

GSA TODAY

VOL. 21, NO. 12

A PUBLICATION OF THE GEOLOGICAL SOCIETY OF AMERICA

DECEMBER 2011

Unique Geologic Insights from “Non-Unique” Gravity and Magnetic Interpretation

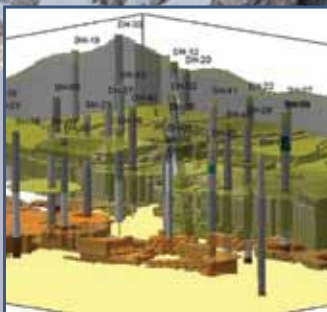


JACK AND SUE ARE ABOUT TO LEARN ABOUT
THE NON-UNIQUENESS OF POTENTIAL FIELDS!

Inside:

- ▲ **Preliminary Announcement and Call for Papers:** 2012 GSA Rocky Mountain Section Meeting, p. 18
- ▲ **Groundwork:** Enhancing Participation of Two-Year College Faculty in The Geological Society of America, p. 36

Not Just Software . . . RockWare. For Over 28 Years.

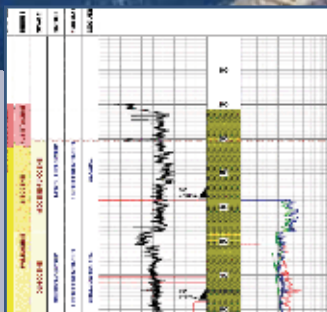


RockWorks®

3D Data Management, Analysis and Visualization

- Powerful measured-section/borehole database for managing:
 - Lithology
 - Stratigraphy
 - Hydrology
 - Hydrochemistry (e.g. Contaminants)
 - Geophysics
 - Fractures
 - 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
- Full range and township support

\$3,000

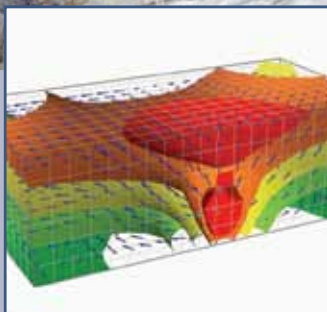


WellCAD™

Well Log Data Management

- PC-based composite log package, combining comprehensive graphic editing and data processing tools
- Formula parser for log analysis
- Fracture and breakout analysis
- Optional modules for core logging, image analysis, LIS/DLIS import, sonic processing, deviation calculations, ODBC connectivity, automation and cross-section generation
- Integrates all data acquired in a well into a single document
- Combines excellent display, editing and analysis capabilities for well data

\$3,120

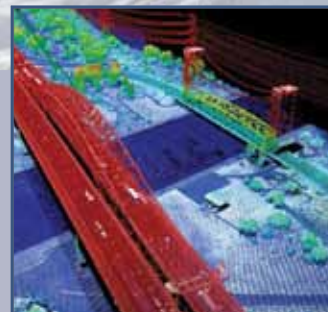


PetraSim™

A Preprocessor and Postprocessor for TOUGH2, T2VOC, TMVOC, TOUGHREACT and TOUGH-FX/HYDRATE

- Model multi-component fluid flow, heat transfer and reactive transport processes
- Saturated and unsaturated conditions
- Fractured and porous media
- Mesh generation, parameter definition, and display of results
- Now supports TOUGH2-MP (parallel version of the TOUGH2 simulator)
- Applications include geothermal studies, carbon sequestration, contaminant transport modeling, vadose zone hydrology and more

Call for pricing



MARS®

Data Processing for Airborne, Terrestrial and Mobile LiDAR Datasets

- 64-bit support for all Windows operating systems
- Capable of loading LiDAR (LAS), imagery (RGB and hyperspectral) and GIS vectors
- Supports WMS imagery, including Bing Maps
- Batch generate DEMs and elevation contours
- Automated and manual LiDAR filtering tools
- Allows multi-core processing for more efficient use of PC hardware
- 3D coordinate transformation support for LAS files (horizontal and vertical)

\$4,995

Free trials for most of our products available at www.rockware.com

Follow us on:



RockWare®

Since 1983

303.278.3534 • 800.775.6745 • RockWare.com



GSA TODAY (ISSN 1052-5173 USPS 0456-530) prints news and information for more than 23,000 GSA member readers and subscribing libraries, with 11 monthly issues (April/May is a combined issue). *GSA TODAY* is published by The Geological Society of America® Inc. (GSA) with offices at 3300 Penrose Place, Boulder, Colorado, USA, and a mailing address of P.O. Box 9140, Boulder, CO 80301-9140, USA. GSA provides this and other forums for the presentation of diverse opinions and positions by scientists worldwide, regardless of race, citizenship, gender, sexual orientation, religion, or political viewpoint. Opinions presented in this publication do not reflect official positions of the Society.

© 2011 The Geological Society of America Inc. All rights reserved. Copyright not claimed on content prepared wholly by U.S. government employees within the scope of their employment. Individual scientists are hereby granted permission, without fees or request to GSA, to use a single figure, table, and/or brief paragraph of text in subsequent work and to make/print unlimited copies of items in *GSA TODAY* for noncommercial use in classrooms to further education and science. In addition, an author has the right to use his or her article or a portion of the article in a thesis or dissertation without requesting permission from GSA, provided the bibliographic citation and the GSA copyright credit line are given on the appropriate pages. For any other use, contact editing@geosociety.org.

Subscriptions: GSA members: Contact GSA Sales & Service, +1-888-443-4472; +1-303-357-1000 option 3; gsaservice@geosociety.org for information and/or to place a claim for non-receipt or damaged copies. **Nonmembers and institutions:** *GSA TODAY* is free with a paid subscription to *GSA Bulletin*, *Geology*, *Lithosphere*, and *Geosphere* (all four journals); otherwise US\$75/yr; to subscribe, or for claims for non-receipt and damaged copies, contact gsaservice@geosociety.org. Claims are honored for one year; please allow sufficient delivery time for overseas copies. Periodicals postage paid at Boulder, Colorado, USA, and at additional mailing offices. Postmaster: Send address changes to GSA Sales & Service, P.O. Box 9140, Boulder, CO 80301-9140.

