned 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

Cospersoned by GSA Quaternary Geology and Geomorphology Div.

Scientific Category: Geomorphology; Engineering Geology; Sediments, Clastic; Environmental Geoscience

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

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

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


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

**T15. Trends in Geomorphology: Advances and Innovations in Measurement and Analysis**
Cospromised 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 House, 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**
Cospromised by GSA Quaternary Geology and Geomorphology Div.; GSA Engineering Geology Div.; Gulf Coast Association of Geological Societies
Scientific Category: Quaternary Geology; Geomorphology; Engineering Geology

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**
Cospromised 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**
Cospromised 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**
Cospromised by GSA Quaternary Geology and Geomorphology Div.; Gulf Coast Association of Geological Societies
Scientific Category: Quaternary Geology; Geomorphology
Randall Schaeetzl, 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**
Cospromised 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**
Cospromised 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**
Cospromised 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**
Cospromised by GSA Limnogeology Div.; GSA 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**
Cospromised 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

GSA Topical and Discipline Sessions

Scientific Category: Sediments, Clastic; Geochemistry; Paleoclimateology/
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.

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GSA Topical and Discipline Sessions

T29. Recent Advances in Deepwater Sedimentology: Science Driven by the Search for Natural Resources
Cospresented 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
Cospresented 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
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)
Cospresented 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
Cospresented 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
Cospresented 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
Cospresented 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
Cospresented by Gulf Coast Association of Geological Societies
Scientific Category: Paleoclimatology/Paleoceanography; Geochemistry; Environmental Geoscience
Gangjing 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 paleoclimatic 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
Cospresented by GSA Sedimentary Geology Div.; Gulf Coast Association of Geological Societies
Scientific Category: Paleoclimatology/Paleoceanography; Stratigraphy
Linda A. Hinov, 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)
Cospresented 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 correlative.
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).

MCH059REV,
1 folded sheet (36” × 53”), 7 p. text
$9.95 (sorry, no additional discount)

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”!

MCH092F, 1 folded sheet (36” × 76”), 7 p. text, Reduced price $10.00

$10.00

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

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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GSA Topical and Discipline Sessions

T38. Gulf of Mexico Coastal Plain Paleontology
Cosponsored by Paleontological Society; Gulf Coast Association of Geological Societies
Scientific Category: Paleontology, Biogeography/Biostratigraphy; Paleontology, Paleoeology/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/Biostatigraphy

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 environmental 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/Biostatigraphy; 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; Paleoecology, Paleoclimatology/Paleoceanography
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/Biostatigraphy; 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, Paleooecology/Taphonomy; Sediments, Clastic; Sediments, Carbonates

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, Paleooecology/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.
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, Paleoeconomy/Taphonomy; Hydrogeology; Sediments, Carbonates
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, Paleoeconomy/Taphonomy; Paleoecology/Paleoecology; 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, Paleoeconomy/Taphonomy; Paleoecology/Paleoecology; Geochemistry
Marc L. 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, Paleoeconomy/Taphonomy; Paleontology, Phylogenetic/Morphological Patterns
Colin D. Sumrall, Univ. of Tennessee, Knoxville, Tenn.; Christopher Brochu; Talia Karim, Univ. of Iowa, Iowa City, Iowa
This session will explore neontological 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.
GSA Topical and Discipline Sessions

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
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.

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

Special Paper 434

Exhumation Associated with Continental Strike-Slip Fault Systems
edited by Alison B. Till, Sarah M. Roeske, James C. Sample, and David A. Foster
Regional exhumation associated with strike-slip fault motion was first observed by Raymond A. Price (1979), who linked Eocene crustal stretching in the southern Canadian Rockies with strike-slip displacement on the Tintina fault system. Since that observation, examples of exhumation in continental strike-slip fault systems have been recognized in both transtensional and transpressional tectonic settings. Standard theory of strike-slip faulting does not provide obvious mechanisms for the exhumation process. The papers in this volume examine exhumation processes along major modern and ancient strike-slip fault systems at a wide range of scales in both depth and width using a broad spectrum of geological and geophysical methods. Results from these studies of transtensional and transpressional tectonic settings in western North America, South America, Asia, and New Zealand show that exhumation processes are diverse and contribute significantly to understanding the interaction of continental strike-slip faults with mid- to lower-crustal structures.
SPE434, 264 p. plus index, ISBN 9780813724348
$80.00, member price $56.00

www.geosociety.org/bookstore
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 contractual 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.

