A shift from lithostratigraphic to allostratigraphic classification of Quaternary glacial deposits
Not Just Software... RockWare. For Over 25 Years.

**RockWorks™**
3D Data Management, Analysis & Visualization

- Powerful measured-section/borehole database for managing:
  - Lithology
  - Stratigraphy
  - Hydrology
  - Fractures
  - Hydrochemistry (e.g. Contaminants)
  - Geophysics
  - … and more
- Create striplogs, cross-sections, fence diagrams, and block models.
- Contour data in 2D and 3D (isosurfaces).
- Extensive on-line help and sample data sets.
- Includes RockWorks Utilities


$2,499

---

**DeltaGraph™**
The Most Comprehensive Charting Application Available

- Analyze, visualize and customize your numbers efficiently with high quality output
- Formula Builder with 50 mathematical/statistical functions
- Curve fitting with advanced regression tools
- Over 80 different chart types and 200 different styles
- High quality screen and printer output


$295

---

**The Geochemist's Workbench™**
GWB is the premiere software solution for simulation of:
- Migration of landfill leachate
- Acid rock drainage
- Metal mobility
- Redox control on solute mobility
- Solute attenuation

GWB Standard
Reaction Path Modeling

$3,499

GWB Professional
1D/2D Reactive Transport Modeling

$7,999

---

**RockWorks Utilities™**
An Indispensable Collection of Modeling, Analysis, and Display Tools

- Point maps
- Contour maps
- 3D surfaces
- Gridding tools
- Solid models
- Volumetrics
- Piper/Stiff plots
- Rose & Stereonet diagrams


$599

---

RockWare®
Since 1983

303.278.3534 • 800.775.6745
RockWare.com
4 A shift from lithostratigraphic to allostratigraphic classification of Quaternary glacial deposits
M.E. Räsänen, J.M. Auri, J.V. Huitti, A.K. Klap, and J.J. Virtasalo

Cover: Glacial sequence showing a conformable succession of probable Saalian (Illinoian) upward-fining esker margin deposits, unconformably overlain by a probable Late Weichselian till bed (Early Wisconsinan) (gray), which is again unconformably overlain by Holocene shoreface deposits. The site is at Jurva in western Finland and is typical for the small exposures of glaciogenic deposits upon which the regional stratigraphical frameworks for glaciated shield areas have to be based.

12 Calendar of Upcoming Deadlines & Events

14 Rock Stars: Israel Cook Russell

16 2008 OEST Award Recipients Named

17 Final Announcement: Cordilleran Section Meeting

20 Final Announcement: Rocky Mountain Section Meeting

23 2009 Section Meeting Mentor Programs

24 GSA Foundation Update

26 New Members: GSA Welcomes You!

30 2009 GSA Officer and Councilor Nominees

31 About People and In Memoriam

32 New Science Editors for GSA Journals

33 GSA-ExxonMobil Bighorn Basin Field Award—A FREE Professional Development Opportunity

34 Call for Applications and Nominations: GSA Science Editors

36 Classified Advertising

38 Journal Highlights

39 Seeking Earth Science Fair Judges

GSA celebrates our three-year association with the International Year of Planet Earth.
A shift from lithostratigraphic to allostratigraphic classification of Quaternary glacial deposits

M.E. Räsänen, Department of Geology, University of Turku, 20014 Turku, Finland; j.m.auuri@utu.fi; M.E. Räsänen, Geological Survey of Finland, Vaasantie 6, 67100 Kokkola, Finland; J.V. Huitti, A.K. Klap, and J.J. Virtasalo, Department of Geology, University of Turku, 20014 Turku, Finland

ABSTRACT

The bedrock of the northern halves of North America and Europe is covered by Quaternary glacial deposits, forming a surficial overburden that is relatively thin, nonlithified, lithologically variable on a small scale (in terms of grain-size, mineralogy, texture, fabric, structure, and color), and often has a well-preserved depositional topography. These geologically unique characteristics and the fact that the glacial overburden was long considered to be of only restricted economic value have caused it to be treated differently in geological research from the older, regularly lithified strata. Due to the striking geomorphology of these glacial deposits, their investigation has also been incorporated into physical geography research. Thus, the segregation of the Quaternary research community into different schools of geology and geography has created multiple classification approaches and has caused the formal stratigraphic classifications successfully applied in pre-Quaternary geology to be applied less regularly to Quaternary glacial strata. This has led to inefficient use of Quaternary geological data for scientific and socio-economic purposes.

The INTRODUCTION

INTRODUCTION

A considerable proportion of the developed societies in Europe and North America are located in temperate terrain that was repeatedly glaciated during the cold climatic cycles of the Quaternary Period (the past 2.6 m.y.). It is important for future development in these areas that geologists be able to provide society with more accurate information on the past behavior and distribution of the continental ice sheets and the present structure and nature of the resulting glacial deposits. When this spatial and descriptive stratigraphic information can be correlated with the unusually good decadal and even annual high-resolution oxygen isotope and other geochemical or varve chronologies available from Quaternary marine, lake, and glacial ice records (Gibbard et al., 2007; Brauer and Negendank, 2004; see Fig. 1), it should be possible to construct local high-resolution chronostratigraphic and diachronic time stratigraphies (cf. Johnson et al., 1997; Karrow et al., 2000). This time stratigraphic information would in turn enable more reliable long-term local climate, glacial, and sea-level scenarios to be provided to assist in resolving the heated worldwide discussion on the anthropogenic and/or natural reasons behind the present global warming (IPCC, 2007) and to inform decisions regarding nuclear waste disposal strategies in glaciated terrains (Heathcote and Michie, 2004).

Many societies are investing heavily in infrastructure to be built on and in deposits belonging to glacial landscapes while at the same time they are dependent on the characteristics of the glaciogenic terrains, including their groundwater and extractive resources. The existence of problematic geotechnical questions, landslide risks, contaminated land, and brown field problems and the relevance of Quaternary deposits to agriculture and forestry are examples of other issues societies face with regard to glaciogenic terrains. Intensified land use in metropolitan areas has caused a particular need to improve control over all types of geotechnical and geochemical data referring to Quaternary deposits, and data management should in any case be improved in order to enhance the sustainable use of land in all types of regional planning (European Union, 2007). This land-use planning would greatly benefit from the existence of practical stratigraphic classification systems and formal stratigraphic frameworks interconnected with flexible national and international geologic databases. The existing traditional soil and lithologic-lithogenetic surface maps clearly no longer provide the level of information needed in detailed planning, construction, and environmental projects (McMillan, 2005). Instead, there is an increased need for three-dimensional (3-D) stratigraphical information.

It has generally been thought that the lithostratigraphic classification used most commonly in pre-Quaternary geology, which is based on lithostratigraphic units, which are “bodies of rocks that are defined and recognized on the basis of their observable and distinctive lithologic properties or combination of lithologic properties and their stratigraphic relations” (Salvador, 1994), cannot be used as successfully in the case of glaciogenic Quaternary deposits, at least not in glaciated shield areas. This is due to the complexity and small-scale variation of the lithologic units in these deposits (cf. Flint, 1957; Eyles et al., 1984; Miall, 1997).

Some developed countries have recently made countrywide efforts to develop lithostratigraphic procedures for classifying their Quaternary glacial and non-glacial overburden, as exemplified by the work of the Deltares (Weerts et al., 2005; Weerts...
and Westerhoff, 2007), the Minnesota State Geological Survey (MGS; Johnson, 2005), and the British Geological Survey (BGS; McMillan, 2005).

But how successfully do the Deltares, MGS, and BGS classifications overcome the problem of high-frequency lithological variation in glaciated terrains? The Deltares and MGS approaches follow a tradition in which lithostratigraphic classification is applied quite freely, so that the lithostratigraphic formations defined in the Deltares classification, for example, represent depositional systems and basin fills, with a great variety of lithologies (Weerts et al., 2005). The Deltares and MGS usages follow the definition of the international guides (Salvador, 1994; North American Commission for Stratigraphic Nomenclature [NACSN], 2005) quite loosely, so that the higher hierarchy subgroups, groups, and supergroups in the Deltares classification are interpretable or geographically determined units and are not always related to the principles of lithostratigraphic classification.

The BGS classification defines a formation in a somewhat stricter manner, and the resulting lithostratigraphic formations are smaller in scale and generally show greater lithologic homogeneity (understood in a more petrographic sense). At the higher subgroup and group levels, the BGS scheme intends to show the lithologic (= petrographic) homogeneity in formations derived from the same provenance areas.

Because unconformities and small-scale lithologic variations are so abundant and are of primary importance in Quaternary glaciogenic deposits (Flint, 1957; Eyles et al., 1983; Miall, 1997), especially in shield areas, a practical approach involving the combined use of allostratigraphy and lithostratigraphy (CUAL) is proposed here. The new features in this descriptive CUAL approach are (1) unconformity-bounded allostratigraphic units are given preference as basic units, which means that all depositional units within an area will belong to a certain alloformation; and (2) these allostratigraphic units are subdivided into lithostratigraphic or lower-order allostratigraphic units as appropriate (Figs. 1 and 4–6). As in sequence stratigraphy (Vail et al., 1977; Gutteridge, 2008) or glacial sequence stratigraphy (Powell and Cooper, 2002), the unconformity-bounded units are the primary genetic units to be identified, with predictive textural and structural architecture.

**QUATERNARY STRATIGRAPHY IN GLACIATED TERRAINS**

The major reasons Quaternary researchers have had problems applying lithostratigraphy to glaciated terrain deposits can be summarized as follows (cf. Flint, 1957; Eyles et al., 1984; Miall, 1997):

1. **Quaternary glaciogenic deposits often miss the fundamental gross lithologic changes** (in grain-size, mineralogy, texture, fabric, structure, and color), which are more common in older rock series and aid in their lithostratigraphic classification. Quaternary deposits represent shorter periods of time and less fundamental paleoenvironmental changes in the provenance areas or in the post-depositional weathering or diagenesis of the sediments than in older strata.

2. **Minor-scale gross lithological variation and local provenance is common** when the bedrock type varies considerably, and transport distances are generally short in glacial systems (Figs. 2 and 3).

3. **Lithologically similar units can be relatively small in scale, their thicknesses can vary frequently, and the units often occur as isolated deposits.** This is because deposition occurred within laterally migrating, advancing, or retreating zones of glacial deposition, where rapid base-level changes occurred due to glacio-isostasy and/or eustasy or because the sediment input channels changed position laterally along the glacial margin (cf. Flint, 1957; Brookfield and Martini, 1999). These characteristics are especially prominent in the Canadian and Fennoscandian shield areas, where the pre-Quaternary bedrock topography tightly controlled the accommodation space during deposition.

4. **Finally, due to the dynamic erosional and depositional processes combined with the repeated pattern of glacial cycles, unconformities and diastems are very common in Quaternary deposits,** and lithostratigraphy does not use these features as primary classification criteria (Walker and James, 1992; Miall, 1997; NACSN, 2005).
Figure 2. Petrographic variations in the coarse fraction of the Late Weichselian till bed in relation to the underlying Precambrian bedrock type within a 40 km transect parallel to the Late Weichselian ice movement in central Sweden. Only one till bed has been reported within the area. The exotic stone types refer to types that have not been encountered in the bedrock of the transect. Gray—acid granite; tan—intermediate granite; black—basic granite; teal—plagioclase quartzite; blue—exotic stones. Modified from Linden (1975).

Figure 3. Petrographic variation of the coarse fraction of an unconformity-bounded till bed (pie charts) showing the influence of an Archean greenstone belt surrounded by granitoids on the composition of the coarse fraction of the till bed. Arrow shows direction of ice flow during deposition. The studied till bed is the lowermost of the three unconformity-bounded till beds in eastern Finland. Modified from Saarnisto and Peltoniemi (1984).
This leads to a situation in which reasonably homogeneous lithostratigraphic units are often so small in scale that they are not easily mappable (cf. Eyles et al., 1983, 1984; Miall, 1997). This contrasts markedly with the lithostratigraphic classification of most pre-Quaternary rocks, where the units are more broadly representative in time and space.

DEVELOPMENT OF THE CLASSIFICATION APPROACHES

In order to elucidate the relation of the proposed CUAL classification to the stratigraphic classification systems applied earlier, their backgrounds are briefly reviewed here.

The Lithologic and Lithogenetic Approach

The most widely applied systems for classifying the Quaternary overburden are based on varying combinations of lithologic information (grain-size, mineralogy, color) and the genesis of the surficial (<1 m or ≥1 m) deposits. The stratigraphic aspect is normally very limited (North American Geologic Map Data Model Science Language Technical Team, 2004; McMillan and Powell, 1999). These classifications give the necessary surficial base data for wide areas, but seldom meet any more demanding scientific or applied needs.

The Morphogenetic and Morphostratigraphic Approach

Morphostratigraphical schemes have been published by Willman and Frye (1970) and Nystuen (1986), and physical geographers have also traditionally favored this approach. This approach may apply in areas of sediment cover derived from one glacial cycle, but it cannot apply to terrains with deposits from multiple glacial events (cf. Möller, 2006).

The Lithostratigraphic Approach (sensu lato)

At the very beginning of systematic Quaternary research in Canada, Logan (1863) classified Quaternary units into lithostratigraphic formations in a similar manner to the strata from the older geological column. Later, in the late nineteenth and early twentieth centuries, when glacial geology was becoming increasingly segregated from Paleozoic and Precambrian geology (Willman and Frye, 1970), the lithologic and lithogenetic approach and the morphostratigraphic approach described above were developed.

In later years, however, a return to the application of lithostratigraphy occurred. Willman and Frye (1970) presented a systematic classification of the Pleistocene glacial deposits covering the Paleozoic bedrock of Illinois in terms of rock-stratigraphic units (= lithostratigraphic units) to be “defined and recognized on the basis of observable lithology without necessary regard to biological, time, or other types of criteria. They (rock-stratigraphic units) must be sufficiently distinctive to be recognizable by common field and subsurface methods” (p. 40). They added, however, “Once described, a rock-stratigraphic unit may be traced laterally, even though its lithologic character changes gradationally, so long as the integrity of the unit as a continuous body of rock can be recognized” (p. 40). They made this addition in order to amplify their lithostratigraphic classification criteria to meet the changing lithologies in their strata. The members in their scheme are lithologically distinctive, but most of them do not have the regional continuity to be mappable.

Lithostratigraphic units have been used in abundance to identify Quaternary deposits in the UK. In the 1970s, it was already common practice that lithologically varying units were accepted as formations, and members have come to be used for the lithologically more uniform parts of those formations (cf. Rose and Allen, 1977; Rose and Menzies, 1996). Earlier, Lüttig et al. (1969, p. 35) had proposed that a formation “is to be understood as a document of a genetically uniform sedimentation process, which may have led to the formation of a rock sequence more or less, in some cases even highly differing in single subunits, but of a uniform facies and genetic character.” In this scheme, a member shows “a reasonable lithologic similarity … so that the strata may belong to one cycle of sedimentation.”

Although mixing genetic interpretation and descriptive criteria, the definitions of Rose and Allen (1977) and Lüttig et al. (1969) for a lithostratigraphic formation and member resemble the more descriptive criteria of Willman and Frye (1970). These definitions can be regarded as the basis for the BGS, Deltares, and MGS stratigraphical frameworks (cf. Rawson et al., 2002).

Morpho(Litho)-Stratigraphic Approach

Recently in the UK, Hughes et al. (2005) presented a combined morpho(litho)stratigraphical approach in which the landform morphology was taken as an elemental part of the definition of the lithostratigraphic unit from which the landform was composed. This evidently works well with deposits derived from one glacial cycle but will meet problems when deposits of polygenetic landforms derived from multiple glacial cycles are classified (cf. Möller, 2006).

The Depositional System Approach

Some Quaternary researchers who have considered lithostratigraphy more strictly have tended to avoid its use, adopting instead the concept of depositional systems, for example, to classify their strata (Eyles et al., 1983). A depositional system was originally defined by Fisher and McGowen (1967) as an assemblage of genetically related facies.

Allostratigraphic Approaches

Geologists have always accepted unconformities as the limits between lithostratigraphic formations in pre-Quaternary stratigraphies, although it is the lithological change occurring at an unconformity that has been taken as the defining criterion for delimiting the units (Salvador, 1994).