GSA TODAY STAFF

Executive Director and Publisher: John W. Hess

Science Editors: Bernie Housen, Western Washington Univ. Geology Dept. (ES 425) and Advanced Materials Science and Engineering Center (AMSEC), 516 High Street, Bellingham, WA 98225-9080, USA, bernieh@wwwu.edu; R. Damian Nance, Ohio University Dept. of Geological Sciences, 316 Clipping Laboratory, Athens, OH 45701, USA, nance@ohio.edu

Managing Editor: K.E.A. "Kea" Giles, kgiles@geosociety.org, gsatoday@geosociety.org

Graphics Production: Margo McGrew

Advertising (classifieds & display): Ann Crawford, +1-800-472-1988 ext. 1053; +1-303-357-1053; Fax: +1-303-357-1070; advertising@geosociety.org; acrawford@geosociety.org

GSA Online: www.geosociety.org

GSA TODAY: www.geosociety.org/gsatoday/

Printed in the USA using pure soy inks.

4 Unique geologic insights from "non-unique" gravity and magnetic interpretation

Richard W. Saltus and Richard J. Blakely

Cover: Two geophysicists dual on the outcrop over alternate potential-field interpretations. Nature is about to provide eruptive evidence for yet another solution. Illustration by Rick Blakely. See related article, p. 4–10.



- 12 **2012 Birdsall-Dreiss Distinguished Lecturer:** James S. Famiglietti
- 13 **Upcoming Award, Recognition & Grant Deadlines**
- 14 **34th International Geological Congress (IGC)**
- 14 **2012 Student Research Grants**
- 15 **Section Meeting Mentor Programs**
- 16 **GSA Division Awards:** Call for Nominations
- 18 **Preliminary Announcement and Call for Papers:** 2012 GSA Rocky Mountain Section Meeting
- 19 **2012 GSA Section Meeting Calendar**
- 22 **Second Announcement:** 2012 GSA Northeastern Section Meeting
- 24 **2010–2011 GSA-USGS Congressional Science Fellow Final Report:** Reflections on a Year with Congress
- 28 **GSA Foundation Update**
- 30 **Classified Advertising**
- 36 **Groundwork:** Enhancing Participation of Two-Year College Faculty in The Geological Society of America
- 38 **Call for Applications:** 2012–2013 GSA-USGS Congressional Science Fellowship

Unique geologic insights from “non-unique” gravity and magnetic interpretation

Richard W. Saltus, U.S. Geological Survey, MS 964, Denver, Colorado 80225-0046, saltus@usgs.gov; and **Richard J.**

Blakely, U.S. Geological Survey, 345 Middlefield Road, MS 989, Menlo Park, California 94025, USA, blakely@usgs.gov

ABSTRACT

Interpretation of gravity and magnetic anomalies is mathematically non-unique because multiple theoretical solutions are always possible. The rigorous mathematical label of “non-uniqueness” can lead to the erroneous impression that no single interpretation is better in a geologic sense than any other. The purpose of this article is to present a practical perspective on the theoretical non-uniqueness of potential-field interpretation in geology. There are multiple ways to approach and constrain potential-field studies to produce significant, robust, and definitive results.

The “non-uniqueness” of potential-field studies is closely related to the more general topic of scientific uncertainty in the Earth sciences and beyond. Nearly all results in the Earth sciences are subject to significant uncertainty because problems are generally addressed with incomplete and imprecise data. The increasing need to combine results from multiple disciplines into integrated solutions in order to address complex global issues requires special attention to the appreciation and communication of uncertainty in geologic interpretation.

INTRODUCTION

Potential theory traces its long roots back to Isaac Newton’s 1687 Universal Law of Gravitation and Pierre Laplace’s 1770 paper on differential equations. In mathematical terms, potential theory describes functions that satisfy a basic differential equation known as Laplace’s equation. These functions include those describing natural forces that decrease with distance from their causative sources (e.g., gravity and magnetic fields), as well as electrical fields, steady-state heat flow, some fluid flow, and the behavior of elastic solids. Green (1828) is evidently the first to apply the term “potential” to the mathematics of this set of phenomena. Parker (1973) eloquently summarizes the non-uniqueness of potential fields in the context of the Earth sciences. For more detail on the theoretical underpinnings of gravity and magnetic applications, see Blakely (1995).

The rich mathematics of potential-field theory provides the basis for a variety of tools to analyze and explain gravity and magnetic anomalies. For example, Fourier domain filters allow us to transform and decompose potential-field data and facilitate map-based interpretations. Modern software and computers allow us to calculate the gravity or magnetic effects of modeled geological formations and test these models against observed data. And powerful tools and techniques continue to be developed for calculating specific physical properties or

other structural characteristics directly from gravity and/or magnetic measurements.

A basic illustration of the non-uniqueness of unconstrained potential-field interpretation is the construction of a set of discrete bodies, each of which yields the same calculated anomaly. Figure 1 (modified from figure 4.18 in Sleep and Fujita, 1997) shows a stack of carefully crafted density bodies, ranging from a broadly tapered shallow source to a compact deeper source, each producing the same bell-shaped anomaly. This same figure illustrates another oft-quoted property of potential-field solutions: Changing the sign of the density contrast on one of these hypothetical bodies produces an equal and opposite anomaly to one of the other bodies; thus, we can add any number of these specially designed bodies with alternating signs and not change the total calculated anomaly.

While these theoretical diagrams are interesting for learning about the mathematics of potential fields, they are not particularly relevant to real-world applications. What are the chances that nature will produce two perfectly cancelling anomaly sources? Real-world anomaly sources are unlikely to have an ideal shape and perfect homogeneity. As a result, shallow source bodies (like body “C” in Fig. 1) will produce, in addition to the broad anomaly, short wavelength features that correlate with the natural and expected irregularities of any true geologic body. A deeper body (like body “A” in Fig. 1) will produce a smoothly varying anomaly because the short-wavelength attributes of the anomaly are naturally damped with distance. Thus, the additional information provided in the real world allows us to intelligently decide on the likely depth of the body, regardless of the fact that infinitely many models may be constructed to fit the data mathematically. In the next two sections, we follow up on this idea of practical versus theoretical non-uniqueness; we argue that (1) many unique and important conclusions can be drawn directly from potential-field data, and (2) even basic geologic constraints provide sufficient *a priori* knowledge to allow for significant results.

UNIQUE GRAVITY AND MAGNETIC RESULTS WITH LITTLE OR NO A PRIORI INFORMATION

A number of fundamentally unique results arise directly from analysis of gravity and magnetic data. It is possible, for example, to calculate the total anomalous mass causing a gravity anomaly, and this has application to a number of practical problems. A basin filled with sediments causes a gravity low because of the contrast between low-density sediments that fill the basin and higher density rocks that surround it. The total mass deficit of the basin is given unequivocally by integration of the gravity anomaly across the entire anomaly. That calculation requires no knowledge of the actual densities. We can extend our knowledge if we can determine reasonable densities from geologic arguments and rock property analysis. In

particular, knowing the total mass deficit and assuming a maximum density contrast between sediments and rocks provides the minimum volume of the basin, a useful measure of erosion and mass transport. Another potential-field technique that yields unique results with few *a priori* assumptions is the Nettleton method for determination of average density (Nettleton, 1971). Using this technique, it is possible to estimate the average density of topography by selecting a Bouguer gravity reduction density that minimizes the correlation between topography and Bouguer gravity anomaly.