**GSA Topical and Discipline Sessions**

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.

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

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.
GSA Topical and Discipline Sessions

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

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

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

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

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.
GSA Topical and Discipline Sessions

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 Shardy, 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 paleoclimates 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

Scientific Category: Tectonics; Structural Geology; Geomorphology

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; Paleoecology and Paleoenvironments; Paleontology; 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/Seismology

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; Petrology, Igneous; Volcanology
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 Ultralow 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 ultralow-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, 14C, 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 Ramirez Fernandez, Universidad Autonoma de Nuevo Leon, Linares, Mexico; Fernando Velasco Tapia, Universidad Autonoma de Nuevo Leon, Linares, Mexico
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 Lutge, Rice Univ., Houston, Tex.; Adrian Lenardic, Rice Univ., Houston, Tex.; Gerald Dickens, Rice Univ., Houston, Tex.

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, Cali.; 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 Roebeling 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
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.

GSA Topical and Discipline Sessions
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.

T96. 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 Lutge, Rice Univ., Houston, Tex.; Adrian Lenardic, Rice Univ., Houston, Tex.; Gerald Dickens, Rice Univ., Houston, Tex.
GSA Topical and Discipline Sessions

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
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, and Beyond
Cosponsored by Geochemical Society; Gulf Coast Association of Geological Societies
Scientific Category: Petrology, Igneous; Planetary Geology; Geochemistry
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
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 Analogues
Cosponsored by Mineralogical Society of America; Lunar and Planetary Institute
Scientific Category: Planetary Geology; Geochemistry; Mineralogy/ Crystallography
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
GSA Topical and Discipline Sessions

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

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

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.
GSA Topical and Discipline Sessions

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
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
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
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, Originization; Paleontology, Phylogenetic/Morphological Patterns

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

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

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
Johns Hopkins Univ., Baltimore, Md.

This session seeks to examine 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.

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

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.

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
Cosponsored by Geochemical Society; Gulf Coast Association of Geological Societies
Scientific Category: Geochemistry; Mineralogy/Crystallography; Petrology, Experimental
Kenneth Johnson, Univ. of Houston–Downtown, Houston, Tex.; Janusz Grebowski, 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.
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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For more information on becoming an exhibitor, contact Cindy with GSA Exhibits Management Services, +1-303-914-0695, cindylu@qbsoffice.com.

**Welcoming Party and Exhibit Hall Hours**

**Our Welcoming Party Kicks Off the Joint Meeting** in the Exhibit Hall on Sunday, 5 October, 7–9 p.m. and provides exposure to 10,000+ attendees with no conflicting events!

**Exhibits will remain open** Mon.–Tues., 6–7 Oct., 9 a.m.–6 p.m. and Wed., 8 Oct., 9 a.m.–2 p.m.

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5–9 October 2008
George R. Brown Convention Center, Houston, Texas, USA
www.geosociety.org; www.acsmeetings.org; www.gcags.org
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 Lutte, 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.; Gulf Coast Association of Geological Societies
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 Bimineralization: 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 bimineralization 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, Paleooecology/Taphonomy

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.
GSA Topical and Discipline Sessions

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, III.; 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: Hydrogeology; Environmental Geoscience; Geochemistry
Barbara Mahler, Austin, Tex.; Pierre-Yves Jeannin, La Chaux-de-Fonds, Switzerland
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
Joshua M. Feinberg, Univ. of Minnesota, Minneapolis, Minn.; Robert Jarrett, USGS, Lakewood, Colo.; Joseph Liddicoat, Barnard College, New York, N.Y.
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 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
GSA Topical and Discipline Sessions

**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.

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

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

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

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.

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.
GSA Topical and Discipline Sessions

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
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, Paleogeography/Geoscape; 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 Geoscientists
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
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
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

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.

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 Wulf, 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.