One of the first researchers to define sedimentary packages that would today be called unconformity-bounded units/allostratigraphic units/synthemes (Salvador, 1994) was Caster (1934), who studied the Devonian coastal sequences of Pennsylvania and referred to sequences of differing age as parafacies. Later, Forgetson (1957) spoke of the unconformity-bounded ed units as formats and other synonymous terms, such as the sequence of facies, facies tracts, facies families; the terms facies suites of Teichert, the holosome of Wheeler, and the concept of genetic increment of strata of Bush have also been used (cf. NACSN, 2005, and ref. therein). Chang (1975) developed the
Figure 4. Application of the “combined use of allostratigraphy and lithostratigraphy” (CUAL) approach to a Quaternary glacial sequence in the Toronto area, Canada. The figure demonstrates the basic principles of CUAL classification in relation to the lithostratigraphic, depositional system, and glacial sequence approaches. The figure shows the natural gamma-ray emissions (cps—counts per second) and a simplified lithofacies column together with the positions of the major unconformities and deformed contacts within the section (modified from Boyce and Eyles, 2000), providing a basis for the CUAL classification. This tentative CUAL classification shows only the categories of the units (lithostratigraphic/allostratigraphic) and their hierarchy, with the most obvious possible names, deliberately leaving most of the units unnamed. The allounits are bounded by unconformities, while the lithostratigraphic units are separated by gradational or deformed contacts.

Figure 5. A glacial section located in a Precambrian gneiss-granite bedrock area at Stenberget, southern Sweden, divided into three alloformations (A–C) according to the erosive unconformities at the bases of the three till layers (red lines). Each of these alloformations shows a succession from till to sorted sediments. The tills of the alloformations and the alloformations as such have a better mappability than the sorted units. Modified from Lagerlund (1980), who applied detailed formal and informal lithostratigraphic nomenclature for the units in the section.

Figure 6. Application of the “combined use of allostratigraphy and lithostratigraphy” (CUAL) approach. (A) Classification of offshore Baltic Sea sediments based on acoustic soundings and core data, modified from Virtasalo et al. (2005). Dashed line—unconformity; continuous line—gradual contact. The Korppoo Alloformation is divided into two lithostratigraphic formations according to the gradual lithological change at their boundary. (B) Hypothetical example of an unconformity-bounded till bed defined as an allostratigraphic formation. The lateral variation in the lithology within the till bed is used to define lithostratigraphic units (a–c) where appropriate.
term *synthem* for the unconformity-bounded units in South Korean Paleozoic-Mesozoic sequences.

Walker and James (1992) stressed the advantages of the allostratigraphic approach in their textbook and presented a number of good case studies of its application. The NACSN (2005) also proposed that allostratigraphic units should be used as formal units, especially in Neogene and Quaternary strata.

Allostratigraphy and lithostratigraphy have in some cases been used together, and Chang (1975) showed how lithostratigraphic formations form elemental parts of his synthems. The term *folgen* has been used recently for unconformity-bounded units in the Triassic sequences of Germany (Lutz et al., 2005), with lithostratigraphic formations constituting parts of these (Nitsch, 2005).

**Allostratigraphy in Quaternary Deposits**

The allostratigraphic approach has proved easy to apply in the case of fluvial Quaternary deposits, where the unconformities are well developed (Zuchiewicz, 1988; Autin, 1992; Benvenuti, 1997; Straffin et al., 1999; Sinha et al., 2005). Similarly, in offshore studies, the seismic and acoustic profiles reveal the unconformities quite clearly (Hiscott, 2001; Virtasalo et al., 2005). In mountainous regions, the differences in elevation of the glacial deposits have facilitated delimitation of the allostratigraphic units in the field (cf. Hughes et al., 2005, and references therein; Hughes, 2006).

The only work with which we are familiar that combines lithostratigraphic and allostratigraphic approaches is that of Rijjsdijk et al. (2005), who covers the Neogene and Quaternary deposits of the Netherlands. Here the broadly defined lithostratigraphic formations of Weerts and Westerhoff (2007) are included within allostratigraphic formations. This work deals with deposits on the same scale as in sequence stratigraphy. When allostratigraphy has been applied to Quaternary glaciated terrain deposits other than in mountainous regions, it has been used in an interpretative manner (Little, 2005) and not descriptively.

**The Glacial Sequence Stratigraphic Approach**

It is notable that Flint (1957) already used the term *glacial sequence* to refer to a basic depositional element composed of a till bed and overlying sorted sediments in a Quaternary glaciated terrain, but its use has never been firmly established in the same manner as *sequence* in the sequence stratigraphy context of Vail et al. (1977). However, Powell and Cooper (2002) have recently applied a *glacial sequence stratigraphic* nomenclature to seismically well-studied deposits in temperate continental shelves.

In summary, it can be concluded that all the approaches described—lithostratigraphic classification (sensu lato), the morpho(litho)stratigraphic, the depositional system, and the allostratigraphic and glacial sequence stratigraphic approaches—are in practice quite identical in the way in which they have been applied to Quaternary deposits, as they mostly define unconformity-bounded genetic units (Fig. 4). Although exceptions always exist, many of the groups and formations defined in the Deltares, BGS, and MGS lithostratigraphic frameworks could often be alternatively, or even more likely, regarded as unconformity-bounded allostratigraphic units (cf. Chang, 1975; McMillan, 2005) or glacial sequences. They are often delimited by major transgressive and regressive regional unconformities or by unconformities and diastems caused by glacial erosion or shifts in the focus of glaciofluvial deposition. It is simply that the segregation of the research community into different geology/geography schools and traditions with different paradigmatic backdrops has caused multiple terminologies to develop.

**The CUAL Approach**

The true nature of the Quaternary depositional units in glaciated shield areas is that they are arranged in unconformity-bounded, lithologically varying packages, so allostratigraphy may be regarded as the most promising descriptive approach for stratigraphic classification (cf. NACSN, 2005). Lithostratigraphy is undoubtedly applicable as well, but it should be used in a stricter manner than in the examples herein.

In the CUAL approach, the allounits are given preference, and the lithostratigraphic units are subordinate to the allostratigraphy. It is in this aspect that the scheme differs from the proposals of the NACSN (2005). This modification in relation to the previous Quaternary classifications may sound purely semantic, but it is important in that lithostratigraphy can now be applied more strictly (Shultz, 1982) to fill in the lithostratigraphically mappable “details” in the allostratigraphic framework. When the present land surface forms the upper bounding surface of a superficial allounit, then the spatial morpho(litho)stratigraphical information can be applied to the delimitation of the unit.

The main principles and characteristics of the CUAL stratigraphic classification are as follows:

1. A preference for defining mappable allostratigraphic formations. These are normally larger than the lithostratigraphic units in glaciated terrains (Figs. 1 and 4–6).
2. When lithologically identifiable, reasonably homogeneous, and mappable lithostratigraphic formations (sensu stricto) can be defined within an allounformation, this should be done (Figs. 1, 4, 6A, and 6B).
3. Where appropriate, an entire allounformation can be subdivided into either lithostratigraphic units (formations, members; Figs. 1, 6A, and 6B), lower-rank allostratigraphic units (allomembers), or a combination of these (Figs. 1 and 4).
4. Allmembers or members need not be mappable, but can be. It is accepted that a lithostratigraphic member does not need to be part of a lithostratigraphic formation but can be a part of an allounformation.
5. If an allounformation has such a diverse or chaotic lithology that its subdivision is not reasonable, its internal lithological variation should be broadly described when it is defined.
6. The preference for defining allostratigraphic units means that in cases where a lithologically uniform unit is cut by unconformities, which is less common in glaciogenic terrains, the unit should be named in accordance with the allostratigraphy.
7. The single definition criterion for an allounit should always be its bounding unconformities, the nature of which need to be properly described. The nature of a boundary between allounits may change from that of a clear unconformity to a deformed bed or even a conformable
bed in the same way as a correlative conformity surface in sequence stratigraphy.

**DISCUSSION**

Formal stratigraphic classification is a fundamental scientific tool for developing a regional knowledge of any period in Earth's history. For the subfield of Quaternary geology, the selection of stratigraphic classification criteria is as important a paradigmatic decision as was the adoption of sequence stratigraphy for petroleum geology in the 1980s. The CUAL approach proposed here provides a hierarchical classification system for glaciogenic deposits and creates a sound basis for detailed chronostratigraphic and diachronic work (Johnson et al., 1997) in order to improve our understanding of the complicated Quaternary couplings of astronomical forcing, climatic change, and continental glacial dynamics that have determined the distribution and nature of glacial depositional and erosional products.

Although Quaternary glaciated terrain deposits have geologic unique properties, they should be studied using the same type of stratigraphic toolbox as pre-Quaternary strata. The establishment of a stratigraphic framework system using a CUAL approach would require more excavations and surficial drilling as well as wireline geophysics, ground-penetrating radar, shallow seismics, acoustic soundings, and other geophysical methods that are still under development.

Major unconformities may sometimes be difficult to define in unconsolidated glacial-terrain deposits. This may be caused by, for example, multiple glacial scouring, which has created repeated unconformities. Although allostratigraphy and the CUAL approach are intended to be objective and descriptive methods, we have to accept that the definition and hierarchical ranking of unconformities will sometimes include more or less interpretation. In order to place our major regional unconformities, we have to evaluate the importance of (a) the possible changes in lithology, (b) the adjacent lithofacies successions/associations within the section, and (c) the physical expression of an unconformity or its reflection in the geophysical data. Therefore, we cannot completely avoid interpretation if we aim to construct a stratigraphical framework for an area. Ultimately, it may be of less importance what kind of data are used for identifying the presence of an unconformity than what kinds of stratigraphic units one defines and uses as basic units in a formal stratigraphic framework. As sequence stratigraphy has shown, unconformity-bounded units explain geologic history in a better way than lithostratigraphy (e.g., Gutteridge, 2008).

**ACKNOWLEDGMENTS**

We wish to express our sincere thanks to W.E. Westerhoff, H.J.T. Weerts, and A.A. McMillan for discussions and comments on this theme, as well as to the three anonymous reviewers for their constructive comments.

**REFERENCES CITED**


February

09  Early registration deadline for the Southeastern and South-Central Section Meetings.

15  Nominations for the Geophysics Division’s George P. Woollard Award due online at http://geosocience.unlv.edu/pub/GSA_Geop/woolland.html.

15  Applications for the Coal Geology Division’s Antoinette Lierman Medlin Scholarship are due to Jack C. Pashin, Geol. Survey of Alabama, P.O. Box 869999, Tuscaloosa, AL 35486, USA; fax: +1-205-349-2852; jpashin@gsa.state.al.us.

17  Early registration deadline for the Northeastern Section Meeting.

20  Nominations for the Sedimentary Division’s Laurence L. Sloss Award for Sedimentary Geology are due via e-mail to Paul Link, linkpaul@isu.edu.

27  Applications due for the GSA-ExxonMobil Bighorn Basin Field Awards. See p. 33.

28  Nominations for the Coal Geology Division’s Gilbert H. Cady Award are due. Send three copies of nomination materials to Glen Stracher, East Georgia College, Div. of Science & Mathematics, 131 College Circle, Swainsboro, GA 30401-3643, USA; +1-478-289-2073; stracher@ega.edu.

March

02  Early registration deadline for the North-Central Section Meeting.

04  Applications to attend the Penrose Conference, “Plumes and Their Role in Whole Mantle Convection and Recycling,” in Pico, the Azores, are due by e-mail to penrose2008@els.mq.edu.au. Learn more at www.geosociety.org/penrose/09azores.htm.

12–13  GSA’s Southeastern Section meets in St. Petersburg, Florida, USA.

13  GSA elections begin. Learn more at www.geosociety.org.

16–17  GSA’s South-Central Section meets in Dallas, Texas, USA.

20  Expressions of interest for the Field Forum, “Structure and Neotectonic Evolution of Northern Owens Valley and the Volcanic Tableland, California,” are due via e-mail to David Ferrill, dferrill@swri.org.

22–24  GSA’s Northeastern Section meets in Portland, Maine, USA.
Nominations for the **John C. Frye Environmental Geology Award** are due. Learn more at www.stategeologists.org/awards_honors, or contact GSA Grants, Awards, and Recognition at +1-303-357-1028 or awards@geosociety.org.

### April

02 Nominations for the Quaternary Geology and Geomorphology Division’s **Don J. Easterbrook Distinguished Scientist Award** and **Farouk El-Baz Award for Desert Research** are due. Send nominations for the Easterbrook award to Marith Reheis, USGS, MS980, Federal Center, P.O. Box 25046, Denver, CO 80225-0046, USA; +1-303-277-1843; mreheis@usgs.gov. Nominations for the El-Baz award should go to Paul R. Bierman, Univ. of Vermont, Dept. of Geology, Delehanty Hall, Burlington, VT 05405-0001, USA; +1-802-656-4411; pbierman@zoo.uvm.edu.

06 Early registration deadline for the **Cordilleran and Rocky Mountain Section Meetings**.

12 **GSA elections**—ballots must be postmarked or submitted electronically by this date.

### May

01 Applications for the **History of Geology Student Award** are due. Learn more at http://gsahist.org/HoGaward/awards.htm or contact Jane P. Davidson at jdhexen@unr.edu.

01 Applications to attend the **Penrose Conference**, “Tectonic Development of the Amerasian Basin,” at the Banff Centre, Alberta, Canada, on 4–9 October 2009 are due to Victoria Pease, vicky.pease@geo.su.se, or Lawrence Lawver, lawver@utig.ig.utexas.edu.

06 **GSA’s Cordilleran Section** meets in Kelowna, British Columbia, Canada.

11–13 **GSA’s Rocky Mountain Section** meets in Orem, Utah, USA.

11–15 **Penrose Conference**: “Plumes and Their Role in Whole Mantle Convection and Recycling,” in Pico, the Azores.


---


Spring in the south Okanagan Valley, about an hour south of Kelowna, British Columbia. Photo courtesy Robert Young.
Israel Cook Russell (1852–1906) was one of America’s leading early pioneers in geomorphology and glacial geology. He served as a U.S. Geological Survey geologist for most of his career, first full-time and later, after he joined the University of Michigan faculty, as a seasonal employee. He was president of the Geological Society of America in 1906, vice-president of the American Association for the Advancement of Science in 1904, president of the Michigan Academy of Science in 1902, and a member of a host of other alpinist and geographical societies. His research focused on geomorphology, reflecting his interest in surficial processes.

Russell was born in upstate New York in 1852 into a family whose ancestors were early settlers in New England. He earned a bachelor of science and civil engineering degree from the University of the City of New York in 1872 and a master of science degree in 1875. He visited New Zealand in 1874 as a member of the U.S. Transit of Venus Expedition. As no provision was made for work in natural history on this expedition, Russell obtained an appointment as “photographer” and acquired the necessary skills in a hurried course under noted physicist Ernest Rutherford (1871–1937). These skills were put to extensive use the remainder of his life and account for the majority of photographs in his publications. After New Zealand, he joined Columbia University as an assistant professor of geology in 1875.

In 1878, Russell was hired as an assistant geologist on George Montague Wheeler’s (1842–1905) U.S. Geographical Survey West of the 100th Meridian, working in Colorado and New Mexico (Gilbert, 1906). In 1880, he was appointed assistant geologist in the newly formed U.S. Geological Survey and aided Grove Karl Gilbert (1843–1918) in studying pluvial Lake Bonneville. During the 1880 field season, Russell traveled alone some 5500 km on horseback through the northern Great Basin, undertaking reconnaissance in a region he was to visit repeatedly throughout his career. He rather liked the wild and, though slight of build, he had the “capacity for sustained effort and endurance,” without which his more strenuous explorations would have been impossible (Gilbert, 1906, p. 667).