Another unique result from gravity and magnetic analysis is the use of maximum gradients to map physical property boundaries and trends (Cordell, 1978; Blakely and Simpson, 1986; Grauch and Cordell, 1987). The directionality, linearity, continuity, and many other attributes of physical boundaries are important structural and geological indicators. For example, many faults and fault zones have well-known gravity and magnetic expression (e.g., Langenheim et al., 2004; Jachens et al., 2002; Blakely et al., 2002; Saltus, 2007; Grauch et al., 2001). Tectonic boundaries also have prominent and distinctive gravity and magnetic expression (e.g., Lillie, 1999; Turcotte and Schubert, 2002), including the trends and amplitudes of anomalies.

In many cases, general estimates of potential-field sources can be derived directly from measured anomalies without appeal to specific assumptions about the source distribution. For example, a basic graphical technique (Peters, 1949) gives a reasonable estimate of depth to the top of a density or magnetic source. Similarly, limits on source depths can be found using relatively simple formulas (e.g., Bott and Smith, 1958;

Smith, 1959). Many of these “rule of thumb” and other direct interpretation methods were developed in the early (i.e., pre-computer) period of modern geophysical exploration. More advanced depth estimation techniques (e.g., Phillips, 1979; Reid et al., 1990; Nabighian and Hansen, 2001; Phillips et al., 2007; Salem et al., 2008) are now available as computer codes and, in most cases, yield stable results when properly applied. Certain geometric constraints can produce unique results (e.g., Smith, 1961; Cordell, 1994). Parker and Heustis (1974) and Parker (1975) cover this topic well, including the introduction of the concept of “ideal bodies,” a way to derive certain fundamental source characteristics that are properties of all possible theoretical solutions.

ROBUST POTENTIAL-FIELD RESULTS WITH EVEN MODEST AMOUNTS OF A *PRIORI* INFORMATION

Even the most basic geologic constraints are often sufficient to yield specific, robust, and defensible potential-field interpretations. For example, the dip direction of a fault is determined directly by observing the form of the gravity anomaly step across the fault. The position of the midpoint of the step in gravity anomaly relative to the mapped surface trace of the fault indicates direction of dip (Fig. 2; inspired by fig. 4.19 in Sleep and Fujita, 1997). Another geologic example involves extension of geologic mapping from areas of outcrop into covered regions. In many cases the patterns of gravity and magnetic anomalies can be confidently associated with observed geologic units, and the continuation of these same patterns can be observed in adjacent covered regions (e.g., Jaques et al., 1997).

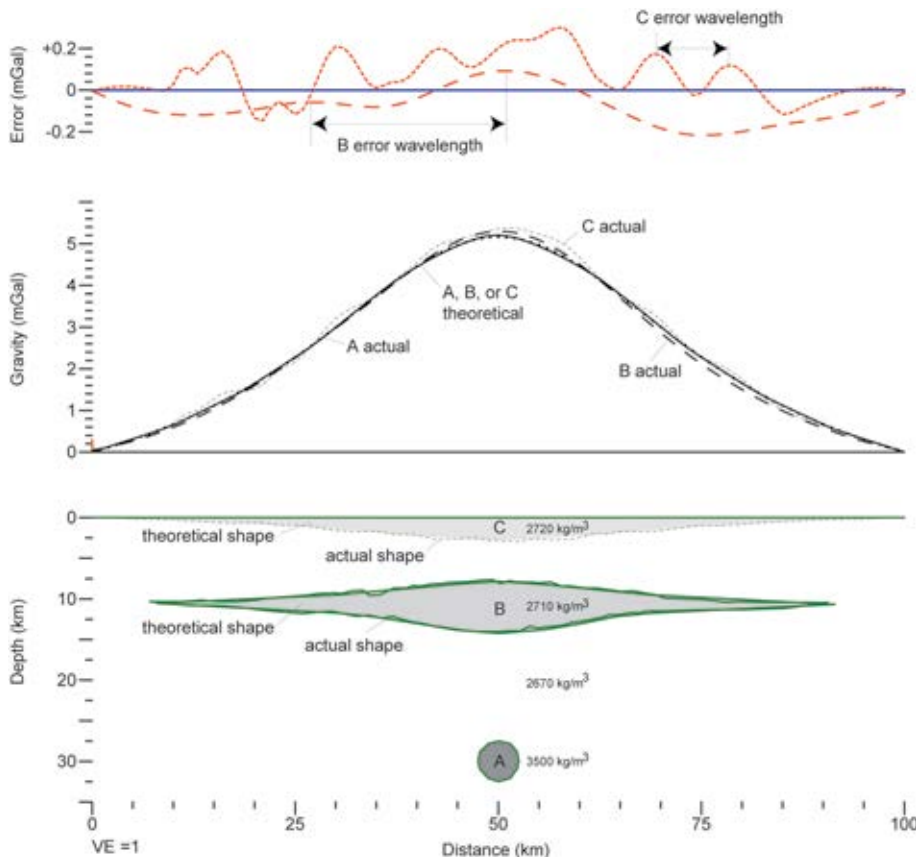


Figure 1. Results of two-dimensional calculation of the gravity effect of the source bodies (A, B, and C) depicted in the cross section view (bottom panel). When the smooth theoretical shape of each is used, the resulting calculated anomaly is identical in all three cases, as depicted by the smooth dotted line labeled “A, B, or C theoretical.” However, when the source bodies include some irregularity in their shape, as expected in the real world, the calculated gravity anomaly will differ from the smooth theoretical result (as shown by the “B actual” and “C actual” curves). The difference between the anomalies caused by the theoretical and actual shapes is shown by the “error” curves in the top panel. These differences will depend on the depth to source bodies as illustrated by the broad wavelength for the B error curve and the narrower wavelength for the C error curve.