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 Geology and Society 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

This session on digital geologic mapping will encompass 3-D model construction, computational applications such as groundwater models and CO₂ 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 geologic mapping.

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.

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. Geocartilages and Unique Geological Heritage
Cosponsored by GSA Quaternary Geology and Geomorphology Div.; GSA Geology and Society Div.; GSA Geoscience Education Div.; GSA Geoinformatics 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

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.

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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

GSA TODAY, APRIL/MAY 2008
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

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

NASA Space Center, Houston.
Submitting An Abstract

Deadline: 3 June 2008

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.
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.

**PREMEETING**


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.


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.

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.


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 Geooarchaeological 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.


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@geo.tamu.edu; Jim Gibaud; 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.


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


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.


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

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.


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.

Roadside Geology of Florida
Jonathan R. Bryan, Thomas M. Scott, and Guy H. Means
The authors of the latest addition to the Roadside Geology series will lead you through a world of cavernous limestone, roiling springheads, and rock strata containing the remains of some of the strangest animals that ever walked on Earth. The book’s color maps and color photographs provide stunning examples of Florida’s exciting geology.

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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., 9 a.m.–5 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. 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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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.

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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GSA EMPLOYMENT SERVICE CENTER

Looking for QUALIFIED CANDIDATES?

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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.

GSA Mentor Programs

Find full program descriptions at www.geosociety.org/science/.

For additional information, contact Jennifer Nocerino jnocerino@geosociety.org.
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

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<th>All fees are in U.S. dollars</th>
<th>Early Bird</th>
<th>Standard</th>
<th>Late/Onsite</th>
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<td>Prof. Member—full meeting</td>
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Each meeting registrant will receive 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.

Field Geology

ILLUSTRATED

Terry S. Maley

First detailed, comprehensive book on field geology in 20 years.

704-page, richly illustrated book with 688 high quality photographs and 300 interpretive sketches: a treasure trove of practical field-related information essential for the recognition, interpretation, and description of geologic features.

This superb field guide includes hundreds of classic USGS photographs and represents some of the best examples available of common and significant geologic features and structures.

2nd edition, 2005, $35.00 plus $4 shipping

Mineral Land Publications, P.O. Box 1186, Boise, Idaho 83701 Phone: 208-343-9143

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.

GSA TODAY, APRIL/MAY 2008 61
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/positions/ 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.
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

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

Victor 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.

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.

The combined “very satisfied” and “somewhat satisfied” scores for both Field Trips (67%) and Short Courses (59%) are up substantially from past years.
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 under-represented 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!
Call for GSA Committee Service

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-
recommendations 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.

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**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.

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*Extensive time commitment required* • **AM**—Meets at the Annual Meeting • **B/E**—Meets in Boulder or elsewhere • **T/E**—Communicates by phone or electronically
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.

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.
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/](http://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.

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**Special Offer for GSA Members**

As a member of the Geological Society of America, you are eligible for the Subaru VIP Purchase Program.

No haggling, no negotiation, no pressure - just a great deal on a brand new Subaru!

Save between $1,300 - $3,300 off the Manufacturer's Suggested Retail Price* (depending on model and accessories) plus any applicable incentives on the purchase or lease of a new 2007 or 2008 Subaru, including Subaru Tribeca, Legacy, Outback, Forester and Impreza** models, from participating dealers.

To qualify, you must be a GSA member in good standing for at least six consecutive months prior to participation in this program. Please contact GSA Sales and Service at 1-888-443-4472 or 1-303-357-1000 option 3, or [giaservice@geosociety.org](mailto:giaservice@geosociety.org) to receive your Dealer Visit Authorization form before visiting your local Subaru dealer.

Access [Subaru.com](http://www.subaru.com) to find a nearby dealer or learn more about Subaru vehicles.

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*MSRP does not include tax, title and registration fees. Subject to change without notice. Terms and conditions apply.