Pleistocene Glaciation and Pluvial Lakes

In 1881, Russell undertook a reconnaissance of both the pluvial Lake Lahontan and Mono Lake (later named pluvial “Lake Russell” in his honor) in the western Great Basin. At its maximum, Lake Lahontan covered 13,500 km$^2$, with a maximum depth of 268 m (Russell, 1885). Active faults bound many of the mountain ranges that would have appeared as “peninsulas and islands during the existence of the lake [dividing] its surface into a number of irregular water bodies that were connected by narrow channels” (Russell, 1885, p. 31). In addition to reviewing depositional features characteristic of shorelines, such as terraces, barrier beaches, sea cliffs and deltas, he identified three tufa morphologies—“lithoid” (compact, encrusting, stony), “thiolitic” (orthorhombic prismatic crystals), and “dendritic” (branching, mushroom-shaped)—deposited in succession accompanying lowering lake levels. From tufa deposits, Russell delineated three periods in the history of the lake: the first when the lake filled its basin to within 10 m of the highest tufa, the second when the surface marked a shore line 120 m lower, and the third at an intermediate elevation some 70 m below its high stand.

Russell visited the Sierra Nevada in 1881–1883 and demonstrated that small glaciers at the heads of drainages into the Mono Lake basin had been large valley glaciers during the Pleistocene. He mapped the extent of these ancient ice tongues based upon the distribution of drift, usually well defined at lower elevations by lateral and terminal moraines, and noted that “four of the glaciers extended a short distance below the highest of the terraces formed by the ancient lake. … The proof that the highest stage of the lake followed the maximum extension of the glaciers is thus abundant’ (Russell, 1889, p. 369). He also noted the interaction between Sierran glaciers, Mono Lake, and volcanism associated with the range front fault (Russell, 1889, p. 371): “The evidence of late volcanic activity in Mono Valley is furnished by craters and lava flows which are more recent than the former high water stage of the lake and were formed after the last recession of the Sierra Nevada glaciers.”

Northern Great Basin Geology

Russell undertook reconnaissance mapping of the northwestern part of the Great Basin in 1881 and 1882 and described the fault-block mountains,
volcanic rocks, and playas. He recognized that the young extensional faults crosscut earlier-deformed rocks. First, rocks were plicated and crumpled into anticlinal and synclinal folds, then a second disturbance produced the present topography. He noted that the volcanic rocks are not folded, but are cut by younger faults, and thus are intermediate in age between the two periods of disturbance. The youthfulness of the second disturbance was demonstrated where faults continued through recent alluvial slopes and stream beds.

During his reconnaissance of the northern Great Basin and Columbia Plateau, Russell gave special attention to the genesis and features of plateau basalts. Lava on the Snake River Plain was extruded in two ways: by fissure eruption, which resulted in widespread blanketing sheets with extensive columnar jointing, and by more localized explosive eruptions, which produced cinder cones and a wide variety of volcanic bombs.

ALASKAN EXPLORATION

In 1890 and 1891, Russell conducted two pioneering explorations of the Mount St. Elias region under the auspices of the U.S. Geological Survey and the National Geographical Society. Landing through the surf at Icy Bay west of Yakutat in 1891, which resulted in the drowning of six men, the expedition attempted to maintain a straight course to Mount St. Elias. From the shores of Icy Bay, Russell and his team of five assistants trekked overland through thick forest to the margin of Malaspina Glacier, braving swift streams, mosquito swarms, and abundant bears.

“Reaching the inner border of the forest-covered moraine, we had before us a vast expanse of barren moraine broken by thousands of crevasses, and diversified by pits and hollows holding lakes. Between the lakes rose huge pyramids and spires of ice of the most rugged description, each one sheathed with stones and dirt, which furnished only an insecure foothold” (Russell, 1896, p. 220).

Due to delays and the characteristic inclement weather of the St. Elias Range, Russell never did achieve the summit in 1890. He made a solo attempt on the summit in 1891 but was caught in a storm. To survive, he excavated a tunnel into the snow and made a chamber in which he passed the night. However, he did determine the summit elevation at 5485 m, at that time considered the highest peak in North America. On the second expedition (1896), Russell collected a Quaternary marine fauna preserved among faceted and striated stone-bearing glacial-marine sediments in the Chaix Hills, which rose through Malaspina Glacier to an elevation of ~1000 m, attesting to rapid orogenic uplift.

MICHIGAN YEARS

As an academician, Russell felt that it was the duty of the university to select the few students of exceptional ability and encourage them to devote their lives to the task of carrying on research in the direction in which they were especially qualified. He wrote four textbooks on lakes, rivers, glaciers, and volcanoes, which he viewed as reading lessons for students of geography and geology. A fifth textbook was a treatise on the geography of North America that included not only coverage of physical and geological features, but also ethnology and political geography. Gilbert (1906, p. 666) wrote that Russell was not a theorist, but was “pre-eminently a scientific observer. His best work was in seeing, recording, and discussing the phenomena of a new field. His observation was sharpened by knowledge of existing theories, but not biased by them.”

REFERENCES CITED


# 2008 OEST AWARD RECIPIENTS NAMED

The National Association of Geoscience Teachers (NAGT) has announced their 2008 Outstanding Earth Science Teacher (OEST) Award recipients. These awards are given to outstanding pre-college teachers who have made exceptional contributions to the stimulation of interest in the earth sciences.

The OEST award is administered by The Geological Society of America. For further information, go to [www.geosociety.org/awards/oest.htm](http://www.geosociety.org/awards/oest.htm).

GSA congratulates these outstanding earth science teachers!

## SECTION Awardees

No awardees were selected for the Midcontinent, North Central, and Texas sections.

### Central Section

**Teresa Lee Huckleberry**

Indianapolis, Ind., USA  
Indiana School for the Deaf  

### Eastern Section

**John D. Moore**

Laurel Springs, N.J., USA  
Burlington County Institute of Technology  

### FarWest Section

**Anna Foutz**

Highland, Calif., USA  
North High School  

### New England Section

**Gregg Wachtelhausen**

Hingham, Mass., USA  
Hingham Middle School  

### Pacific-Northwest Section

**Jeff Hashimoto**

Ellensburg, Wash., USA  
Ellensburg High School  

### Southeast Section

**Tina Coleman**

Martin, Tenn., USA  
Martin Middle School  

### Southwest Section

**Suzi Shoemaker**

Casa Grande, Ariz., USA  
Casa Verde High School  

### State Awardees (in alphabetical order by state)

- **Jennifer Grant**  
  Autaugasville, Alabama, USA  
- **Adam Low**  
  Cordova, Alaska, USA  
- **Kathryn Bylsma**  
  West Chapel, Florida, USA  
- **Rebecca E. Chunn**  
  Brunswick, Georgia, USA  
- **Robert Walker**  
  Boise, Idaho, USA  
- **Kelda N. Hutson**  
  Murdelein, Illinois, USA  
- **Teresa Lee Huckleberry**  
  Indianapolis, Indiana, USA  
- **Wendy DeMers**  
  New Orleans, Louisiana, USA  
- **Susan E.P. Phillips**  
  Laytonsville, Maryland, USA  
- **Chris Bolhuis**  
  Hudsonville, Michigan, USA  
- **John D. Moore**  
  Laurel Springs, New Jersey, USA  
- **Christopher Visco**  
  Patchogue, New York, USA  
- **Robert Greenberg**  
  Chapel Hill, North Carolina, USA  
- **Jamie Rumage**  
  Corvallis, Oregon, USA  
- **Richard W. Schmidt**  
  Broomall, Pennsylvania, USA  
- **Dina Ledford**  
  Summerville, South Carolina, USA  
- **Tina Coleman**  
  Martin, Tennessee, USA  
- **Christopher Kaznosky**  
  Weyers Cave, Virginia, USA  
- **Jeff Hashimoto**  
  Ellensburg, Washington, USA  
- **Tiffany Litton**  
  Weston, West Virginia, USA  
- **State Awards Honorable Mention Certificates**
  - **Charles Simer**  
    Mt. Vernon, Illinois, USA  
  - **Jim Rock**  
    Golden Valley, Minnesota, USA  

---

The Geological Society of America  
Science Stewardship Service  

< ![Geological Society of America](https://via.placeholder.com/150)>

---

16 FEBRUARY 2009, GSA TODAY
Welcome

The Cordilleran Section of The Geological Society of America will hold its 2009 annual meeting on the University of British Columbia–Okanagan (UBC-O) campus in Kelowna, south-central British Columbia. The UBC-O Earth and Environmental Sciences Program is pleased to serve as host.

Kelowna, surrounded by lakes, mountains, and vineyards, is a geographic and geologic paradise. Located in the northern end of the North American extensional regions on the interior plateau and situated between major mountain belts, Kelowna and the Okanagan Valley offer many excellent field trip opportunities. The accessible geology includes Proterozoic basement complexes, Eocene and Miocene volcanic-plutonic complexes, and Quaternary glacial and deglacial landforms and sediments. Kelowna is also within a few hours’ drive of the Burgess Shales area.

CONTACT INFORMATION
Find up-to-the-minute information at www.geosociety.org/meetings/. If you have questions or have special requirements, contact the general meeting co-chairs, Rob Young, +1-250-807-9523, robert.young@ubc.ca, and Craig Nichol, +1-250-807-8087, craig.nichol@ubc.ca.

PASSPORTS
Passports are required to fly into Canada. Obtaining passports may be a lengthy process; therefore, it’s important to begin the passport application process immediately.

REGISTRATION
Early Registration Deadline: 6 April 2009
Cancellation Deadline: 13 April 2009
Please register online via link at www.geosociety.org/meetings/. Early registration qualifies for lower rates, but on-site registration will be available during the meeting. Payment with check must be drawn on a U.S. bank; no Canadian checks will be accepted. Both Canadian and U.S. currency will be accepted for on-site registration.

REGISTRATION FEES (all fees are in U.S. dollars)

<table>
<thead>
<tr>
<th></th>
<th>Early Full mtg.</th>
<th>Early One day</th>
<th>Standard Full mtg.</th>
<th>Standard One day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional Member</td>
<td>$180</td>
<td>$120</td>
<td>$210</td>
<td>$130</td>
</tr>
<tr>
<td>Professional Nonmember</td>
<td>$200</td>
<td>$140</td>
<td>$230</td>
<td>$150</td>
</tr>
<tr>
<td>Student Member</td>
<td>$75</td>
<td>$60</td>
<td>$90</td>
<td>$70</td>
</tr>
<tr>
<td>Student Nonmember</td>
<td>$100</td>
<td>$75</td>
<td>$130</td>
<td>$90</td>
</tr>
<tr>
<td>K–12 Teacher or Student</td>
<td>$50</td>
<td>$30</td>
<td>$55</td>
<td>$35</td>
</tr>
<tr>
<td>Guest</td>
<td>$60</td>
<td>n/a</td>
<td>$70</td>
<td>n/a</td>
</tr>
<tr>
<td>Field Trip or Workshop only</td>
<td>n/a</td>
<td>$40</td>
<td>n/a</td>
<td>$50</td>
</tr>
</tbody>
</table>

On-Site Registration and Registration Packet Pick-up Schedule
Gym Building, University of British Columbia–Okanagan, Kelowna, British Columbia, Canada
Wed., 6 May 4–7 p.m.
Thurs., 7 May 7:30 a.m.–4:30 p.m.
Fri., 8 May 7:30 a.m.–4:30 p.m.
Sat., 9 May 7:30–11 a.m.

ACCOMMODATIONS
GSA and UBC-O are committed to providing access to all individuals interested in attending. Please indicate any special requirements when you register. Reference the GSA Cordilleran Section Meeting when making reservations at any of the following:


**TECHNICAL PROGRAM**

Inquiries about the technical program can be directed to Rob Young, robert.young@ubc.ca.

**Theme Sessions**

1. **Paleozoic Paleogeography of Cordilleran Terranes.** JoAnne Nelson, British Columbia Geological Survey, joanne.nelson@gov.bc.ca; Maurice Colpron, Yukon Geological Survey, mcolpron@northwestel.net.

2. **Effective Geoscience Education Using Innovative Models in Google Earth.** Declan Depaor, ddepaor@odu.edu; Steve Whitmeyer.

3. **Mid- and High-Latitude Quaternary Paleolimnological Research in Western North America.** Scott W. Starratt, U.S. Geological Survey, sstarratt@usgs.gov; Ian Walker, Univ. of British Columbia–Okanagan, ian.walker@ubc.ca.

4. **Assessing and Developing the Water Resources of Inter-Basin Valleys.** Craig Nichol, Univ. of British Columbia–Okanagan, craig.nichol@ubc.ca; Brian Smerdon, brian.smerdon@gmail.com.

5. **Subglacial Environments and Landforms.** D. Sjogren, Univ. of Calgary, sjogren@ucalgary.ca; John Shaw, Univ. of Alberta, john.shaw@ualberta.ca.

6. **Extensional Tectonics in the Cordillera.** Carrie Whitehill, Stanford, cwhitehill@gmail.com; Julie Fosdick, Stanford.

7. **Recent Developments in Paleontology.** Paul Johnson, Mount Royal College, pjohnson@mroyal.ca.


10. **Pulling Apart the Cordilleran Orogen: Tectonic and Magmatic Processes Revealed within Extensional Terranes.** Dan Gibson, Simon Fraser Univ. (SFU), hdgibson@sfu.ca; Derek Thorkelson, SFU; Sarah Brown, SFU.

11. **Rivers, Humans, and Fish: River Morphology and Ecohypdraulics.** Leif Burge, Okanagan College, lburge@okanagan.bc.ca.

**FIELD TRIPS**

Direct inquiries to the field trip committee co-chairs, Craig Nichol, craig.nichol@ubc.ca, and John Greenough, john.greenough@ubc.ca. Find up-to-the-minute details at www.geosociety.org/meetings/.

1. **Geological Highlights, Terroir, and Wines of the Okanagan Valley.** Mon.–Wed., 4–6 May. Robert Fulton, Geological Survey of Canada (GSC), retired, robert_fulton@telus.net; Patricia Bowen, Pacific Agri-Food Research Centre (PARC); Andrew Okulitch, GSC emeritus; Scott Smith, PARC.


3. **Tertiary Volcanism in the B.C. Interior: Calderas, Domes, Plateaus.** Tues.–Wed., 5–6 May. Neil B. Church, nchurch@shaw.ca.

4. **Late Quaternary Landscapes of the Central Okanagan Basin.** Wed., 6 May. Skye Thomson, Univ. of British Columbia–Okanagan, skye.thomson@gov.bc.ca.


6. **Water Contributions to the Channeled Scablands from the Cordillera.** Sat.–Wed., 9–13 May. John Shaw, Univ. of Alberta, john.shaw@ualberta.ca; Darren Sjogren, Univ. of Calgary, sjogren@ucalgary.ca; Rob Young, Univ. of British Columbia, robert.young@ubc.ca.

7. **Effects of Channelization on Rivers.** Sun., 10 May. Leif Burge, Okanagan College, lburge@okanagan.bc.ca; Norman Corbett, Okanagan College, ncorbett@okanagan.bc.ca.

Squally Point, Okanagan Lake, British Columbia, Canada. Photo courtesy Robert Young.
8. **Geoarchaeology in the Southern Interior B.C. Plateau Culture Area.** Sun.–Mon., 10–11 May. James Baker, Oka-nagan Univ. College (retired), ajwbaker@shaw.ca; Dan Bruce, Univ. of British Columbia–Okanagan (UBC-O); John Greenough, UBC-O, john.greenough@ubc.ca.

9. **Mount Stephen: Low Level Equivalents to the Burgess Shales.** Sun.–Mon., 10–11 May. Paul Johnston, Mt. Royal College, pajohnston@mtroyal.ca.

10. **The Okanagan Valley Fault System, An Early Tertiary Extensional Collapse.** Sun.–Mon., 10–11 May. Cost: US$300. Min.: 10; max.: 30. Dan Gibson, Simon Fraser Univ. (SFU), hdgibson@sfu.ca; Derek Thorkelson, SFU; Sarah Brown, SFU.

**WORKSHOPS**


2. **Helping K–12 Teachers Explore GSA Geoscience Resources.** Cosponsored by GSA Education & Outreach and the GSA Education Committee. Fri., 8 May, 8–11 a.m. Free—must register to attend. Refreshments included. Min.: 5; max.: 20. Chris McLelland, GSA, cmclelland@geosociety.org.

**OPPORTUNITIES FOR STUDENTS**

**Mentoring Programs**

1. **Roy J. Shlemon Mentor Program in Applied Geoscience.** Sponsored by the GSA Foundation. Thurs., 7 May, 11:30 a.m.–12:30 p.m. and 12:30–1:30 p.m. This is a chance for students to enjoy a FREE lunch and discuss career opportunities and challenges with professional geoscientists from multiple disciplines. Learn more at www.geosociety.org/mentors/shlemon.htm.