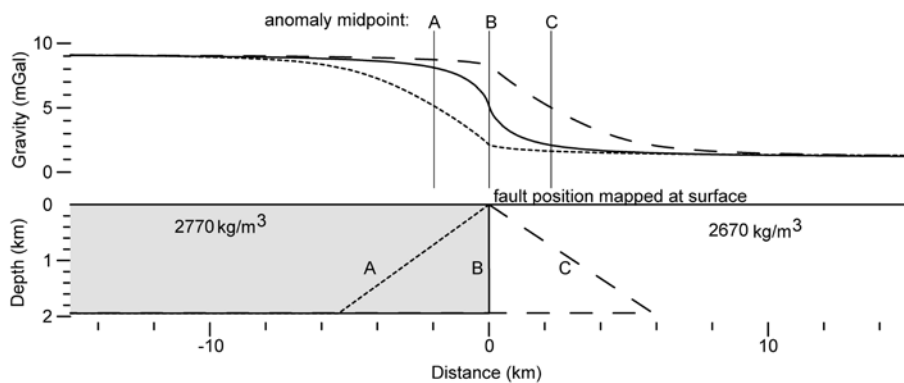


Figure 2. Cross section to illustrate unique interpretation of fault dip if surface trace of the fault is known. Midpoint of the step in gravity anomaly falls directly over fault trace for a vertical fault. If the midpoint is offset from the fault trace, it indicates the direction of fault dip.

The point here is that interpretation of potential-field data, while mathematically non-unique, still provides practical information when *a priori* knowledge is blended into the solution. In fact, every credible potential-field interpretation does this. Call it a “geophysical bill of rights”: We hold certain truths to be self-evident—e.g., regional crustal density will never exceed 4000 kg/m³; rocks hotter than the Curie temperature (~580 °C) don’t produce significant magnetic anomalies; and seismic-reflection methods will see and constrain physical property boundaries. Applying these (and many other) constraints reduces the infinite set of answers to a smaller set of plausible ones. Interpreted solutions become increasingly constrained as additional information is included, such as geologic mapping, rock property measurements, and results from other geophysical methods.

NON-UNIQUENESS AND UNCERTAINTY IN THE EARTH SCIENCES

While the “non-uniqueness” label is frequently associated with potential-field interpretations and results, it is worth noting that many broader aspects of geologic and geophysical interpretation are also subject to ambiguity. In fact, making interpretations from incomplete evidence is the rule rather than the exception in much of geology (Frodeman, 1995).

For example, in all but the most simple geologic settings even basic geologic mapping is “non-unique.” Send two different geologists into a complex region with poor outcrop and you will get two different geologic maps. In his erudite presidential address to GSA, Krauskopf (1968) discusses in great detail the difficulties of mapping ten plutons in the Sierra Nevada, emphasizing the complex considerations in choosing and defending geologically mappable units. Modern digital mapping and real-time capture of data in the field offer opportunities for quantifying mapping uncertainty and recording field interpretation choices (Jones et al., 2004), and computer methodologies have been created to approach the quantification of mapping uncertainty (e.g., Brodaric et al., 2004). Nevertheless, most published geologic maps contain significant uncertainties that can be difficult to estimate, particularly for non-geologists.

Interpretation of seismic data is also subject to ambiguity and “non-uniqueness” (e.g., Bond et al., 2007; Rankey and Mitchell, 2003). In seismic refraction, the unequivocal identification of seismic wave phases is often challenging, especially in complex and/or noisy settings. In seismic reflection, the identification and interpretation of geologic structure is subject to many

judgment calls, and the process of migrating data from time to depth also depends on the experience and judgment of the practitioner. Seismic data are frequently “re-processed” to make iterative improvements and changes to interpretations—if the solution was unique, there would never be a need for reprocessing.

EXAMPLES OF ROBUST GEOLOGICAL INSIGHT FROM GRAVITY AND MAGNETIC ANALYSIS

One of the most fundamental examples of potential-field interpretation is the association of oceanic magnetic stripes with the concept of sea-floor spreading (e.g., Vine and Matthews, 1963; Vine, 1966) (Fig. 3). In this case, direct observation of the anomaly pattern is interpreted in terms of sea-floor spreading, the geomagnetic time scale, and the well-established concept of remanent magnetism. The patterns of the positive and negative anomaly “stripes” are correlated with the patterns of normal and reversed magnetic epochs in the geomagnetic time scale. The reliability of the interpretations is not affected by the mathematical non-uniqueness of potential-field interpretation.

Another unambiguous application of potential-field interpretation is the use of gravity and/or magnetic maps to trace geologic units under surficial cover (e.g., dense vegetation and/or young sediments). In many cases, mapped lithologies have distinctive geophysical expression, and this can be firmly established by the spatial coincidence of outcrop with geophysical map patterns. These ties to lithology are strengthened by *in situ* measurement of physical properties to verify the suspected source of specific geophysical features (e.g., high densities measured on a mafic intrusion or reversed and normal polarity magnetic remanence measured on basaltic flows). Gettings (2002) (Fig. 4) shows the concealed continuation of a mapped suite of granitic to dioritic intrusions using data from an aeromagnetic survey in the Santa Cruz Valley, Arizona. Blakely et al. (2000, 2011) apply this idea to map rocks of the Columbia River Basalt series beneath adjacent surficial geology. There are many other formal and informal examples of this potential-field application; in fact, too many to cite here. This “pattern matching” approach is widely used, for example, in geologic mapping and exploration in places like Alaska (e.g., Werdon et al., 2004; Day et al., 2007), where much of the geology is concealed and logistics are expensive.

Another direct application of potential-field study is mapping of important geologic contacts, most notably faults, between exposures or other locations known from LiDAR or trenching. This is particularly important in regions of human disturbance,

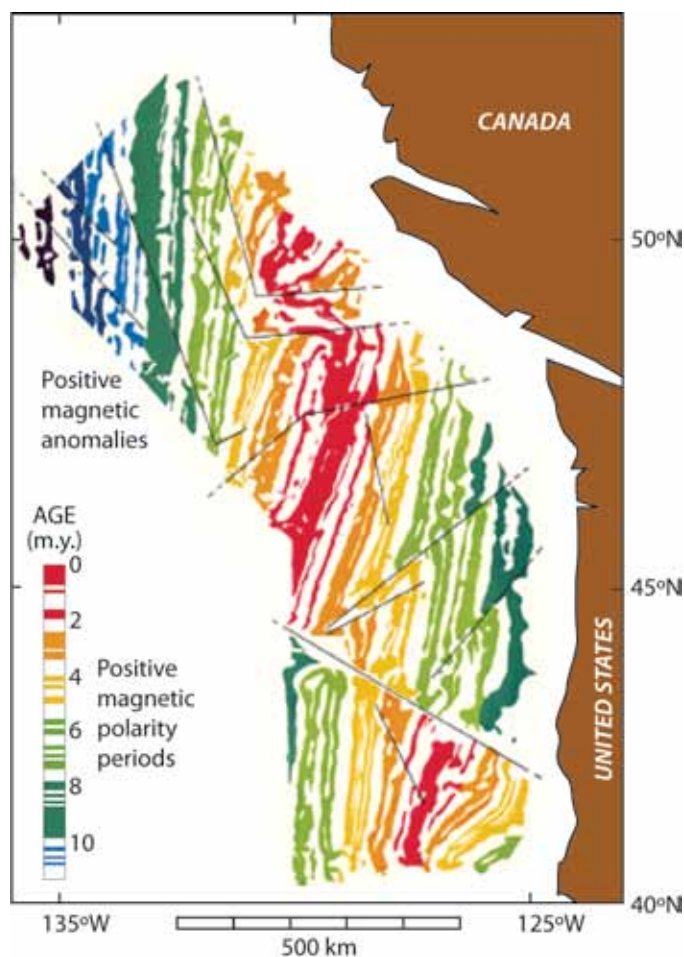


Figure 3. The positive magnetic anomaly stripes are colored to match their association with the geomagnetic polarity time scale (redrawn from original by Vine, 1966).