**Excludes 2007 Impreza WRX STi Limited and 2008 Impreza WRX STi models.*
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.
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 bequests (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, bequests, 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](http://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*
Positions Open

POSTDOCTORAL RESEARCH SCIENTIST
STANFORD ROCK FRACTURE PROJECT
STANFORD UNIVERSITY

The Stanford Rock Fracture Project is opening for a Postdoctoral Research Scientist to participate in a project on characterizing the basic architecture of a reservoir and its implications for field development. Experience with analytical instrumentation, computers, and interpretation and presentation of these results to individuals and agencies as appropriate and/or required. To apply, please submit a complete resume, statement of relevant experience, and names of three references to Dr. Paul L. Smith, Head, Department of Earth & Ocean Sciences, the University of British Columbia, 6339 Stores Road, Vancouver, British Columbia, V6T 1Z4. The deadline for receipt of applications is May 15, 2008.

GEOLOGY LABORATORY SUPERVISOR
WASHINGTON AND LEE UNIVERSITY

The Washington & Lee Geology Department invites applications for an instrumental Supervisor of our analytical laboratories. The new Laboratory Supervisor will primarily maintain, oversee, and facilitate the use of our analytical instruments and equipment in service of both our teaching and research missions. Additional duties will include assisting in 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/．Review of applications will begin March 1, 2008 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, IRP-OES, IC), field (seismometer, gravimeter, resistivity, GPS, hydrolog.) and computing (GIS, Remote Sensing, 3D/3D geo-physicals) 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.

NEOTECTONICIST/STRUCTURAL GEOLOGIST
CALIFORNIA STATE UNIVERSITY, LOS ANGELES

The Department of Geologic Sciences seeks to fill a temporary full-time faculty position in neotectonics/structural geology at the Assistant Professor level to begin in September 2008 and at an initial salary commensurate with qualifications and experience for one year with possibility of additional appointments. Applicants must have an expertise in one or more of the following: Quaternary faulting and tectonic processes, structural geology, geomorphic processes, neotectonic development, history of southern California, paleoseismology, and or earthquake seismology. A Ph.D. in geology is required. Review of applications will begin May 15, 2008 and continue until the position is filled. Washington and Lee is an Equal Opportunity Employer. Women and Minorities are encouraged to apply.

Classified Advertising

To estimate cost, count 54 characters per line, including all punctuation and blank spaces. Actual cost may differ if you use capitals, centered type, or special characters. Ads (or cancellations) must reach the GSA Advertising office no later than the 20th of the month prior to issue. Contact Advertising: advertising@geoscience.org; +1-800-472-1988 x103; +1-303-357-1053. Complete contact information, including mailing and email address, must be included with all correspondence. Rates are in U.S. dollars.

To apply for a position, applications and nomination should be addressed to Larry R. Grillot, Dean of the Mewbourne College of Geology and Petroleum, University of Oklahoma, Norman, Oklahoma, and is under the direction and supervision of the Board of Regents of the University of Oklahoma. The University of Oklahoma is an Affirmative Action, Equal Opportunity Employer. Women and Minorities are encouraged to apply.

DEPARTMENT OF EARTH & OCEAN SCIENCES UNIV. OF BRITISH COLUMBIA, VANCOUVER MINERAL DEPOSIT RESEARCH UNIT

The Board of Directors for the Mineral Deposit Research Unit (MDRU) of the Department of Earth & Ocean Sciences at the University of British Columbia (UBC) invites applications for a new Director. The Director will provide leadership and supervision of MDRU programs including research, administration, and life-long learning. Successful operation requires extensive experience in the academic and research world and industry at large and with faculty, researchers and graduate students within the Department of Earth & Ocean Sciences (UBC) and externally. 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: http://www.ubc.ca/faculty_relations/agreements/appoint-mentfaculty.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. 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 & Ocean Sciences, the University of British Columbia, 6339 Stores Road, Vancouver, British Columbia, V6T 1Z4. The deadline for receipt of applications is May 15, 2008.

FACULTY POSITIONS EARTH AND ENVIRONMENTAL SCIENCES
UTAH STATE UNIVERSITY

The University of Utah is an Equal Opportunity/Affirmative Action Employer. Women and Minorities are encouraged to apply.