2. **The John Mann Mentors in Applied Hydrogeology Program.** Sponsored by the GSA Foundation. Fri., 8 May, 11:30 a.m.–1:00 p.m. This event gives students and recent graduates with an interest in applied hydrogeology or hydrology as a career an opportunity to interact and network with professionals practicing in these fields of interest over a FREE lunch. Learn more at www.geosociety.org/mentors/mann.htm.

**Volunteering**

**Deadline to Volunteer:** 1 March 2009

The local committee and section officers of GSA’s Cordilleran Section are pleased to offer student volunteers free registration for the meeting in return for ~6 hours of work. Contact Rob Young, robert.young@ubc.ca, for more information.

**Travel Grants**

**Deadline to Apply:** 6 April 2009

Students must be Cordilleran Section members, currently enrolled, and registered for the meeting in order to apply for support. Find information and an application at www.geosociety.org/sectdiv/cord/. If you have questions, contact Cordilleran Section secretary Joan Fryxell at +1-909-880-5311 or jfryxell@csusb.edu.

**Student Field Trip Grants**

Students may also apply for 50% grants on field trip fees. Go to www.geosociety.org/sectdiv/cord/ to apply.

**GUEST ACTIVITIES**

Kelowna is quickly becoming known worldwide as a major tourist attraction because of its close proximity to superior venues for outdoor activities and for its high-quality wines and restaurants. It is surrounded by freshwater lakes that provide recreational opportunities in spring and summer, and boat rentals and/or charters are available. The Spring Wine Festival will coincide with the conference. Wine tasting tours can be undertaken independently or through any of several local charter services, which will also provide a vehicle and informed interpretation.
ROCKY MOUNTAIN
61st Annual Meeting
Utah Valley University, Orem, Utah, USA
11–13 May 2009

Thistle Landslide, which formed in 1983 during an unusually wet spring, in Spanish Fork Canyon near Provo/Orem, Utah, USA. Photo by B. Kowallis.

Reaching for Greater Heights: Geology in the Rocky Mountains

The 2009 meeting of the Rocky Mountain Section of GSA will be held in the new library on the Utah Valley University (UVU) campus. The library, recognized by Utah Governor Jon Huntsman Jr. as the most energy-efficient building in the Utah higher education system, features large, comfortable open spaces, sweeping views of the Wasatch Range and Utah Valley, and a full-service café. The fastest growing institute of higher learning in Utah, UVU is within easy walking distance of hotels and restaurants.

CONTACT INFORMATION
Find up-to-the-minute meeting information at www.geosociety.org/meetings/. If you have questions or special requirements, please contact the general meeting co-chairs, Bart Kowallis, +1-801-422-2467, bkowallis@byu.edu, and Daniel Horns, +1-801-863-8582, hornsd@uvu.edu.

REGISTRATION
Early Registration Deadline: 6 April 2009
Cancellation Deadline: 13 April 2009

REGISTRATION FEES (all fees are in U.S. dollars)

<table>
<thead>
<tr>
<th></th>
<th>Early Full mtg. One day</th>
<th>Standard Full mtg. One day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional Member</td>
<td>$140</td>
<td>$80</td>
</tr>
<tr>
<td>Professional Nonmember</td>
<td>$160</td>
<td>$110</td>
</tr>
<tr>
<td>Professional Member 70+</td>
<td>$75</td>
<td>$45</td>
</tr>
<tr>
<td>Student Member</td>
<td>$45</td>
<td>$35</td>
</tr>
<tr>
<td>Student Nonmember</td>
<td>$55</td>
<td>$45</td>
</tr>
<tr>
<td>K–12 Teacher</td>
<td>$45</td>
<td>$30</td>
</tr>
<tr>
<td>Guest or Spouse</td>
<td>$30</td>
<td>$15</td>
</tr>
<tr>
<td>Field Trip or Short Course Only</td>
<td>n/a</td>
<td>$30</td>
</tr>
</tbody>
</table>

On-Site Registration and Badge Pickup Schedule
Utah Valley University, Orem, Utah, USA
Sun., 10 May 4–8 p.m.
Mon., 11 May 7:30 a.m.–4 p.m.
Tues., 12 May 7:30 a.m.–4 p.m.
Wed., 13 May 7:30 a.m.–10 a.m.

ACCOMMODATIONS
Blocks of rooms have been reserved for attendees at the following hotels. Attendees should call the hotel directly to make reservations and reference the 2009 GSA Rocky Mountain Section Meeting to get the group rate.

Hampton Inn & Suites, 851 West 1250 South, Orem, UT 84058, USA, +1-801-426-8700; standard room: $104+tax.


LaQuinta Inn & Suites, 521 W. University Pkwy, Orem, UT 84058, USA, +1-801-226-0440; standard room: $89+tax.

TECHNICAL SESSIONS
Abstract Deadline: 10 February 2009

Stratigraphy, Sedimentology, Paleontology
1. Neoproterozoic Geology of the Rocky Mountains. Paul Link, Idaho State Univ., linkpaul@isu.edu; Carol Dehler, Utah State Univ., chuaria@cc.usu.edu.
2. New Developments and Discoveries in Paleozoic Stratigraphy and Paleontology in the Rocky Mountains and Basin and Range. Scott Ritter, Brigham Young Univ., scott_ritter@byu.edu; Forest Gahn, Brigham Young Univ.–Idaho, gahnf@byui.edu.

Hydrology, Surficial Geology, and Engineering Geology
5. Getting a Better Handle on the “Dirt” Covering the Bedrock—Mapping and Dating of Surficial Deposits. Tammy Rittenour, Utah State Univ., tammy.rittenour@usu.edu.

6. Quaternary Tectonics and Earthquake-Hazard Characterization in the Rocky Mountain Region. Christopher B. Duross, Dept of Geology & Geophysics, Univ. of Utah, cbduross@hotmail.com; Ivan Wong, URS Corp., ivan_wong@urscorp.com.

7. Geologic Hazards in the Rocky Mountain Region and Their Impacts on Development: A Tribute to the Career of Gary Christensen. Danny Horns, Utah Valley Univ., hornsda@uvsc.edu.

Structure and Tectonics
8. Compression and Extension—Thrusts and Normal Faults and Their Interplay in the Rocky Mountains and Basin and Range. Adolph Yonkee, Weber State Univ., ayonkee@weber.edu.


Energy and Economic Geology
10. Energy Resources and Developments in the Rocky Mountain Region. Michael Vanden Berg, Utah Geological Survey, mvandenberg@mines.utah.edu; Bill Keach, Brigham Young Univ., bill_keach@byu.edu.


Igneous and Metamorphic Rocks

14. New Developments in Understanding Metamorphic Rocks in the Rocky Mountains and Great Basin. Bill Dinklage, Utah Valley Univ., dinklawi@uvsc.edu; Mark Colberg, Southern Utah Univ., colberg@suu.edu.

Other Theme Sessions
15. Geologic Mapping Supported by EDMAP and STATEMAP in the Rocky Mountains Region. Bart Kowallis, Brigham Young Univ., bkowallis@byu.edu; Grant Willis, Utah Geological Survey, grantwillis@utah.gov.


17. Geoinformatics. Walt Snyder, Boise State Univ., wsnyder@boisestate.edu.


FIELD TRIPS

Pre-Meeting

This trip includes visits to hot springs in Saratoga Springs, Diamond Fork Canyon, Spanish Fork Canyon,
and Wasatch Mountain State Park, with a discussion of recent research on the arsenic cycle in hot springs. At Wasatch Mountain State Park, we will see 70-ft-thick deposits of calcareous tufa along with both flowing hot springs and hot pots.

During the Meeting
2. **Behind the Scenes at the Museum of Paleontology.**
   Tues., 12 May, 1–5 p.m. Cost: US$15. Max.: 30. Brooks Britt, Brigham Young Univ. (BYU), brooks_britt@byu.edu; Rod Scheetz, BYU, rod_scheetz@byu.edu.
   Participants will experience preparing bones, get an introduction to the taphonomy of select quarries, and learn how global information systems (GIS) are used to better map and analyze bone locations in quarries.

Post-Meeting
3. **Geologic Hazards of the Southern Wasatch Front.**
   This trip focuses on the most significant geologic hazards expressed along the southern Wasatch Front, from about Lehi to Levan. We will examine surface faulting related to large prehistoric earthquakes on the Wasatch fault zone, discuss the results of paleoseismic trenching studies, observe recent fire-related debris flows and risk-reduction measures, and examine the morphologies and damaging effects of active landslides.

4. **Tectonics and Stratigraphy of the Western Colorado Plateau.**
   Three-day trip, Thurs.–Sat., 14–16 May. Cost: US$370. Max.: 24. Bill Keach, Brigham Young Univ. (BYU), bill_keach@byu.edu; Tom Morris, BYU, tom_morris@byu.edu; Scott Ritter, BYU, scott_ritter@byu.edu.
   This robust field trip will visit and study classic Utah exposures of fluvial, shoreline, eolian, and carbonate sediments within Sevier and Laramie structures and the transition between two of North America’s great geologic provinces, the Colorado Plateau and the Basin and Range.

5. **Classic Geology of the Central Wasatch Mountains: Almost Two-Billion Years of Geologic History.**
   Two-day trip, Thurs.–Fri., 14–15 May. Departing 8 a.m. Thursday; returning 6 p.m. Friday. Cost: US$170. Max.: 38. Grant Willis, Utah Geological Survey, grantwillis@utah.gov; Robert Biek, Utah Geological Survey, bobbiek@utah.gov; Mark Milligan, Utah Geological Survey, markmilligan@utah.gov.
   This trip will highlight the geologic history of the central Wasatch Mountains between Salt Lake City and Provo, traveling north and east with stops at Cedar Hills, Alpine City, the eastern Traverse Mountains, the G.K. Gilbert geologic park at the mouth of Little Cottonwood Canyon, Big Cottonwood Canyon, Park City, Heber Valley, the Keetley volcanics at the Jordanelle Dam, the Midway hot springs, the Charleston-Nebo thrust near Deer Creek, lower Provo Canyon, the Indian Hills subdivision landslide, and Rock Canyon.

6. **Geology of the Kennecott Open-Pit Mine.**
   Thurs., 14 May, 8 a.m.–6 p.m. Cost: US$40. Max.: 22. David Simon, Simon Bymaster Inc., david@sbigeo.com; Geoff Bedell, Kennecott Utah Copper Corp.
   This trip addresses the engineering, geologic, and mining aspects of operating one of the largest open-pit copper mines in the world and includes entering the bottom of the pit. Topics covered: the geology of the ore deposit, history of mining activities, slope stability, engineering geology, ore control, groundwater and surface-water control, and blasting techniques.

**OPPORTUNITIES FOR STUDENTS**

**Mentor Programs**
Questions? Contact Jennifer Nocerino, jnocerino@geosociety.org.

**Roy J. Shlemon Mentor Program in Applied Geoscience.**
*Sponsored by the GSA Foundation.* Mon., 11 May, 11-30 a.m.–1 p.m. This is a chance for students to enjoy a FREE lunch and discuss career opportunities and challenges with professional geoscientists from multiple disciplines. Learn more at www.geosociety.org/mentors/shlemon.htm.

**The John Mann Mentors in Applied Hydrogeology Program.**
*Sponsored by the GSA Foundation.* Tues., 12 May, 11:30 a.m.–1 p.m. This event gives students and recent graduates with an interest in applied hydrogeology or hydrology as a career an opportunity to interact and network with professionals practicing in these fields of interest over a FREE lunch. Learn more at www.geosociety.org/mentors/mann.htm.

**Travel Grants**
**Deadline to apply:** 6 April 2009
Students must be Rocky Mountain Section members, currently enrolled, and registered for the meeting in order to apply for support. Find information and an application via a link at www.geosociety.org/sectdiv/.
Missed the annual meeting mentor programs?

Didn’t want them to end?

Plan now to attend one or more of the following mentor luncheons at your 2009 Section Meeting.

MEET YOUR CAREER MENTORS

Chat one-on-one with practicing geoscientists. Our quality group of volunteer mentors will answer your questions and share insights on how to get a job after graduation. Space for these events is limited, so plan to arrive early. If you have questions, please contact Jennifer Nocerino, jnocerino@geosociety.org. Both programs are sponsored by the GSA Foundation.

DESCRIPTIONS

Roy J. Shlemon Mentor Program in Applied Geoscience

This luncheon provides an occasion for students to discuss career opportunities and challenges with professional geoscientists from multiple disciplines. Students will receive tickets for this FREE lunch in their meeting registration packets.

John Mann Mentors in Applied Hydrogeology Program

This event presents opportunities for students and recent graduates interested in a career in applied hydrogeology or hydrology to network with practicing professionals. Whether you’ve already decided to head down the hydro career path or would just like to know more about career options, this luncheon is for you! Students will receive a ticket for this focused, small-scale event and FREE lunch in their meeting registration packets.

SOUTHEASTERN

St. Petersburg, Florida, USA

Shlemon Mentor Program Luncheons
Thurs., 12 March, 11:30 a.m.–12:30 p.m.
and 12:30–1:30 p.m.
Mann Mentors in Applied Hydrogeology Luncheon
Fri., 13 March, 11:30 a.m.–1 p.m.

SOUTH-CENTRAL

Dallas, Texas, USA

Shlemon Mentor Program Luncheon
Mon., 16 March, 11:30 a.m.–1 p.m.
Mann Mentors in Applied Hydrogeology Luncheon
Tues., 17 March, 11:30 a.m.–1 p.m.

NORTHEASTERN

Portland, Maine, USA

Shlemon Mentor Program Luncheons
Mon., 23 March, 11:30 a.m.–12:30 p.m.
and 12:30–1:30 p.m.
Mann Mentors in Applied Hydrogeology Luncheon
Tues., 24 March, 11:30 a.m.–1 p.m.

NORTH-CENTRAL

Rockford, Illinois, USA

Shlemon Mentor Program Luncheons
Fri., 3 April, 11:30 a.m.–12:30 p.m.
and 12:30–1:30 p.m.
Mann Mentors in Applied Hydrogeology Luncheon
Thurs., 2 April, 11:30 a.m.–1 p.m.

CORDILLERAN

Kelowna, British Columbia, Canada

Shlemon Mentor Program Luncheons
Thurs., 7 May, 11:30 a.m.–12:30 p.m.
and 12:30–1:30 p.m.
Mann Mentors in Applied Hydrogeology Luncheon
Fri., 8 May, 11:30 a.m.–1 p.m.

ROCKY MOUNTAIN

Orem, Utah, USA

Shlemon Mentor Program Luncheon
Mon., 11 May, 11:30 a.m.–1 p.m.
Mann Mentors in Applied Hydrogeology Luncheon
Tues., 12 May, 11:30 a.m.–1 p.m.
Meet the Foundation’s Current Board of Trustees

1. Robert H. Rutford, Chair
   Richardson, Texas, USA
   Term 2005–2010

2. P. Geoffrey Feiss, Vice Chair
   Williamsburg, Virginia, USA
   Term 2006–2011

3. Michael A. Manship, Treasurer
   Bozeman, Montana, USA
   Term 2006–2011

4. Charles B. Andrews
   Bethesda, Maryland, USA
   Term 2007–2012

5. Bruce R. Clark
   Irvine, California, USA
   Term 2007–2012

6. Margaret R. Eggers
   Oceanside, California, USA
   Term 2007–2012

7. Mohamed El-Ashry
   Washington, D.C.
   Term 2008–2013

8. Farouk El-Baz
   Boston, Massachusetts, USA
   Term 1999–2009

9. Carl A.P. Fricke
   San Rafael, California, USA
   Term 2006–2011

10. Susan M. Landon
    Denver, Colorado, USA
    Term 1999–2009

11. Patrick Leahy
    Alexandria, Virginia, USA
    Term 2006–2011

12. George O. Linkletter
    Irvine, California, USA
    Term 2007–2012

13. Elaine Padovani
    Tucson, Arizona, USA
    Term 2005–2010

14. Virginia B. Sisson
    Houston, Texas, USA
    Term 2000–2010

15. Harvey Thorleifson
    Minneapolis, Minnesota, USA
    Term 2007–2012

16. Edward Warner
    Denver, Colorado, USA
    Term 2006–2011

17. John Wise
    Hidden Valley Lake, California, USA
    Term 2006–2011

To learn more about the Foundation’s Trustees please go to www.gsafweb.org.