such as urban centers. As with much of potential-field analysis, there are examples of this approach at a wide range of scales. At the continental scale, Bischke et al. (1990) map the regional continuation of the Philippine fault system. Saltus (2007) shows the detailed location of the Tintina fault and uses the matching of distinctive anomalies transposed by the fault to deduce amount of fault movement. Blakely et al. (2002) (Fig. 5) use compiled aeromagnetic surveys to follow the Seattle fault under the heavily populated Puget Lowland from Bremerton east to Bellevue and beyond. The concept of using potential-field patterns for the mapping of geologic entities between known locations also applies to connecting seismically mapped structures between widely spaced seismic lines (e.g., Phillips, 1999).

Examination and analysis of potential-field anomalies provides a powerful and direct way to choose between geologic scenarios; in many cases, geologic concepts can be tested and confidently rejected if they do not jibe with their geophysical implications. One can readily distinguish vertical tectonic models from lateral tectonic models in orogenic regions by simple examination of correlations between gravity and topography. Mountains with deep crustal roots (e.g., the Sierra Nevada in California) have distinctly different gravity expression from

rootless mountains (e.g., ranges in Wyoming). For example, Saltus et al. (2001) rule out thin-skinned interpretation of the Copter Peak allochthon in the western Brooks Range by testing it against measured gravity and magnetic anomalies in conjunction with measured physical properties (density and magnetic susceptibility) of exposed mafic rocks.

In some cases, individual anomalies are sufficiently isolated and simple that they can be confidently modeled in detail. For example, Thompson and Robinson (1975) construct detailed models of the magnetic and gravity anomalies of the Twin Sisters Dunite in Washington state, and Burns (1983, 1985) models a portion of the Knik Arm magnetic anomaly (Cook Inlet, Alaska) by tying it to surface outcrop of Jurassic intrusives with high measured magnetic susceptibility. Even if a single specific solution is not possible, important bounds on solutions can frequently be established, as Blakely (1994) demonstrates, or key elements of the solution can be identified (e.g., shapes of sedimentary basins; Jachens and Moring, 1990; Saltus and Jachens, 1995).

DISCUSSION

Uncertainty is fundamental to the scientific endeavor. Every scientific conclusion is subject to review and is only as good as the assumptions and methodologies that went into it. Scientists construct working hypotheses, models, and experiments to test our understanding. If a model or hypothesis produces results that agree with data and experiment, we regard it as successful for the time being, recognizing it may ultimately fail and need to be corrected, updated, or abandoned in light of new discovery or understanding. The widely quoted (and variously attributed) maxim “all models are wrong, but some are useful” is an expression of the basic nature of science. In terms of uncertainty we could rephrase this maxim as “all models are uncertain, but some are better than others.”

The broader issue in potential fields, as in all science, is the effective and accurate communication of uncertainty (including aspects of non-uniqueness) in our interpretations (Frodeman, 1995; Bond et al., 2007). Indeed, the difficulties of dealing with uncertainty are a fundamental part of ordinary life and not confined to science or any other particular human endeavor (as Pollack, 2003, elegantly discusses). Earth scientists routinely deal with more uncertainty in interpretation than some other scientists because of the generally incomplete nature of our data sampling (Frodeman, 1995). The mathematical non-uniqueness of potential fields requires direct acknowledgment of uncertainty—perhaps more so than for other methods in the Earth sciences. As such, the study of potential-field interpretation provides fertile ground in which to explore the practical implications of theoretical uncertainty.

Many of the greatest scientific challenges of today span the traditional subdivisions of science. Climate change research, for example, spans Earth, atmospheric, and biological sciences and requires the combination of results from physics, chemistry, biology, geology, engineering, sociology, and economics. A key component to successful integrated science is the effective communication and mutual understanding of uncertainties arising in all of the component studies that feed into the ultimate integrated solution. But, it is also important to realize that the ultimate significance of a given result is not necessarily