CO-DIRECTOR MINERAL DEPOSIT RESEARCH UNIT

Position: Open Date: 09/01/2008 Salary: $75,000–$125,000

The Department of Earth & Ocean Sciences (DEOS) is recruiting for a new Co-Director to the Mineral Deposit Research Unit (MDRU). MDRU is a resource for deposit-related research located at the south end of the University of Utah campus. The Co-Director, along with the current Director, will continue to lead a research group focusing on mineral deposits and is an integral part of the research faculty in the Department of Earth & Ocean Sciences. The successful candidate is expected to lead MDRU research and contribute to graduate education and services.

Qualifications:

A Ph.D. in earth sciences, with research experience in mineral deposits, is required.

Preferred qualifications:

A Ph.D. in earth sciences with research experience in metals, the U.S. and/or British Columbia, and excellent demonstrated record of excellence in teaching, research, administration, and supervision of people.

Applications: Applications will be accepted until the position is filled. Please send a curriculum vitae, a statement of research interests, and the names and addresses of at least three professional references to: Dr. Mark A. Childs, Department of Earth & Ocean Sciences, University of Utah, 255 South 1400 East, Rm. 230, Salt Lake City, UT 84112. Applicants should also arrange to have three letters of recommendation sent to the above address.

The University of Utah is an Equal Opportunity/Affirmative Action Employer. Women and Minorities are encouraged to apply.

 Classified Rates—2008

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Vita and other supporting material should be sent to Atilla Aydin at aydin@wlu.edu. EOE.

AWARD OF THE DIRECTOR, OKLAHOMA GEOLOGICAL SURVEY
UNIVERSITY OF OKLAHOMA

Applications are solicited for the position of Director, Oklahoma Geological Survey (OGS). The OGS is located on the University of Oklahoma campus in Norman, Oklahoma. The Director is an appointed position with supervision of the Board of Regents of the University of Oklahoma. Organizationally, the OGS is located within the Energy and Environment Center, which also includes: ConocoPhillips School of Geology & Geophysics, Mewbourne School of Petroleum & Geosystems Engineering, and the Petroleum Information Center. The Director of the OGS reports administratively to the Dean, Mewbourne College of Geosciences and, depending on qualifications and experience, will hold a faculty position within the College as an Associate or Full Professor, renewable every 4 years. We seek an individual who 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, mineral and energy resources.

(b) The preparation and publication of bulletins and reports, accompanied with necessary illustrations and data, including both general and detailed descriptions of the geological structure of the state and its mineral resources.

(c) The consideration of such other related scientific and economic questions that shall be deemed of value to the state and its citizens.

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 laboratories, and the OGS Field and State Resources areas, including both general and detailed descriptions of the geological structure of the state and its mineral resources.

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 deadline for receipt of applications is May 15, 2008.
The Jackson School of Geosciences can be found at www.jsg.utexas.edu.

The University of Texas Institute for Geophysics (UTIG), Director. UTIG is an international leader in marine geology, geophysics, seismology, and climate research. With a 30-year history, UTIG has built a program of scientific excellence, with a broad focus on the use of quantitative tools in geosciences. UTIG currently supports more than 150 research scientists and engineers and has annual externally funded research expenditures of approximately $50 million. Information about UTIG and the recruitment of new faculty is available at www.jsg.utexas.edu/hiring.

**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-Utah 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.cnrs.usu.edu.**

**ASSISTANT PROFESSORSHIP ANALYTICAL GEOCHEMISTRY/GELOGICAL 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 Sciences.

**MULTIPLE HIRES IN ENERGY GEOSCIENCE**

The Jackson School is building a premier education and research program in Energy Geoscience. Over the next three years, we seek six or more scientists at the forefront of their disciplines to complement our existing strengths. We seek people attracted to challenging areas of scholarship that require collaboration across disciplines and programs, aimed at the following goals:

- Improve quantitative understanding of sedimentary basins by integrating on all scales classically separated disciplines such as stratigraphy and sedimentology, structural geology and tectonics, geomechanical and diagenetic modeling, geochemistry, basin modeling, petrophysics, and geophysical imaging.

- Determine fluid-rock interactions and the interplay between mechanical and chemical processes influencing fluid flow and storage in the subsurface, especially for carbon sequestration and unconventional sources of fossil energy, such as shale gas and tight gas reservoirs.