The GSA Foundation has five Standing Committees, each comprised of at least three Trustees:

▲ Executive Committee
▲ Finance Committee
▲ Nominating Committee
▲ Donor Intent Committee
▲ Development Committee

Digging up the Past

Most memorable early geologic experience:
As a 20-year-old, I was hired to collect geophysical data. Five days after sailing from Chile, we were surrounded by icebergs!

—Bruce F. Molnia

Support GSA Programs
Donate now!

1. Enclosed is my contribution in the amount of $__________

2. Please credit my contribution to the:
   ☐ Greatest Need
   ☐ GeoCorps™ Program
   ☐ Other: ____________ Fund
   ☐ I have named GSA Foundation in my Will (please contact me)

3. Name
   __________________________________________
   Address
   __________________________________________
   City / State / Zip
   Phone

4. Mail to:
   GSA Foundation
   P.O. Box 9140
   Boulder, CO 80301
   Or donate online at www.gsafweb.org
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 Subaru, including Subaru Tribeca, Legacy, Outback, Forester, Impreza, WRX and STI 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 gsaservice@geosociety.org to receive your Dealer Visit Authorization form before visiting your local Subaru dealer.

Access Subaru.com to find a nearby dealer or learn more about Subaru vehicles.

*MSRP does not include tax, title and registration fees. Subject to change without notice. Terms and conditions apply.
The following people were elected into membership by GSA Council at its October 2008 meeting:

**PROFESSIONAL MEMBERS**
- John T. Abney
- Irshad Ahmad
- Angel L. Alicea Leon
- Richardson B. Allen
- Gene L. Ames III
- Camille Anderson
- Deborah Anderson
- John Ray Anderson
- Trevre Roys Andrews
- Dale Armstrong
- Nathan A. Ash
- Steven Autry
- Arman Azizbekyan
- Christopher James Bablin
- Karl Stephen Baltz Sr.
- Roland Barbullushi
- Robert Barnhill
- Catherine D. Barrie
- Kamaladdin Bazargani-Gulani
- Harold R. Beaver
- Robyn Begley
- Carlos M. Belgodere
- Kevin Bell
- Janina Benoit
- Nate Berube
- Mehmet Z. Bilor
- Edward F. Birkhead
- María de Fatima Bitencourt
- Janis Lynn Boettiger
- Jennifer Bogadi
- Olga Bogolepova
- William M. Bohrer
- Carlos Alberto Borrero
- David Borrok
- Mark Kevin Borucki
- Paul Richard Bown
- Laura Boehm Bowne
- Uwe Brand
- John P. Brandenburg
- Cari A. Bray
- Stephen Eames Brellethin
- David Briggs
- Aleeya Brookes
- Nahid Brown
- Wesley Augustus Brown
- Robert H. Brune
- Nigel Brush
- Hugo F.R. Buccher
- Michael Allen Busby
- Jonathan Bush
- James Duane Byous
- LaQuanti Galligan
- Gary C. Calvert
- Dwight E. Cassell
- Mariano Cerca
- Silvia Nelida Césari
- Carlos Jorge Chemicoff
- Harvey Clark
- Julia Allison Clarke
- Aaron Clauet
- David A. Cockrum
- Michael L. Coffey
- Karen Walker Connell
- Albert J. Connolly
- James Cornons Jr.
- James Erik Conrad
- Richard A. Cooke
- Mehry Gornett
- John Hugh McMaster Cox
- Anthony Coyne
- Larry S. Crumper
- James E. Cumlife
- Mark Cunnane
- Lynn Curtis
- John Cushman
- Graham Dalldorf
- Michael Daniy
- Alexandra Krull Davatzes
- Nicholas F. Davis
- William de Lorraine
- Brian Joseph de Martin
- Gregory P. De Pascale
- Lori L. Dennis
- Bill Deutsch
- Narender Dhingra
- Jani A. Dipokusumo
- John Doherty
- Daniel S. Domam
- Hugo Sévilo Domínguez
- Joyce Sattler Dunkin
- Anthony J. Duplechin
- Ursula Edwards
- Rebecca Elwood
- Judah Epstein
- Henry C. Esterly
- Nicholas Thomas Evans
- Patricia C. Fanning
- Warren R. Farmer IV
- Habibur R. Farooqui
- Michael J. Faulkner
- Nick Fedorko
- Chad A. Feerick
- Matthew Joseph Ferrari
- Justin Filiberto
- Stefan Finsterle
- Thomas F. Fiorito
- Neil Fishman
- Danny Fitzgerald
- Marvin Charles Floyd
- Michael F. Forlenza
- Michelle Leigh Foster
- Aimee B. Fratarcangeli
- David Fries
- Gerard J. Fryer
- James W. Fullmer
- Teresa Kennedy Gagnon
- Yongjun Gao
- Joseph T. Gasperi
- Joerg Geldmacher
- Leo Gentile
- Stephen Swift Gentry
- Donald T. Gerace
- Sylvain Remi Gerber
- Melissa Germain
- Mark W. Getscher
- Brett Hollis Gilley
- Jake Glascock
- Greg Good
- David Latham Goodrich
- Lauren Gosster
- Susan Friel Grammer
- Janusz Grebowicz
- Christopher Green
- Michael J. Greene
- Pablo Gunieul
- Hou Guowei
- Andrew J. Guswa
- David Michael Haag
- Halpin O. Hackett
- James V. Hamel
- Alex L. Hanco
- Michael Haschke
- Scott Alan Hatfield
- James Lloyd Hawkins
- Mark H. Hayes
- Bruce William Hayward
- John M. Healey
- Matt Heavner
- John C. Hempel
- James V. Hengesh
- Alexander P. Henry
- Elmer Lawrence Healthy
- John F. Hermance
- Glenn B. Hieshima
- William Bryan Hilgartner
- David Hirsch
- John Adams Hodge
- Judson D. Hooks
- Daniel Horns
- Benjamin Douglas Hudson
- Eileen Hughes
- Alan Hull
- Ernest Leon Hunsaker III
- Robert Hunter
- Bryan Hurst
- Gary H. Isaksen
- James J. Janora
- Noor Jchan
- Joe E. Jenkins

**NEW MEMBERS:**
GSA Welcomes You!

- David Borrok
- Mark Kevin Borucki
- Paul Richard Bown
- Laura Boehm Bowne
- Uwe Brand
- John P. Brandenburg
- Cari A. Bray
- Stephen Eames Brellethin
- David Briggs
- Aleeya Brookes
- Nahid Brown
- Wesley Augustus Brown
- Robert H. Brune
- Nigel Brush
- Hugo F.R. Buccher
- Michael Allen Busby
- Jonathan Bush
- James Duane Byous
- LaQuanti Galligan
- Gary C. Calvert
- Dwight E. Cassell
- Mariano Cerca
- Silvia Nelida Césari
- Carlos Jorge Chemicoff
- Harvey Clark
- Julia Allison Clarke
- Aaron Clauet
- David A. Cockrum
- Michael L. Coffey
- Karen Walker Connell
- Albert J. Connolly
- James Cornons Jr.
- James Erik Conrad
- Richard A. Cooke
- M robotic
- John Hugh McMaster Cox
- Anthony Coyne
- Larry S. Crumper
- James E. Cumlife
- Mark Cunnane
- Lynn Curtis
- John Cushman
- Graham Dalldorf
- Michael Daniy
- Alexandra Krull Davatzes
- Nicholas F. Davis
- William de Lorraine
- Brian Joseph de Martin
- Gregory P. De Pascale
- Lori L. Dennis
- Bill Deutsch
- Narender Dhingra
- Jani A. Dipokusumo
- John Doherty
- Daniel S. Domam
- Hugo Sévilo Domínguez
- Joyce Sattler Dunkin
- Anthony J. Duplechin
- Ursula Edwards
- Rebecca Elwood
- Judah Epstein
- Henry C. Esterly
- Nicholas Thomas Evans
- Patricia C. Fanning
- Warren R. Farmer IV
- Habibur R. Farooqui
- Michael J. Faulkner
- Nick Fedorko
- Chad A. Feerick
- Matthew Joseph Ferrari
- Justin Filiberto
- Stefan Finsterle
- Thomas F. Fiorito
- Neil Fishman
- Danny Fitzgerald
- Marvin Charles Floyd
- Michael F. Forlenza
- Michelle Leigh Foster
- Aimee B. Fratarcangeli
- David Fries
- Gerard J. Fryer
- James W. Fullmer
- Teresa Kennedy Gagnon
- Yongjun Gao
- Joseph T. Gasperi
- Joerg Geldmacher
- Leo Gentile
- Stephen Swift Gentry
- Donald T. Gerace
- Sylvain Remi Gerber
- Melissa Germain
- Mark W. Getscher
- Brett Hollis Gilley
- Jake Glascock
- Greg Good
- David Latham Goodrich
- Lauren Gosster
- Susan Friel Grammer
- Janusz Grebowicz
- Christopher Green
- Michael J. Greene
- Pablo Gunieul
- Hou Guowei
- Andrew J. Guswa
- David Michael Haag
- Halpin O. Hackett
- James V. Hamel
- Alex L. Hanco
- Michael Haschke
- Scott Alan Hatfield
- James Lloyd Hawkins
- Mark H. Hayes
- Bruce William Hayward
- John M. Healey
- Matt Heavner
- John C. Hempel
- James V. Hengesh
- Alexander P. Henry
- Elmer Lawrence Healthy
- John F. Hermance
- Glenn B. Hieshima
- William Bryan Hilgartner
- David Hirsch
- John Adams Hodge
- Judson D. Hooks
- Daniel Horns
- Benjamin Douglas Hudson
- Eileen Hughes
- Alan Hull
- Ernest Leon Hunsaker III
- Robert Hunter
- Bryan Hurst
- Gary H. Isaksen
- James J. Janora
- Noor Jchan
- Joe E. Jenkins
Deborah Reid Jerez
Steve B. Johnson
M.P. Jonathan
Patricia N. Kamhesis
Adam T. Karst
Juliet N. Kelty
Jane-Clair A. Kerin
Suzette M. Kimball
Justin Kirby
Joseph A. Klinkemich
Attila Kovacs
Bjarne David Kristiansen
Joshua K. Kuhn
Mike J. Kunz
Rene D. LaBerge
Luis E. Lara Pulgar
Eric Dean Larson
James A. Lawrence
Gary F. Lawyer
Jeffrey A. Lee
Jung-Eun Lee
Jackie Anne Lees
William R. Stefan II
Kimberly Stanfield
Robert D. St. Claire
Michael J. Sperber
Jennifer M. Smith-Engle
Chris Smart
Thomas L. Slosson
Edwin Lee Simon
Elizabeth L. Simmons
Koji Shimada
Ravi Shekhar
Randy Shields
Koji Shimada
Leonardo Lopes Silva
Elizabeth L. Simmons
Edwin Lee Simon
Thomas L. Slosson
Chris Smart
Jennifer M. Smith-Engle
Michael J. Sperber
Robert D. St. Claire
Kimberly Stanfield
William R. Stefan II
Matthew Stein
JoEllen Strait
Luke Strauss
Christopher E. Strong
Donald G. Sullivan
Josh Sullivan
Nathaniel Swanson
Hiroyuki Takata
Larry A. Taylor
Paul D. Taylor
Louis Joseph Thibodeaux
Lonnie G. Thompson
Lucy M. Thompson
Thomas M. Thornton
Michael G. Tiefenback
Robert Timmer
Jeff Tracy
Eric J. Trinkle
Katsuhiro Tsukimura
Paul Tybor
Kamil Ustaszewski
Michaela E. Ustaszewski
Frank J.G. Van den Belt
Scott Wade
Mezemir F. Wagaw
Rick Weingarz
Tarin Harrar Weiss
John S. Whalley
Melissa A. Wheaton
Eric P. White
Chris Widge
Maria Wiesinger
Gerry Vernon Winter
Clarence S. Winzer III
Axel Wittmann
Jacqueline Mary Wood
Steven Woodhull
Trevor G. Woodward
Helmut Victor Wuerch III
Kajal Yadav
Svetlana Yanina
Hua Yu
Maggie C. Zborowski

STUDENT MEMBERS
Cindy Lauren Abbott
Katie J. Abramson
Francis A. Abreu
Khaldoun S. Abu Alhin
Amber Diane Adamicz
Allan Stephen Adams II
James Patrick Adams
Brian Agenbroad
Soo Yeun Ahn
Heather Elizabeth Ahrens
Paul David Alms
Sameh W. Al-Muqaddi
Tricia Alvarez
Yaser Alzayer
Kate E. Amrhein
Dustin Carl Anderson
Sheika Aragundi
Travis Lamar Atwood
Tracy Aze
Zahid Aziz
Matthew Bailey
Joshua William Balmat
Pamela M. Bandini
Jonathan C. Banks
Samuel Bansah
Matthew Bansak
Michelle Len Barger
Jane E. Barnes
Teresa Diane Barnes
James Gregory Barr III
Kieran Barrows
Brandon Bartkowiak
Brittney Bates
Shelby Bates
Matthew Batina
Evan Lee Batton
Jessica Lee Beard
Michael Beardsley
Catherine Beck
Laura Silene Bennati
Nicola Bernascon
Fiona Claire Best
Matthew Bethel
Brian Blagg
Jayne Bormann
Mary Borrello
Dickson J. Borsada
Meagan Elise Bosket
Allison Brady
Kareemot A. Brainoh
Lindsey Dru Brewer
Bryanna Broadaway
Cassandra Browne
Thomas Bruhwiler
William Thomas Bryan
Richard Bubisco
Christopher Buchen
Kathryn Buckner
Bethany Marie Busch
Rosemary Bush
Kort Hewitt Butler
Nicolette Byrd
Megan Kathleen Caldwell
Kipp Callahan
Milo Louis Cameron
Guoliang Cao
Catherine Jeanne Carlisle
John Casiano III
Joshua Caster
Miguel Castillo
Douglas E. Caton Jr.
Jeremy Caves
Dan Cervin
Suvankar Chakraborty
Tzuchien Chang
Marina Chavez
Tsegaye Memoria Checkol
Scott Cherry
Elena Chmielewic
Timothy Lee Chung
Colin Thomas Cikoski
Joshua Clabeaux
Heather F. Clark
Kinsie Leigh Clark
Cathy Clausen
Jaymi Marie Collar

New Members: GSA Welcomes You!
Jaymi Marie Collar
Cathy Clausen
Kinsie Leigh Clark
Scott Cherry
Elena Chmielewic
Timothy Lee Chung
Colin Thomas Cikoski
Joshua Clabeaux
Heather F. Clark
Kinsie Leigh Clark
Cathy Clausen
Jaymi Marie Collar

GSA TODAY, FEBRUARY 2009
## New Members: GSA Welcomes You!