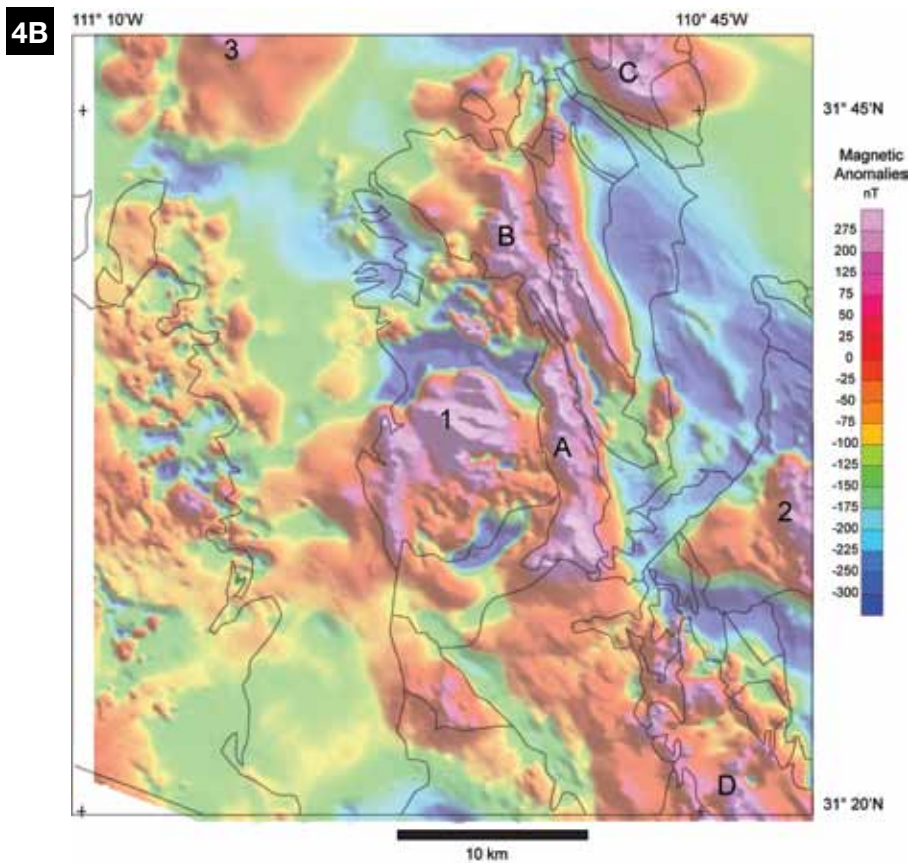
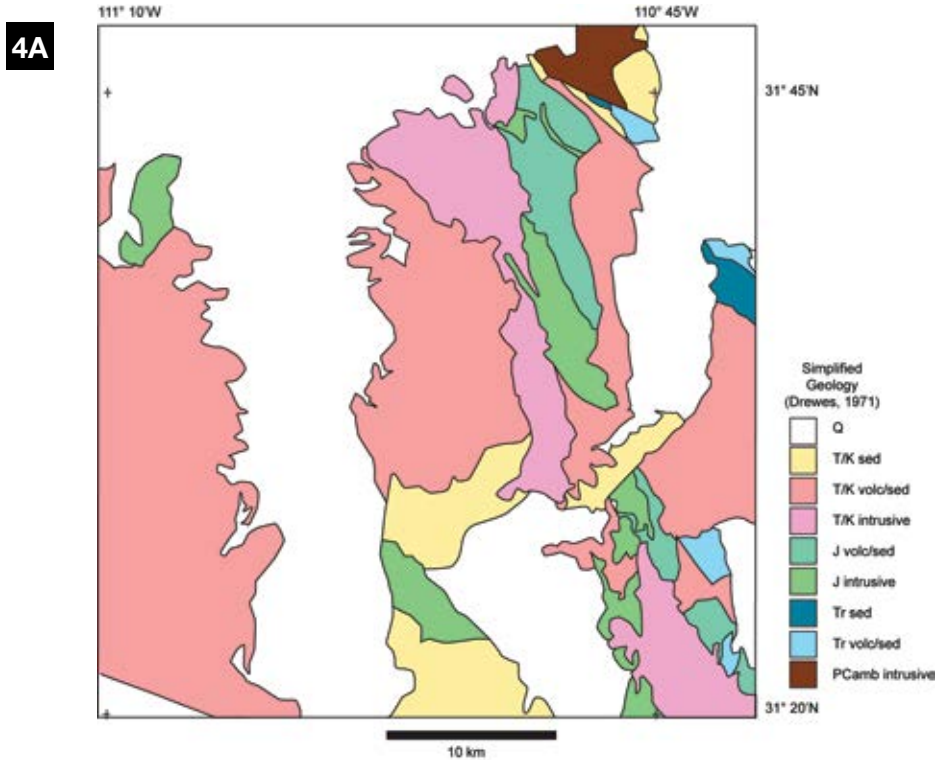


Figure 4. Mapped geology (A; simplified from Drewes, 1971) and magnetic anomalies (B) in Santa Cruz Valley, Arizona, USA (Gettings, 2002). High amplitude magnetic anomalies correlate with mapped intrusive rocks (e.g., anomalies labeled A, B, C, and D) and indicate the presence of additional intrusive rocks under sedimentary and volcanic cover (e.g., anomalies labeled 1, 2, and 3). See Gettings (2002) for additional detail; this figure is greatly simplified.

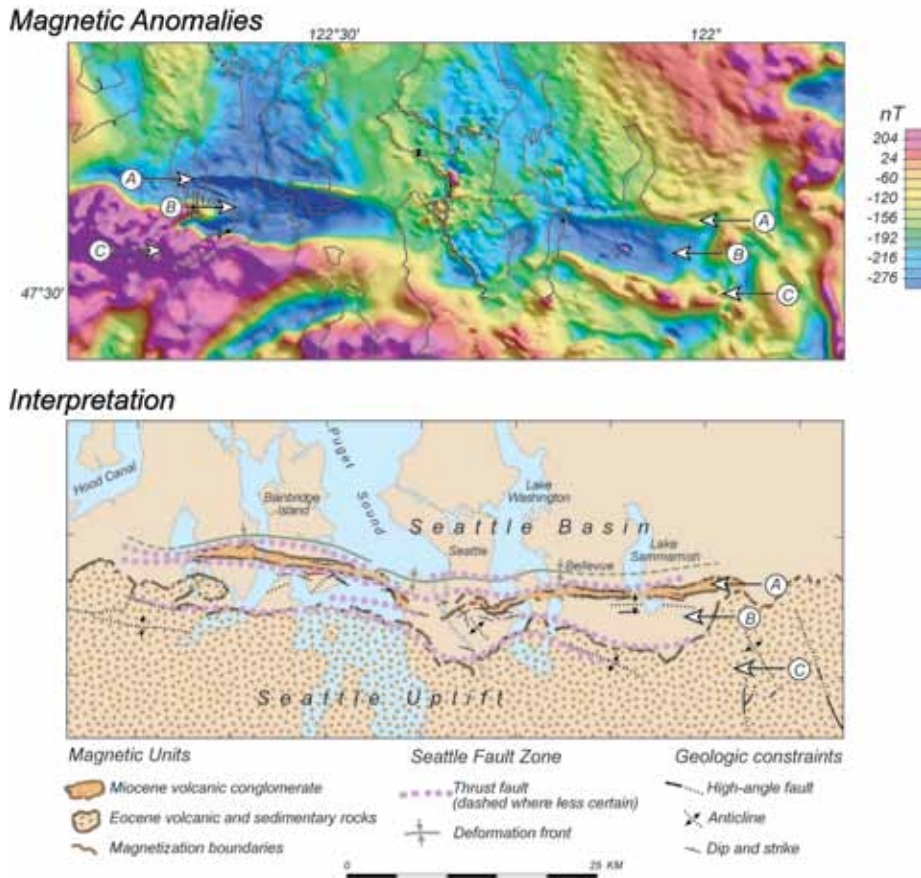


Figure 5. Example of using magnetic anomalies to map subsurface lithologies. A, B, and C on top map indicate sinuous magnetic anomalies (positive, negative, and positive, respectively) above the hanging wall of the Seattle fault, Washington, USA. Analysis of these data lead to the interpretation shown in the lower map, where the sources of anomalies A, B, and C are interpreted as steeply dipping Miocene conglomerate, relatively nonmagnetic Oligocene sedimentary rocks, and Eocene volcanic rocks, respectively. Interpretation is constrained by geologic mapping, LiDAR surveys, and seismic-reflection interpretations. See Blakely et al. (2002) for details.

related to the relative certainty of that result. A partial solution or constraint to a fundamental problem may have greater significance than an exact solution to a trivial problem. And an effective integrated solution may encompass a wide range of uncertainties in the component results. To paraphrase Aristotle: *The whole (integrated interpretation) is greater than the sum of its parts (methods and assumptions)*. And, we might add, the individual parts do not necessarily contribute equally to the sum.