- Enhance identification and recovery of energy resources by comprehensive integration of information at all scales, using numerical modeling, and innovative automated monitoring, such as time-lapse seismic and instrumented oil fields.

We encourage applications from innovative scientists working in all fields of energy geoscience. We are building a body of faculty and scientists to place the school at the forefront of energy geoscience research and teaching for the coming century. Appointments include full-time faculty, full-time research, and mixtures of the two in any Jackson School unit— the Bureau of Economic Geology, the Department of Geological Sciences, or the Institute for Geophysics. For more information on the school and its hiring program visit us online at www.jsg.utexas.edu/hiring.

A PhD is required for appointment. An application should note the title of the specific advertisement you are responding to and include a cover letter, CV, list of publications, list of references, statements of teaching and/or research interests, sent to: Randal Okumura, Office of the Dean / Jackson School of Geosciences, The University of Texas at Austin / PO Box B, University Station / Austin, TX 78713 or jobs@jsg.utexas.edu.

**THE UNIVERSITY OF TEXAS AT AUSTIN IS AN AFFIRMATIVE ACTION / EQUAL OPPORTUNITY EMPLOYER**

**CHANGING THE WORLD OF GEOSCIENCES**
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.  
Basi Tikoff (basi@geology.wisc.edu) or Christine Siddoway (CSiddoway@ColoradoCollege.edu).

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; www.standingrock.org or +1-701-254-2025 for more info.

Fellowship Opportunities  
VISITING FELLOWSHIPS  
INSTITUTE FOR ROCK MAGNETISM  
Applications are invited for visiting fellowships (regular and lasting for up to 10 days) and visiting professorships (open to any field of study involving fine particle magnetism, but preferably geology or environmental studies). More information is posted on the website.

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.irrm.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.

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 applications 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 web site at: http://www.wright.edu/academics/envsci/index.html

Questions regarding our program may be directed to our Program office; Ms. Cathy Kempt, Administrative Specialist, 262 Digs Laboratory, Wright State University, Dayton, OH 45435, Phone: +1-937-775-7373, FAX: +1-937-775-3445, Office Hours: 8:30 a.m.–5:30 p.m. Monday–Friday; e-mail: director.envsci@wright.edu.

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 University of Texas at Austin is an Equal Opportunity/Affirmative Action employer.

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 soon as possible and applications will be accepted until the position is filled. Applications and nominations will be accepted until the position is filled. The task 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 udiredirectsearch@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 candidates.

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Paleontology of the Upper Eocene Florissant Formation, Colorado
edited by Herbert W. Meyer and Dena M. Smith

The Upper Eocene Florissant Formation of central Colorado contains an exceptionally preserved, highly diverse assemblage of fossil plants and insects along with some vertebrates. This volume offers 11 diverse contributions, including the history of the paleontological study of the site; new models for the role of biofilms in fossil preservation; the relevance to interpretations of paleoclimate, biogeography, and the Eocene-Oligocene floral transition; plant-insect associations during the Eocene; morphometric approaches to fossil spider identification; a summary of the mammalian fauna; the mineralogical preservation of the fossil woods and conservation strategies for the petrified forest; and the development of a new database to compile a complete inventory of the fossils and their taxonomy. The volume is partially the outcome of a GSA symposium that was held during its 2004 annual meeting, and it reports many of the newest advances in our understanding of Florissant during the past decade.

SPE435, 177 p., ISBN 9780813724355
$60.00, member price $42.00
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, multi-disciplinary, 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.

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Deep Geologic Repositories reviews the success stories of underground waste isolation. It focuses on repositories that did, do, and will permanently and safely isolate dangerous materials from the near-surface biosphere. Complementary topics address the isolation capability of average crustal rock, investigations at one representative underground research laboratory, and the geologic preservation of fission products from Precambrian nuclear reactors. An international cast of contributors presents proven practical solutions to a formerly confounding issue in environmental and engineering geology: What do we do with wastes that retain their dangerous characteristics in human terms forever? The principal answer: Recycling into the lithosphere by “reverse” mining.

REG019, 119 p., ISBN 9780813741192
$50.00, member price $35.00