<table>
<thead>
<tr>
<th>Name</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diana I. Cook</td>
<td>Erin Hollemenback</td>
</tr>
<tr>
<td>Simon J. Cook</td>
<td>Steven Philip Hollis</td>
</tr>
<tr>
<td>Avery Cota</td>
<td>Shari Houston</td>
</tr>
<tr>
<td>Morgan Ellis Courteney</td>
<td>Tracy Howe</td>
</tr>
<tr>
<td>Stephanie A. Cox</td>
<td>Evan Richard Howell</td>
</tr>
<tr>
<td>Stephen Matthew Crabtree</td>
<td>Ping Hu</td>
</tr>
<tr>
<td>Brandon Crusen</td>
<td>Brian Michael Huber</td>
</tr>
<tr>
<td>Jennifer Cumpston</td>
<td>Christian Huber</td>
</tr>
<tr>
<td>Ryan Cumpston</td>
<td>Jillian Amy Hudgins</td>
</tr>
<tr>
<td>Howard Cyr</td>
<td>Barbara Hudson</td>
</tr>
<tr>
<td>Cathleen Lauren Dale</td>
<td>Aubrey Humbolt</td>
</tr>
<tr>
<td>Michelle M. Dam</td>
<td>Daniel Robert Hummer</td>
</tr>
<tr>
<td>Timothy L. Daniluk</td>
<td>Joseph John Hutnik</td>
</tr>
<tr>
<td>James Darling</td>
<td>Chinosomo Ogechi Ibe</td>
</tr>
<tr>
<td>Simon A.F. Darroch</td>
<td>Salman Ijazi</td>
</tr>
<tr>
<td>Padmini Das</td>
<td>Lisa K. Irvine</td>
</tr>
<tr>
<td>R. Bart Davis</td>
<td>Tomoko Ishikawa</td>
</tr>
<tr>
<td>Tiffany Rebecca Davis</td>
<td>Laura Izzo</td>
</tr>
<tr>
<td>Matthew Dawkins</td>
<td>David Jakim</td>
</tr>
<tr>
<td>Jody L. Dean</td>
<td>Kelli Anna Janos</td>
</tr>
<tr>
<td>James T. De Lanoy</td>
<td>Peter Jastrzenbski</td>
</tr>
<tr>
<td>Maria E.S. Della Giustina</td>
<td>Catherine Jedrzejczyk</td>
</tr>
<tr>
<td>Rafael E. Del Rio</td>
<td>Brad Jeffrey</td>
</tr>
<tr>
<td>Thomas Denis</td>
<td>Alexander Jensen</td>
</tr>
<tr>
<td>Lisa DeRose</td>
<td>Tamara Nicole Jeppson</td>
</tr>
<tr>
<td>Colleen Devoto</td>
<td>Stephanie Brinson Jiles</td>
</tr>
<tr>
<td>Yam Zul Ocampo Diaz</td>
<td>Josh Johns</td>
</tr>
<tr>
<td>Susan Dickerson</td>
<td>Kristine Winn Johnson</td>
</tr>
<tr>
<td>Andrew Donald Dinkelacker</td>
<td>Amber Johnson-Carroll</td>
</tr>
<tr>
<td>Angela Dippold</td>
<td>Laura K.Z. Jones</td>
</tr>
<tr>
<td>David A. Ditthrenner</td>
<td>Adam Barrett Jost</td>
</tr>
<tr>
<td>Sarah Liam Doyle</td>
<td>Nathan Andrew Jud</td>
</tr>
<tr>
<td>Linda Dreedland</td>
<td>Nefeli Kafousia</td>
</tr>
<tr>
<td>Susan Drymala</td>
<td>Christopher Kakolewski</td>
</tr>
<tr>
<td>William Denis Dugat IV</td>
<td>Andis Kalvans</td>
</tr>
<tr>
<td>Sarah Duguid</td>
<td>Moshghan Kani</td>
</tr>
<tr>
<td>Lorri Dee Dukes</td>
<td>Amir Karimian Torghabe</td>
</tr>
<tr>
<td>Anne Dunkel</td>
<td>Jessica Blair Kash</td>
</tr>
<tr>
<td>Sandy Ebersole</td>
<td>Michele Viola Kashouh</td>
</tr>
<tr>
<td>Mason Cole Edwards</td>
<td>Cynthia A. Kearns</td>
</tr>
<tr>
<td>Mary Sterling Ellison</td>
<td>Evan Keffeler</td>
</tr>
<tr>
<td>Rebecca Ann Entler</td>
<td>Michael Landvlg Keller</td>
</tr>
<tr>
<td>Kristen M. Enzweiler</td>
<td>Lindsay Danielle Kelley</td>
</tr>
<tr>
<td>Sarah Epps</td>
<td>Michael James Kennedy Jr.</td>
</tr>
<tr>
<td>Larry Erickson</td>
<td>Megan Kenworthy</td>
</tr>
<tr>
<td>Judith Esposito</td>
<td>Joseph Loren Kessinger</td>
</tr>
<tr>
<td>Cassidy Evans</td>
<td>Alexander Ketchpaw</td>
</tr>
<tr>
<td>Maggie Ewan</td>
<td>Katherine L. Ketterer</td>
</tr>
<tr>
<td>Jeffrey K. Ewell</td>
<td>Jahmiilah Khabir</td>
</tr>
<tr>
<td>Kofo O. Fadeyi</td>
<td>Shamin A.K. Uddin Khan</td>
</tr>
<tr>
<td>Rhonda Fairchild</td>
<td>Kelsey Leigh Kidd</td>
</tr>
<tr>
<td>Ryan Kent Farmer</td>
<td>Catherine Kim</td>
</tr>
<tr>
<td>Lindsay L. Farrell</td>
<td>Hyung Jeek Kim</td>
</tr>
<tr>
<td>Michael Farwell</td>
<td>Kimberly Kline</td>
</tr>
<tr>
<td>Laury Michelle Fassett</td>
<td>Zach Koch</td>
</tr>
<tr>
<td>Scott Christopher Fedak</td>
<td>Matrika Prasad Koirala</td>
</tr>
<tr>
<td>Rose Feinstein</td>
<td>Douglas Alan Kolb Jr.</td>
</tr>
<tr>
<td>Julia Ferguson</td>
<td>Matthew Konkler</td>
</tr>
<tr>
<td>Lauren Michelle Ferragut</td>
<td>Adel Diab Mohammed Kotb</td>
</tr>
<tr>
<td>Holly Ann Fitzgibbon</td>
<td>Kristopher Kotouch</td>
</tr>
<tr>
<td>Ciara Marie Fitzpatrick</td>
<td>Ranae Kowalcz</td>
</tr>
<tr>
<td>Suzanne Fleury</td>
<td>Douglas Edward Kowalewski</td>
</tr>
<tr>
<td>Stephen J. Floersheimer</td>
<td>Suzanne Krahn</td>
</tr>
<tr>
<td>Corrie Thomas Floyd</td>
<td>Drew Michael Kremen</td>
</tr>
<tr>
<td>Brianna D. Force</td>
<td>Sean Krepshi</td>
</tr>
<tr>
<td>Christopher H. Fralix</td>
<td>Kayla Kroll</td>
</tr>
<tr>
<td>Eric Freeburg</td>
<td>John C. Kroon</td>
</tr>
<tr>
<td>Diana Carolina Fregoso</td>
<td>Kunthea Kry</td>
</tr>
<tr>
<td>Marcelo de Almeida Freimann</td>
<td>Debbie Kunath</td>
</tr>
<tr>
<td>Kereszturi Gabor</td>
<td>Marcus Kunzmann</td>
</tr>
<tr>
<td>Paul James Gabrielsen</td>
<td>Darin Michael Lang</td>
</tr>
<tr>
<td>Donna R. Gangadeen</td>
<td>Kristina Sofia Larsson</td>
</tr>
<tr>
<td>Claire Gannon</td>
<td>Michael Lawson</td>
</tr>
<tr>
<td>Edwin Garcia Jr.</td>
<td>Daniel Jay Lee</td>
</tr>
<tr>
<td>Catherine Guinn Garrett</td>
<td>Janie Lee</td>
</tr>
<tr>
<td>Daniel Garza</td>
<td>Crystal L. Lemon</td>
</tr>
<tr>
<td>Tej P. Gautam</td>
<td>Dominik Letsch</td>
</tr>
<tr>
<td>Barivure Confidence Gharaba</td>
<td>Vivian Leung</td>
</tr>
<tr>
<td>Gretchen E. Gehrke</td>
<td>Jana Levison</td>
</tr>
<tr>
<td>Sevon Geil</td>
<td>Ryan Lee Lewis</td>
</tr>
<tr>
<td>Christopher George</td>
<td>Jill Libby</td>
</tr>
<tr>
<td>Jonathan Daniel Gerst</td>
<td>Fushen Liu</td>
</tr>
<tr>
<td>Jaydeep Ghosh</td>
<td>John Charles Lock</td>
</tr>
<tr>
<td>Alexander Robert Gibbs</td>
<td>Joseph Chad Lollar</td>
</tr>
<tr>
<td>Allegra Giblin</td>
<td>Nicole Longinotti</td>
</tr>
<tr>
<td>Kimberly Gilbert</td>
<td>Darline Lott</td>
</tr>
<tr>
<td>Kwasi N. Gilbert</td>
<td>Kim Lutggen</td>
</tr>
<tr>
<td>Erik S. Gilmore</td>
<td>Marianne M. Mader</td>
</tr>
<tr>
<td>Sarah Elizabeth Gitt</td>
<td>Jessica Malone</td>
</tr>
<tr>
<td>David Gombosi</td>
<td>James Kenneth Markin</td>
</tr>
<tr>
<td>Jesus D. Gomez</td>
<td>Jill Marshall</td>
</tr>
<tr>
<td>Angelina Kristine Gordon</td>
<td>Fernando Martinez-Torres</td>
</tr>
<tr>
<td>Jennifer Neil Gordon</td>
<td>Kathryn E. McAdams</td>
</tr>
<tr>
<td>Nicolas Goudemand</td>
<td>Shauna McDonald</td>
</tr>
<tr>
<td>Sofie Gradmann</td>
<td>Kate Jane McGinnis</td>
</tr>
<tr>
<td>Jonathan D. Green</td>
<td>Marie McLane</td>
</tr>
<tr>
<td>Robin Marie Green</td>
<td>Kristie S. McIn</td>
</tr>
<tr>
<td>Andrew Greenhagen</td>
<td>Melissa McMullen</td>
</tr>
<tr>
<td>Martin Griessmann</td>
<td>Benjamin E. McVeigh</td>
</tr>
<tr>
<td>Grant Griffith</td>
<td>Lorena Medina Luna</td>
</tr>
<tr>
<td>Sarah Elizabeth Grubuha</td>
<td>John Reed Meixner</td>
</tr>
<tr>
<td>Daniel J. Gustafson</td>
<td>Lauren John Michaels</td>
</tr>
<tr>
<td>Nathan Guzman</td>
<td>Ivan Mihajlov</td>
</tr>
<tr>
<td>Skylar Haas</td>
<td>Lauren Elizabeth Miller</td>
</tr>
<tr>
<td>Mohamed Habib</td>
<td>Scott Lyon Miller</td>
</tr>
<tr>
<td>Preston Benjamin Hall</td>
<td>Shant Minas</td>
</tr>
<tr>
<td>Nozomu Hananaka</td>
<td>Thomas Miskelly Jr.</td>
</tr>
<tr>
<td>Hannah Elaine Himmack</td>
<td>Jonathan Stuart Mitchell</td>
</tr>
<tr>
<td>Nazifa Haniff</td>
<td>Kevan B. Moffett</td>
</tr>
<tr>
<td>Lorna Hanko</td>
<td>Audrey Mohr</td>
</tr>
<tr>
<td>Alexander C. Hanna</td>
<td>Timothy Paul Moloney</td>
</tr>
<tr>
<td>David J. Hansen</td>
<td>Stanley Paul Mordensky II</td>
</tr>
<tr>
<td>Hunter Harlow</td>
<td>Kristin Morell</td>
</tr>
<tr>
<td>Brian Stewart Harms</td>
<td>Jason Morgan</td>
</tr>
<tr>
<td>Katherine S.A. Harrison</td>
<td>Michael Abram Morgan</td>
</tr>
<tr>
<td>Kathryn Alexandria Hart</td>
<td>Cameron E. Morisette</td>
</tr>
<tr>
<td>Christina Joy Hartwell</td>
<td>Becky Morlier</td>
</tr>
<tr>
<td>Elizabeth Hasenmueller</td>
<td>Christina Morrison</td>
</tr>
<tr>
<td>Erik William Haug</td>
<td>Keith David Morrison</td>
</tr>
<tr>
<td>Andrew Donald Hawkins</td>
<td>Theresa Morrison</td>
</tr>
<tr>
<td>Dawn Schmidli Hayes</td>
<td>Robert M. Morrow IV</td>
</tr>
<tr>
<td>Jorden L. Hayes</td>
<td>Charles A. Munn IV</td>
</tr>
<tr>
<td>Bo He</td>
<td>Satoro Muraoka</td>
</tr>
<tr>
<td>Nicole Darlene Henderson</td>
<td>Olga I. Nedorub</td>
</tr>
<tr>
<td>Patrick Henderson</td>
<td>Iain Nell</td>
</tr>
<tr>
<td>Matthew Lee Hennessy</td>
<td>Sterling Nesbitt</td>
</tr>
<tr>
<td>Mark Steven Hickey</td>
<td>Rachel A. Neurath</td>
</tr>
<tr>
<td>Nicholas Dean Hightower</td>
<td>Ai D. Nguyen</td>
</tr>
<tr>
<td>Drew Michael Krenan</td>
<td>Chin Thuc Nguyen</td>
</tr>
<tr>
<td>Sean Krepshi</td>
<td>Lien Kim Nguyen</td>
</tr>
<tr>
<td>Kayla Kroll</td>
<td>Phillip A. Nickerson</td>
</tr>
<tr>
<td>Jasymn Maureen Nolasco</td>
<td>John C. Kroon</td>
</tr>
</tbody>
</table>
New Members: GSA Welcomes You!

Alexander Rohrmann
Tiziana Trabucchi
Tyler Treece
Kimberly Anne Trent
Ganesh Nath Tripathi
Anne Tyler
Karen Janet Van Tiem
Ryan Glenn Vannier
Noel O. Velasco
Amalia Villarreal
Marco Igor Voinich
Gustavo G. Voldman
Joshua Ian Wabindato
Davin Wallace
Steven James Walsh
John Douglas Walter
Paul Byron Walmant
Kim C. Walton
Ting Wang
Jared J. Warner
Brittany L. Weeks
Benjamin Eugene Weide
Deborah Weiser
Blake Paul Weissling
Misty Lynn Wertz
Tom White
Nick Allen Whitfield
Steve Whiting
Satrio Adi Wicaksono
Michael A. Wicker
Nicholas James Wieclaw
Jeremy C. Williams
Stephanie Scholten Willis
Richard Duane Wilson
Ian Samuel Witt
Brett Wittman
Binyam W. Woldemichael
Brett Wittman
Ian Samuel Witt

AFFILIATE MEMBERS

Michael P. Bedford
Meg Finn
Michael A. Bill
Gérard Breton
John B. Bush Jr.
Elizabeth K. Christie
Daniel Patrick Connelly
Megghan Doughty
G. Dressler
Marilyn Gaull
Charles George
Maria Geralyn Gerber
Tim Glenn
Fred Greenberg
James E. Haase
Sue Henderson
George Heslep
Sara Ketabi
Judy (Jesse) Lowe
Sara Ketabi
Rodney Moore
Rethinavel Raja
Sumir Ray
David Arnold Roberts
Tom Slaughter
Shannon Smith
Roy William Stoehr
Harry H. Thomas
Elizabeth Jean Wasserman
Vivian A. W. Whitney

THE GEOLOGICAL SOCIETY OF AMERICA®
SCIENCE STEWARDSHIP SERVICE
Call for Papers:

GSA Today is seeking submissions for its “Groundwork” series—articles that lay the groundwork for furthering the influence of earth science on education, policy, planning, and funding. Articles can include in-depth geoscience commentary, short observations and analysis of hot topics, and discussion of policy news and issues.

GSA Today “Groundwork” articles must be no longer than two print pages: ~1400 words with two small figures or ~1600 words with one figure. The philosophy behind this is twofold: (1) keeping an article short can increase the clarity and quality of the writing; and (2) a short article encourages readers to engage and seek more information.

Figures to accompany a “Groundwork” article can be color at no charge to the author.

“Groundwork” articles go to GSA Today's science editors and are run through a rigorous peer review before acceptance and publication.

Submit your article today at http://gsa-today.allentrack.net/cgi-bin/main.plex.

THE GEOLOGICAL SOCIETY OF AMERICA®

2009 GSA OFFICER AND COUNCILOR NOMINEES

GSA’s success depends on you—its members—and the work of the officers serving on GSA’s Executive Committee and Council.

In early March, you will receive a postcard with instructions for accessing your electronic ballot via our secure Website, and biographical information on the nominees will be online for you to review at that time. Paper versions of both the ballot and candidate information will also be available.

Please help continue to shape GSA’s future by voting on the nominees listed here.