SUMMARY

As career practitioners of potential-field interpretation, we feel that the theoretical non-uniqueness of potential-field interpretation creates possible confusion about the reliability of potential-field results. All credible potential-field studies judiciously incorporate *a priori* constraints such as physical property data, geologic mapping, or seismic interpretation to constructively limit the infinite theoretical universe of possible solutions. Furthermore, we feel that the general topic of “non-uniqueness” (and the closely related concepts of uncertainty and error analysis) in the Earth sciences (and indeed, science in general) deserves ongoing discussion and debate, particularly in an age when the best and most difficult problems require multidisciplinary approaches and the need to understand and integrate results from multiple fields. Successful integration requires effective communication and mu-

tual understanding of the uncertainties and assumptions inherent in all scientific results.

ACKNOWLEDGMENTS

We thank Bob Jachens, Bob Simpson, and two anonymous reviewers for enlightening and extremely constructive reviews. We also thank Bernie Housen for his support and encouragement.

REFERENCES CITED

- Bischke, R.E., Suppe, J., and del Pilar, R., 1990, A new branch of the Philippine fault system as observed from aeromagnetic and seismic data: *Tectonophysics*, v. 183, p. 243–264.
- Blakely, R.J., 1994, Extent of partial melting beneath the Cascade Range, Oregon—Constraints from gravity anomalies and ideal-body theory: *Journal of Geophysical Research*, v. 99, p. 2757–2773.
- Blakely, R.J., 1995, *Potential Theory in Gravity and Magnetic Applications*: Cambridge, UK, Cambridge University Press, 411 p.
- Blakely, R.J., and Simpson, R.W., 1986, Approximating edges of source bodies from magnetic or gravity anomalies: *Geophysics*, v. 51, no. 7, p. 1494–1498.
- Blakely, R.J., Wells, R.E., Tolan, T.L., Beeson, M.H., Trehu, A.M., and Liberty, L.M., 2000, New aeromagnetic data reveal large strike-slip (?) faults in the northern Willamette Valley, Oregon: *GSA Bulletin*, v. 112, p. 1225–1233.
- Blakely, R.J., Wells, R.E., Weaver, C.S., and Johnson, S.Y., 2002, Location, structure, and seismicity of the Seattle fault zone, Washington—