GSA Elections Start 13 March 2009

<table>
<thead>
<tr>
<th>PRESIDENT</th>
<th>VICE PRESIDENT</th>
<th>TREASURER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jean M. Bahr</td>
<td>Joaquin Ruiz</td>
<td>Jonathan G. Price</td>
</tr>
<tr>
<td>University of Wisconsin</td>
<td>University of Arizona</td>
<td>Nevada Bureau of Mines &amp; Geology</td>
</tr>
<tr>
<td>Madison, Wisconsin, USA</td>
<td>Tucson, Arizona, USA</td>
<td>Reno, Nevada, USA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COUNCILOR Position 1</th>
<th>COUNCILOR Position 2</th>
<th>COUNCILOR Position 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lisa D. White</td>
<td>George O. Linkletter</td>
<td>Robert B. Finkelman</td>
</tr>
<tr>
<td>San Francisco State University</td>
<td>ENVIRON International Corporation</td>
<td>U.S. Geological Survey</td>
</tr>
<tr>
<td>San Francisco, Calif., USA</td>
<td>Irvine, Calif., USA</td>
<td>Plano, Tex., USA</td>
</tr>
<tr>
<td>Cassandra Runyon</td>
<td>Ricardo A. Astini</td>
<td>J. Douglas Walker</td>
</tr>
<tr>
<td>College of Charleston</td>
<td>Universidad Nacional de Córdoba</td>
<td>University of Kansas</td>
</tr>
<tr>
<td>Charleston, S.C., USA</td>
<td>Córdoba, Argentina</td>
<td>Lawrence, Kan., USA</td>
</tr>
</tbody>
</table>

Ballots must be submitted electronically or postmarked by 12 April 2009.

Penrose Conference & Field Forum Proposals Encouraged

Penrose Conferences

GSA’s Penrose Conferences were established in 1969 to provide opportunities for the exchange of current information and exciting ideas in geology and related fields and to stimulate and enhance individual and collaborative research. Go to www.geosociety.org/Penrose/ for guidelines and a proposal form.

Field Forums

Have a great idea for a Penrose Conference that would be much more effective in a field setting or a field trip idea that captures the essence of new discoveries or a controversial topic? Then submit a Field Forum proposal! Field Forums provide an opportunity for the exchange of current knowledge and ideas that are well expressed by the geology of a specific area. Go to www.geosociety.org/fieldforums/ for proposal guidelines and more information.

Questions? Contact Becky Sundeen, +1-303-357-1041, bsundeen@geosociety.org.

THE GEOLOGICAL SOCIETY OF AMERICA®

GSA Today is seeking submissions for its “Groundwork” series—articles that lay the groundwork for furthering the influence of earth science on education, policy, planning, and funding. Articles can include in-depth geoscience commentary, short observations and analysis of hot topics, and discussion of policy news and issues.

GSA Today “Groundwork” articles must be no longer than two print pages: ~1400 words with two small figures or ~1600 words with one figure. The philosophy behind this is twofold: (1) keeping an article short can increase the clarity and quality of the writing; and (2) a short article encourages readers to engage and seek more information.

Figures to accompany a “Groundwork” article can be color at no charge to the author.

“Groundwork” articles go to GSA Today’s science editors and are run through a rigorous peer review before acceptance and publication.

Submit your article today at http://gsa-today.allentrack.net/cgi-bin/main.plex.

THE GEOLOGICAL SOCIETY OF AMERICA®
In Memoriam

Paul-Emile Auger  
Quebec, Quebec, Canada  
8 September 2008

Robert M. Cassie  
Massillon, Ohio, USA  
16 October 2008

Norbert Edmund Faltyń  
Baldwinsville, New York, USA  
15 October 2008

Terrence J. Frest  
Seattle, Washington, USA  
10 April 2008

Alan M. Goodwin  
Toronto, Ontario, Canada  
1 June 2008

Joseph T. Gregory  
Houston, Texas, USA  
18 November 2007

Allen V. Heyl  
Evergreen, Colorado, USA  
24 October 2008

Seena N. Hoose  
Cupertino, California, USA  
notified 6 October 2008

Frederic R. Kelley  
Gualala, California, USA  
8 August 2008

Troy J. Laswell  
Starkville, Mississippi, USA  
notified 6 November 2008

Paul E. Melancon  
Meadowlakes, Texas, USA  
9 February 2007

John K. Osmond  
Tallahassee, Florida, USA  
notified 18 November 2008

Carter W. Roberts  
Menlo Park, California, USA  
notified 24 November 2008

David C. Roy  
Framingham, Massachusetts, USA  
30 August 2008

H. Sakai  
Tokyo, Japan  
30 September 2008

Gail F. Vernon Jr.  
Edmond, Oklahoma, USA  
30 September 2008

Detlef A. Warnke  
Hayward, California, USA  
23 October 2008

James E. Wilson  
Littleton, Colorado, USA  
notified 31 October 2008

James Lee Wilson  
New Braunfels, Texas, USA  
11 February 2008

About People

GSA Fellows Robert G. Font and Larry R. Rhodes and GSA Member M. Lee Allison were among the five recipients of the American Institute of Professional Geologists (AIPG) 2008 National Awards. Both Font and Rhodes received the AIPG Martin Van Covering Memorial Award, and Allison was honored with the AIPG John T. Galey, Sr., Memorial Public Service Award. Learn more at www.geosociety.org/news/memberNews.htm.

The Geoscience Information Society (GSIS) named Pennsylvania Geological Survey Open-File Report 06-02, Rifts, Diabase, and the Topographic “Fishhook”: Terrain and Military Geology of the Battle of Gettysburg—July 1–2, 1863, the best field trip guidebook for 2008. Among the authors are GSA Fellows Roger J. Cuffey and John D. Inners. GSA Member Lara E. Joseph earned the GSIS Best Paper Award for “Comparison of retrieval performance of eleven online indexes containing information related to Quaternary research, an interdisciplinary science.”

Call for Papers:

GSA Today science articles are timely, focused articles on current topics and discoveries in the earth sciences that appeal to a broad geoscience audience. Each article receives a rigorous peer review, with rapid turnaround both from receipt to acceptance (avg. for 2008: 91.2 days) and from acceptance to publication (avg. for 2008: less than 3 months). GSA Today’s circulation is over 21,500, and we offer free color and no page charges. Finally, GSA Today science articles are always open access online.

Please submit your article through GSA Today’s online manuscript tracking and peer review system via link at www.geosociety.org/pubs/gsatguid.htm.
NEW SCIENCE EDITORS FOR GSA JOURNALS

The Geological Society of America announces the appointment of five new science editors to its journals. Each begins a four-year term this year.

GEOLGY
Geology welcomes Patience Cowie of the University of Edinburgh and Sandra Wyld of the University of Georgia. They will join continuing editors Andy Barth (Indiana University–Purdue University) and Brad Opdyke (Australian National University). Tina Niemi (University of Missouri–Kansas City) completed her term in December 2008.

Cowie (http://xweb.geos.ed.ac.uk/~cowie/) is professor of geodynamics at the School of GeoSciences, University of Edinburgh. Her research is concerned with the mechanics of fault and fracture development in the elastic-brittle part of the lithosphere and includes studies of continental rifts and mid-ocean ridges. She is interested in the rates of fault growth and systematic variations in space and time due to fault interaction, and the implications of rate variations for seismic hazard assessment, geomorphic processes, and sedimentation patterns in active tectonic settings. Cowie has held several editorial positions, including with the Journal of Structural Geology, the Journal of Geophysical Research, and Basin Research.

Wyld (www.gly.uga.edu/Wyld/) is an associate professor in the Dept. of Geology, University of Georgia–Athens. She is one of the department’s undergraduate advisors and teaches classes on structural geology, continental tectonics, and regional geology of global orogenic systems. Wyld’s research interests focus on the structural and tectonic evolution of convergent plate margins, particularly on how convergent margins grow over time and how the structural evolution of these margins can be related to plate tectonic interactions. Her current areas of study are the western North American Cordillera and the Leeward Antilles of the southern Caribbean.

GSA BULLETIN
Joining Brendan Murphy (St. Francis Xavier University) as co-editors for GSA Bulletin are Christian Koeberl of the University of Vienna and Nancy Riggs of Northern Arizona University. Karl Karlstrom (University of New Mexico) completed his term in December 2008.

Koeberl (www.univie.ac.at/geochemistry/koeberl/) is head of the Dept. of Lithospheric Research at the University of Vienna and is a full member of the Austrian Academy of Sciences. His main research interest is meteorite impact craters and processes, combining geology, geochemistry, petrology, mineralogy, stratigraphy, and other disciplines. He is a member of the International Continental Scientific Drilling Program (ICDP) Science Advisory Group. Koeberl has published more than 320 peer-reviewed research papers and has written or edited 12 books (including several GSA Special Papers). He has been an associate editor for several journals, including GSA Bulletin, and also has served on the editorial board of Geology.

Riggs (www.cefns.nau.edu/Academic/Geology/people/Dr. NancyR.Riggs.shtml) is a professor of geology at Northern Arizona University. Her research interests are in volcanic processes, including dome construction and destruction, cinder cone processes, volcanic effects on sedimentation, and the relation between volcanism and tectonics, as well as geology education, and she has also studied the use of detrital zircons in volcanic arc reconstruction and to trace terrane migration. Riggs is a strong advocate for undergraduate women in geosciences. She has served as an associate editor for GSA Bulletin since 1996, and she is on the Geology editorial board.

GEOSPHERE
Dennis Harry of Colorado State University in Fort Collins joins Randy Keller (University of Oklahoma) as co-editor for Geosphere. Keller has been editing solo since the journal’s inception. Harry (http://welcome.warnercnr.colostate.edu/~dharry/dharry.htm) is the Edward M. Warner Professor of Geophysics in the Dept. of Geosciences at Colorado State University. His research activities focus on numerical modeling of tectonic and magmatic processes involved in continental extension, geophysical imaging and geodynamic modeling of extensional and foreland sedimentary basins, and near-surface geophysical characterization of elastic aquifer systems. Harry has served as an associate editor for Geosphere since 2004.

THE GEOLOGICAL SOCIETY OF AMERICA®

SCIENCE • STEWARDSHIP • SERVICE
GSA–ExxonMobil

BIGHORN BASIN FIELD AWARD

A FREE Professional Development Opportunity

Application deadline: 27 February 2009

GSA and ExxonMobil are excited to announce a new field seminar in the Bighorn Basin of north-central Wyoming, which will emphasize multidisciplinary integrated basin analysis. Students (undergraduate, graduate, and international) and faculty are encouraged to apply; preference will be given to graduate students. All expenses will be covered, including hotel, airfare, and meals.

This short course is scheduled for May 2009. To apply, please submit the following items by 27 Feb. 2009 to http://rock.geosociety.org/ExxonMobilAward.

• A résumé or curriculum vitae;
• Academic transcripts;
• Two letters of recommendation; and
• A cover letter indicating your background, your plans for the future, and how you feel this trip will help you accomplish these plans.

Questions? Please contact Jennifer Nocerino, jnocerino@geosociety.org, or +1-303-357-1036.
Each editor will work out of his or her current location. GSA provides some funding to science editors; for specifics, please contact Jeanette Hammann, +1-303-357-1048, jhammann@geosociety.org. For general information, see the back cover of the January GSA Today or go to www.geosociety.org/pubs/editorsCall.htm.

Rafter Radiocarbon dating services and Stable Isotope science

Our AMS ¹⁴C dating services are complimented by δ¹³C, δ¹⁵N, δ³⁴S, δ¹⁸O and hydrogen stable isotope analysis. We offer a 10% discount for jobs requiring all five stable isotopes.

Our analysis is backed by world-leading scientists whose research spans climate, environmental protection and sustainability, geology, and hydrocarbons, supported by expert technicians.

Whether you seek knowledge of "a moment in time" from radiocarbon dating, or "inside knowledge" of isotope processes, GNS Science can provide the answers.

To know more about benefitting from the expertise of the GNS Science Stable Isotope Laboratory and Rafter Radiocarbon Laboratory please visit www.rafterradiocarbon.co.nz www.gns.cri.nz/nic/stableisotopes

or Email us at radiocarbon@gns.cri.nz stableisotopes@gns.cri.nz

Location
National Isotope Centre
30 Gracefield Road
Lower Hutt 5010
PO Box 31312
Lower Hutt 5040
New Zealand
T +64-4-570 4647
F +64-4-570 4657

IS OPEN ACCESS ONLINE!
Go to www.geosociety.org/pubs/ and click on the GSA Today cover.

Call for Applications and Nominations

GSA SCIENCE EDITORS

GSA is seeking co-editor applications and nominations for the following:

- Geosphere—four-year term beginning July 2009
- Geology—four-year term beginning January 2010
- GSA Today—four-year term beginning June 2010

To apply, submit a curriculum vitae and a brief letter describing your qualifications; to nominate a fellow geoscientist, submit your nomination along with the individual’s written permission and CV to:

Jeanette Hammann
GSA Publications, P.O. Box 9140, Boulder, CO 80301, USA
jhammann@geosociety.org.

For first consideration, please complete your submission by 20 February 2009.

Each editor will work out of his or her current location. GSA provides some funding to science editors; for specifics, please contact Jeanette Hammann, +1-303-357-1048, jhammann@geosociety.org. For general information, see the back cover of the January GSA Today or go to www.geosociety.org/pubs/editorsCall.htm.
2009 GSA Section Meetings
Be a part of the geoscience action with GSA’s spring meetings!

SOUTHEASTERN
12–13 March 2009 — St. Petersburg, Florida, USA

SOUTH-CENTRAL
16–17 March 2009 — Dallas, Texas, USA
The Dallas–Fort Worth Metroplex is a great central location for examining many geologic treasures, including the Woodbine Formation at Lake Grapevine, Mineral Wells in the North Texas Hill Country, and Big Bend National Park. Early registration deadline: 9 February 2009.

NORTHEASTERN
22–24 March 2009 — Portland, Maine, USA
The Portland area offers a variety of natural attractions, including the Fore River Sanctuary and Jewell Falls, the Baxter Woods Reserve, Mount Katahdin, and extended salt- and freshwater marshes. Early registration deadline: 17 February 2009.

NORTH-CENTRAL
2–3 April 2009 — Rockford, Illinois, USA
Rockford is so named because of its location at a rock outcrop popular for fording the Rock River, which runs through the city. Just to the northeast of town are Rock Cut State Park and Pierce Lake. Rockford is also the home of juvenile T. rex, Jane, on display at Rockford’s Burpee Museum of Natural History. Early registration deadline: 2 March 2009.

CORDILLERAN
7–9 May 2009 — Kelowna, British Columbia, Canada
Kelowna is situated along the eastern shore of Okanagan Lake in the Okanagan Valley, a geologically diverse area, with mountains, beaches, orchards, and vineyards—ideal country for a geoscience meeting. Early registration deadline: 6 April 2009.

ROCKY MOUNTAIN
11–13 May 2009 — Orem, Utah, USA
Orem is located on the eastern shore of Utah Lake in the foothills of Mount Timpanogos. Nearby is Uinta National Forest, and to the south are several national parks and recreation areas. Early registration deadline: 13 April 2009.

Find more meeting information on the Web at www.geosociety.org/meetings and look for your meeting brochures to arrive by mail in the coming weeks.
Classified Rates—2009

Ads (or cancellations) must reach the GSA advertising office no later than the first of the month, one month prior to the issue in which they are to be published. Contact advertising@geosociety.org, +1.800.472.1988 ext. 1053, or +1.303.577.1053. Advertisements for employment and classifieds must include complete contact information, including e-mail and mailing addresses. To estimate cost, count 54 characters per line, including punctuation and spaces. Actual cost may differ due to typesetting, font style, or special characters. Rates in U.S. dollars.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Per Line for</th>
<th>Per Line each additional format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positions Open</td>
<td>$8.50</td>
<td>$8.25</td>
</tr>
<tr>
<td>Opportunities for Students</td>
<td>$0.00</td>
<td>$4.50</td>
</tr>
<tr>
<td>Additional lines</td>
<td>$4.50</td>
<td>$4.50</td>
</tr>
<tr>
<td>Fellowship Opportunities</td>
<td>$8.50</td>
<td>$8.25</td>
</tr>
</tbody>
</table>

Positions Open

ASSISTANT PROFESSOR SIPPY ROCK UNIVERSITY OF PENNSYLVANIA Slippery Rock University in Pennsylvania is seeking applicants for one (1) full-time, tenure track position at the Assistant Professor level in the Department of Geology, Geography, and the Environment, beginning in August 2009.

A Ph.D. at time of appointment is required. Successful performance in an on-campus interview, including teaching and research demonstrations, is also required. The candidates must demonstrate a commitment to the education of diverse populations.

The Department seeks an assistant professor with an active research and publication agenda and a teaching and research focus on environmental issues, particularly sustainability. The selected candidate will be responsible for teaching introductory environmental courses, upper division courses in her/his area of expertise, and contributing to the department’s newly developed Master of Science in Sustainable Systems. Preference will be given to candidates who also demonstrate the ability to teach one or more of the following courses: Principles of Sustainability, Energy and Society, Green Building Design, and Planning for Sustainable Communities. The Department has a tradition of providing students with opportunities for research, field experiences, and travel; the successful candidate will be expected to contribute to these efforts. We encourage applicants across a broad range of research interests, theoretical frameworks, and methodologies.

Send letter of interest, statements of teaching philosophy and research agenda, curriculum vita, graduate and undergraduate transcripts, and three letters of reference (a list of their names, addresses, and phone numbers) to: Dr. LaGond Smith, Department of Geography, Geology, and Environment, 319 Advanced Technology and Science Hall, Slippery Rock University, Slippery Rock, PA 16057, e-mail: langdon.smith@sru.edu (for questions only—no electronic submissions will be accepted).

Review of complete application materials will begin on 21 February 2009, continuing until the positions are filled. Background investigation required for employment. Slippery Rock University is a member of the State System of Higher Education and is an affirmative action/equal opportunity employer. Visit our Web page at www.sru.edu. Further information about the Department is available at http://academics.sru.edu/gge/index.html.

ENDOWED PROFESSORSHIP IN ECOSYSTEMS AND ESSENTIAL RESOURCES INTERNATIONAL CENTER FOR ADVANCED RENEWABLE ENERGY AND SUSTAINABILITY (I-CARES) COLUMBIA, LOUISIANA The International Center for Advanced Renewable Energy and Sustainability (I-CARES) (www.i-cares.wustl.edu/endowedprof.html) at Washington University in St. Louis invites nominations and applications for endowed professorships, including one in Ecosystems and Earth Systems Science. The search is focused on tenured appointments at the rank of full professor, although other exceptional candidates will be considered for appointments commensurate with their experience and accomplishments.

We seek individuals from such fields as biology, chemistry, earth and planetary sciences, environmental sciences, and physics who have expertise and innovative insight into global change over a range of time and space scales. Important research frontiers in this area include interactions between biological and geophysical processes; feedbacks between the atmosphere and the remainder of the planet; the feedbacks between global change and natural and/or managed ecosystems; and the interactions among agri- culture production, energy, and the environment. For information regarding application procedures, please see www.wustl.edu/About/facultypositions.cfm. Questions regarding the search process can be directed to Dr. Jonathan Chase, Dept. of Biology, jchase@wustl.edu; or Dr. T.R. Kidder, Dept. of Anthropology, tkrkidd@wustl.edu—co-chairs of the Search Committee.

Review of applications will begin immediately, but applications will be received until the positions are filled. Washington University is an Equal Opportunity and Affirmative Action Employer. Applications from women and underrepresented minority groups are strongly encouraged.

MONCRIEF CHAIR IN PETROLEUM GEOLOGY WESTERN STATE COLLEGE OF COLORADO Western State College of Colorado invites applications for the ten-track faculty position of Moncrief Chair in Petroleum Geology starting August 2009. Teaching responsibilities include courses in an expanded petroleum geology curriculum and in petroleum geology curriculum. Requirements include a doctorate in geology or related field and a commitment to undergradate education and excellence in teaching. For full position information and application procedures, visit www.western.edu/hr/jobs. Applications will be accepted until the position is filled. AAVCE/EOE.

ASSISTANT PROFESSOR WATERSHED HYDROLOGY AND GEOMORPHOLOGY DEPARTMENT OF WATER RESOURCES UTAH STATE UNIVERSITY The Department of Watershed Sciences (www.cnr.usu.edu/departments/wats) at Utah State University (www.usu.edu) is seeking to fill a ten-track position in watershed hydrology and geomorphology at the assistant professor level. Applicants must have a Ph.D. in watershed sciences, hydrology, or a related discipline at the time of employment. The full position description and instructions for applying are available on the Web at https://jobs.usu.edu (position ID 051603). Review of applications will start 15 Feb 2009.

Utah State University is an Affirmative Action/Equal Opportunity Employer and encourages applications from women and minorities.

GEOLoGY (PETROLEUM, SEDIMENTATION/STRATIGRAPHY, FORENSIC GEOLOGY): TENURE- TRACK POSITION, ASSISTANT PROFESSOR RADFORD UNIVERSITY, RADFORD, VIRGINIA Applications are invited for a position to begin in September 2009. A doctorate in petroleum with some interest in forensic research and teaching is preferred. Candidates having a firm doctoral completion date within one year of the date hired will be considered. The successful candidate will teach courses in areas of petroleum, sedimentology-stratigraphy, and general geology. Expertise in geology field methods is a plus. The successful candidate will be expected to develop and supervise undergraduate student research. Radford University offers an undergraduate geology major with a focus on environmental and engineering geology, and is home to the RU Forensic Science Institute. Candidates must provide a letter of application, current vita, copies of transcripts, and the names, addresses and phone numbers of three references. Consideration of candidates will be begun immediately, until the position is filled pending funding. Applications should be addressed to Dr. S.W. Lenhart, Search Committee Chair, Dept. of Geology and Geophysics, Box 6839, Radford, VA 24142, or silanht@radford.edu.

Radford University is a co-educational, comprehensive state-supported institution with an emphasis on teaching, located in the mountains of scenic southwest Virginia, 40 miles from Roanoke, with an enrollment of approximately 9,000. Please visit our website at www.radford.edu. Radford University is an Equal Opportunity, Affirmative Action employer. Minority and women candidates are encouraged to apply.

The University of Texas at Dallas

The Department of Geosciences at the University of Texas at Dallas is seeking to take on two tenure/tenure track faculty members who have developed, or have the potential to develop, vibrant, sustained externally funded research programs that complement existing departmental strengths and who will contribute effectively to the Department’s educational programs at the BS, BA, MS and PhD levels.

This departmental expansion in tectonics will play a pivotal role in the University’s strategic emphasis on energy and the environment. We are seeking individuals who will complement and expand departmental strengths in structural geology, active and ancient tectonics, isotopes and geochemistry, geophysics, geospatial science, and computational geoscience, and who will enhance collaboration with other departments in the School of Natural Sciences and Mathematics and programs in geospatial science with the School of Economics, Political, and Policy Studies and the Jonsson School of Engineering and Computer Science. We hope to build upon our traditional collaboration with the petroleum industry in areas that may encompass carbon dioxide sequestration, water and mineral resources, and to expand the use modern high-resolution positioning and imaging technology to characterize and model surface processes associated with crustal deformation.

The Department of Geosciences has strong undergraduate and graduate programs and UTD is a relatively young, growing university. It attracts very talented students (mean freshman SAT > 1200) and is located in a vibrant metropolitan area that is undergoing rapid growth.

The search committee will begin evaluating applications as soon as possible and will continue until the positions are filled. Applications should include a complete resume, a statement of research interest and the names and contact information of five professional references and send to: Academic Search #20097, The University of Texas at Dallas, 800 W. Campbell Road, AD 42, Richardson, TX 75080-3021. Indication of gender and ethnic origin for affirmative action purposes is requested as part of the application process but is not required for consideration.

Questions about the position may be directed to the Department Head, Professor John S. Oldow (oldow@utdallas.edu). Electronic applications can be sent to jobsrch@utdallas.edu. UTD is an equal opportunity/affirmative action employer and encourages application from candidates who would enhance the diversity of the university’s faculty and administration.
### ASSISTANT OR ASSOCIATE PROFESSOR IN HYDROCARBON GEOSCIENCE, GEOLOGY AND GEOPHYSICS DEPT. AND ENERGY & GEOSCIENCE INSTITUTE, UNIVERSITY OF UTAH

The Geoscience (GG) Department and the Energy & Geoscience Institute (EGI) at the University of Utah invite applications for a tenure-track faculty position in an Assistant or Associate Professor beginning 1 July 2009. The successful candidate will bring expertise in hydrocarbon energy research and will develop a strong, self-funded and internationally recognized research program involving students and industry. Teaching responsibilities will include development of new courses and graduate-level courses and integration with existing courses in GG's Petroleum Industry Career Path. The appointee will participate in collaborative efforts between GG and EGI. EGI, Department and EGI share thriving research and academic programs in petroleum geology and geophysics and allied areas of the geosciences, including EGI's Corporate Associate program. The position will have offices at both organizations, and communication and leadership skills as well as teamwork experience are important. We also offer state-of-the-art facilities including the new Frederick A. Sutton Building. More information can be found online at www.earl.ut.edu and www.egi.utah.edu.

The area of specialization is open but possibilities include geologic interpretation of geophysical data, new methodologies for subsurface imaging, petrophysics, rock fracture mechanics, reservoir characterization and engineering, and support to EGI's Industry Career Path.

Candidates must have a completed Ph.D. at the time of appointment and a strong record of research and publication. Review of applications will begin on 15 January 2009 and will continue until the position is filled. Applicants should submit an application letter indicating research, teaching and programmatic interests and agenda, curriculum vitae, and names and contact information of three professional references to Chairs of the Hydrocarbon Geoscience Search Committee, Geology and Geophysics Dept., University of Utah, 135 South 1460 East, WBB 719, Salt Lake City, UT 84112.

Complete applications may also be sent in PDF format by e-mail to Dr. Kristin Christiansen at utah.edu. Questions can be addressed to Carl Johnson (Carl.Johnson@utah.edu) or Ray Levey (RLevey@egi.utah.edu).

The University of Utah values candidates who have experience working in settings with students from diverse backgrounds, and possess a strong commitment to improving access to higher education for historically underrepresented students.

### Opportunities for Students

#### Graduate Study in Geosciences at San Francisco State University

NSF-funded graduate research opportunities are available in igneous and metamorphic petrology, geochemistry, and geochronology toward a project focused on unconventional resources. Preference will be given to students with prior research and field and/or laboratory experience. Financial support is available for a two-year M.S. project. Applications for Fall 2009 admission are due 15 March 2009. For more information, contact Mary Leech at leech@sfsu.edu or see http://online.sfsu.edu/~leech.

Graduate Assistantships, Indiana State University.

The Graduate Indiana State University has graduate assistantships available for students wishing to pursue an M.S. degree in Earth and Quaternary Sciences beginning Fall 2009. The ISU Geoscience Program offers a field- and laboratory-intensive curriculum emphasizing environmental geology and geochemistry, geological survey, surface processes, sediment transport, sequence stratigraphy, geomorphology, geochronology, Quaternary paleoclimatology, marine geology, and paleoenvironments. Collaborative endeavors are established with the Indiana Geological Survey, Indiana Division of Reclamation, Scripps Institution of Oceanography, Woods Hole Oceanographic Institution, Indiana Space Grant Consortium, Bureau of Land Management, US Forest Service, and Ocean Drilling Program. The department supports a number of state-of-the-art laboratory facilities, and our faculty are committed to providing students with hands-on learning experiences. Application review begins 03/01/09; application forms can be obtained by visiting http://www1.indstate.edu/sogs/jobs. For more information, contact Dr. James Speer, Geology Program, Indiana State University, Terre Haute, Indiana 47809, jspeer3@indstate.edu.

Graduate Opportunities in the Earth Sciences: The Department of Marine, Earth and Atmospheric Sciences at North Carolina State University invites applications from prospective M.S. and Ph.D. students in the Earth Sciences. The Department provides a multi-disciplinary learning environment with core research programs in Coastal Margin Evolution, Geomorphology, Geophysics, Geoscience Education, GIS modeling, Chemical and Physical Hydrology, Marine Sediment Transport, Marine Geochemistry, Mid-Ocean Ridge Processes, Igneous Petrology, Structural Geology, Tectonics, and Vertebrate Paleontology. Financial support is available through a combination of research and teaching assistantships. Applications are invited from students with backgrounds in the physical and biological sciences, mathematics or engineering. The deadline for fall admissions is 15 February 2009. For more information, please visit www.mees.ncsu.edu.

Graduate Research Scholarships at UT-San Antonio.

The Center for Water Research at the University of Texas at San Antonio invites applications from students interested in a M.S. program in Geological Sciences (www.geo.utsa.edu/geosci) or Civil and Environmental Engineering (www.utsa.edu/ce/ce pwd belsys containing a link to an application form) beginning in the fall of 2009. The Center supports research in areas of hydrology, hydrogeology, water resources, environmental chemistry, civil and environmental engineering, environmental spatial analysis, environmental microbiology, environmental ecology, and environmental geomorphology. Students with backgrounds in geology, hydrogeology, geochemistry, environmental science, civil and environmental engineering or closely related fields are encouraged to apply. Applications are due no later than 2 March 2009 for admitted students.

Scholarships carry a stipend of up to $12,000 plus an additional $3,000 for tuition per year for a maximum of two years. Interested students are strongly advised to identify and communicate with potential faculty advisors associated with the Center (See www.utsa.edu/water/staff.cm). Further information about scholarship requirements and application procedures can be found at www.utsa.edu/water/scholar_advertising.cfm.

Graduate Student Opportunities (Ph.D. and M.Sc.) in Contaminant Hydrogeology at the University of Toronto.

The Stable Isotope Laboratory has a number of positions available for M.Sc. and Ph.D. students interested in research in environmental isotope geochemistry (compound specific isotope analysis) related to the investigation of biodegradation and remediation of organic contaminants in groundwater (including chlorinated hydrocarbons, petroleum hydrocarbons and hydrocarbon gases). Applicants with a background in any of the following areas are invited to apply: geology, geography, chemistry, physics, engineering, microbiology.

Please send a CV plus 3 letters of reference to Dr. B. Sherwood Lollar by e-mail at

Summer Internships Available in Scientific Drilling, DOESEC (Drilling, Observation and Sampling of the Earth’s Continental Crust) invites students to apply for summer 2009 internships in scientific drilling. The internships promote student involvement in projects where drilling has provided data and materials for study. Interns can undertake research related to ongoing or past drilling efforts. The internships are open to college students (graduate or undergraduate) and primary and secondary school teachers, worldwide. Applicants do not have to be attending a DOESEC Member Institution to be considered for this award. Fellowship funding will be available in the summer of 2009 and budgets of $2000 to $5000 are appropriate. Applications must be received by 1 March 2009 and awardees will be announced 1 April 2009. For additional information, consult the DOESEC Web site, www doesec.org/html/internship.html, or e-mail David Zür, DOESEC’s Education and Outreach Manager at dzur@dosec.org.

## Free 122 Lesson Plans

**Need a lesson plan or resource for that earth science class?**

GSA has loads of free teacher resources. Go to [www.geosociety.org/educate/](http://www.geosociety.org/educate/) to view and download quality lesson plans, developed and classroom-tested by your fellow teachers.

**Have a lesson plan you want to share?**

Go to [www.geosociety.org/educate/](http://www.geosociety.org/educate/), complete our lesson plan template (Microsoft Word format), then send it via e-mail to Chris McLelland, GSA's earth science educator, at educator@geosociety.org. GSA will extend the reach of your work by including it in the Digital Library for Earth System Education (DLESE; [www.dlese.org](http://www.dlese.org)).
GSA provides three special awards for earth-science project excellence at the Intel International Science and Engineering Fair. We are seeking judges for this prestigious event, to be held in Reno, Nevada, USA, 13–15 May 2009. There are no funds for this position, so we are looking for GSA members living near or willing to travel to Reno to donate their time. If you are interested in this fascinating and rewarding volunteer activity, please contact Chris McLelland at educator@geosociety.org or +1-303-357-1082.
Summarizing new geological research in the Horn of Africa—a region well known for the record of human evolution—this volume focuses on four research projects that surround the long-studied Hadar Research Area. These research projects—Dikika, Gona, Hadar, and Ledi-Geraru—cover the geology of most of the Lower Awash Valley. The authors’ new research and inter-project collaborative efforts help to explain the chronology and context of some of our earliest ancestors.