- Evidence from aeromagnetic anomalies, geologic mapping, and seismic-reflection data: *GSA Bulletin*, v. 114, p. 169–177.
- Blakely, R.J., Sherrod, B.L., Weaver, C.S., Wells, R.E., Rohay, A.C., Barnett, E.A., and Knepprath, N.E., 2011, Connecting the Yakima fold and thrust belt to active faults in the Puget Lowland, Washington: *Journal of Geophysical Research*, v. 116, B07105, 33 p.
- Bond, C.E., Gibbs, A.D., Shipton, Z.K., and Jones, S., 2007, What do you think this is? “Conceptual uncertainty” in geoscience interpretation: *GSA Today*, v. 17, no. 11, p. 4–10.
- Bott, M.H.P., and Smith, R.A., 1958, The estimation of the limiting depth of gravitating bodies: *Geophysical Prospecting*, v. 6, no. 1, p. 1–10.
- Brodaric, B., Gahegan, M., and Harrap, R., 2004, The art and science of mapping—Computing geological categories from field data: *Computers and Geosciences*, v. 30, no. 7, p. 719–740.
- Burns, L.E., 1983, The Border Ranges ultramafic and mafic complex—Plutonic core of an intraoceanic island arc [Ph.D. thesis]: Palo Alto, California, Stanford University, 151 p.
- Burns, L.E., 1985, The Border Ranges ultramafic and mafic complex, south-central Alaska—Cumulate fractionates of island-arc volcanics: *Canadian Journal of Earth Science*, v. 22, p. 1020–1038.
- Cordell, L., 1978, Regional geophysical setting of the Rio Grande rift: *GSA Bulletin*, v. 89, p. 1073–1090.
- Cordell, L., 1994, Potential-field sounding using Euler’s homogeneity equation and Zidarov bubbling: *Geophysics*, v. 59, no. 6, p. 902–908.
- Day, W.C., O’Neill, J.M., Aleinikoff, J.N., Green, G.N., Saltus, R.W., and Gough, L.P., 2007, Geologic map of the Big Delta B-1 quadrangle, east-central Alaska: U.S. Geological Survey Scientific Investigations Series Map 2975, 23-page pamphlet, 1 plate, scale 1:63,360.
- Drewes, H., 1971, Geologic map of the Mount Wrightson Quadrangle, southeast of Tucson, Santa Cruz and Pima Counties, Arizona: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-614, scale 1:48,000, 1 sheet.
- Frodeman, R., 1995, Geological reasoning—Geology as an interpretive and historical science: *GSA Bulletin*, v. 107, no. 8, p. 960–968.
- Gettings, M., 2002, An Interpretation of the 1996 Aeromagnetic Data for the Santa Cruz basin, Tumacacori Mountains, Salta Rita Mountains, and Patagonia Mountains, South-Central Arizona: U.S. Geological Survey Open-File Report 02-099: <http://pubs.usgs.gov/of/2002/of02-099/> (last accessed 18 Oct. 2011).
- Grauch, V.J.S., and Cordell, L., 1987, Limitations of determining density or magnetic boundaries from the horizontal gradient of gravity of pseudogravity data: *Geophysics*, v. 52, no. 1, p. 118–121.
- Grauch, V.J.S., Hudson, M.R., and Minor, S.A., 2001, Aeromagnetic expression of faults that offset basin fill, Albuquerque basin, New Mexico: *Geophysics*, v. 66, no. 3, p. 707–720.
- Green, G., 1828, An essay on the application of mathematical analysis to the theories of electricity and magnetism: Facimile—Druck in 100 Exemplaren, Berlin, Mayer u. Mueller (1889), 72 p. (digitized by Google Scholar; last accessed 18 Oct. 2011).
- Jachens, R.C., and Moring, B., 1990, Maps of thickness of Cenozoic deposits and the isostatic residual gravity over basement for Nevada: U.S. Geological Survey Open-File Report 90-404, scale 1:1,000,000.
- Jachens, R.C., Langenheim, V.E., and Matti, J.C., 2002, Relationship of the 1999 Hector Mine and 1992 Landers Fault ruptures to offsets on Neogene faults and distribution of late Cenozoic basins in the eastern California shear zone: *Bulletin of the Seismological Society of America*, v. 92, no. 4, p. 1592–1605.
- Jaques, A.L., Wellman, P., Whitaker, A., and Wyborn, D., 1997, High-resolution geophysics in modern geological mapping: *AGSO Journal of Australian Geology & Geophysics*, v. 17, p. 159–173.
- Jones, R.R., McCaffrey, K.J.W., Wilson, R.W., and Holdsworth, R.E., 2004, Digital field data acquisition—Towards increased quantification of uncertainty during geological mapping: *Geological Society [London] Special Publication 239*, p. 43–56.
- Krauskopf, K.B., 1968, A tale of two plutons: *Geological Society of America Bulletin*, v. 79, p. 1–18.
- Langenheim, V.E., Jachens, R.C., Morton, D.M., Kistler, R.W., and Matti, J.C., 2004, Geophysical and isotopic mapping of preexisting crustal structures that influenced the location and development of the San Jacinto fault zone, southern California: *GSA Bulletin*, v. 116, p. 1143–1157.
- Laplace, P.-S., 1770, Sur le calcul intégral aux différences infiniment petites, & aux différences finies: *Mélanges de philosophie et mathématique de la Société Royale de Turin*, v. 4, p. 273–345, <http://www.cs.xu.edu/math/Sources/Laplace/recherches.pdf> (last accessed 18 Oct. 2011).
- Lillie, R.J., 1999, *Whole Earth Geophysics—An Introductory Textbook for Geologists and Geophysicists*: Upper Saddle River, New Jersey, Prentice Hall, 361 p.
- Nabighian, M.N., and Hansen, R.O., 2001, Unification of Euler and Werner deconvolution in three dimensions via the generalized Hilbert transform: *Geophysics*, v. 66, no. 6, p. 1805–1810.
- Nettleton, L.L., 1971, *Elementary gravity and magnetics for geologists and seismologists*: Society of Exploration Geophysicists, 131 p.
- Newton, I., Sir, 1687, *Philosophiae naturalis principia mathematica*: London Societatis Regiae, 510 p.
- Parker, R.L., 1973, The rapid calculation of potential anomalies: *Geophysical Journal of the Royal Astronomical Society*, v. 31, no. 4, p. 447–455.
- Parker, R.L., 1975, The theory of ideal bodies for gravity interpretation: *Geophysical Journal of the Royal Astronomical Society*, v. 42, no. 2, p. 315–334.
- Parker, R.L., and Heustis, S.P., 1974, The inversion of magnetic anomalies in the presence of topography: *Journal of Geophysical Research*, v. 79, no. 11, p. 1587–1593.
- Peters, L.J., 1949, The direct approach to magnetic interpretation and its practical application: *Geophysics*, v. 14, no. 3, p. 290.
- Phillips, J.D., 1979, ADEPT—A program to estimate depth to magnetic basement from sampled magnetic profiles: U.S. Geological Survey Open-File Report 79-367, 37 p.
- Phillips, J.D., 1999, An interpretation of proprietary aeromagnetic data over the northern Arctic National Wildlife Refuge and adjacent areas, northeastern Alaska, in *The Oil and Gas Resource Potential of the 1002 Area, Arctic National Wildlife Refuge, Alaska*: ANWR Assessment Team, U.S. Geological Survey Open-File Report 98-34, 19 p.
- Phillips, J.D., Hansen, R.O., and Blakely, R.J., 2007, The use of curvature in potential-field interpretation: *Exploration Geophysics*, v. 38, no. 2, p. 111–119.
- Pollack, H.N., 2003, *Uncertain Science ... Uncertain World*: Cambridge, UK, Cambridge University Press, 243 p.
- Rankey, E.C., and Mitchell, J.C., 2003, That’s why it’s called interpretation—Impact of horizon uncertainty on seismic attribute analysis: *The Leading Edge*, v. 22, p. 820–828.
- Reid, A.B., Allsop, J.M., Granser, H., Millett, A.J., and Somerton, I.W., 1990, Magnetic interpretation in three dimensions using Euler deconvolution: *Geophysics*, v. 55, no. 1, p. 80–91.
- Salem, A., Williams, S., Fairhead, D., Smith, R., and Ravat, D., 2008, Interpretation of magnetic data using tilt-angle derivatives: *Geophysics*, v. 73, no. 1, p. L1–L10.
- Saltus, R.W., 2007, Matching magnetic trends and patterns across the Tintina fault, Alaska and Canada—Evidence for offset of about 490 kilometers, in Gough, L.P., and Day, W.C., eds, *Recent U.S. Geological Survey Studies in the Tintina Gold Province, Alaska, United States, and Yukon, Canada—Results of a 5-Year Project*: U.S. Geological Survey Scientific Investigations Report 2007-5289-C, 7 p., <http://pubs.usgs.gov/sir/2007/5289/SIR2007-5289-C.pdf> (last accessed 17 Oct. 2011).
- Saltus, R.W., and Jachens, R.C., 1995, Gravity and basin depth maps of the Basin and Range Province, western United States: U.S. Geological Survey Geophysical Investigations Map GP-1012, scale 1:2,500,000.
- Saltus, R.W., Hudson, T.L., Karl, S.M., and Morin, R.L., 2001, Rooted Brooks Range ophiolite; Implications for Cordilleran terranes: *Geology*, v. 29,

no. 11, p. 1151–1154, plus data repository item 20011131, Physical property data and geophysical models: <http://www.geosociety.org/pubs/ft2001.htm> (last accessed 17 Oct. 2011).

Sleep, N.H., and Fujita, K., 1997, *Principles of Geophysics*: Malden, Massachusetts, Blackwell Science, 586 p.

Smith, R.A., 1959, Some depth formulae for local magnetic and gravity anomalies: *Geophysical Prospecting*, v. 7, no. 1, p. 55–63.

Smith, R.A., 1961, A uniqueness theorem concerning gravity fields: *Proceedings of the Cambridge Philosophical Society*, v. 57, p. 865–870.

Thompson, G.A., and Robinson, R., 1975, Gravity and magnetic investigation of the Twin Sisters Dunite, Northern Washington: *GSA Bulletin*, v. 10, p. 1413–1422.

Turcotte, D.L., and Schubert, G., 2002, *Geodynamics* (second edition): Cambridge, UK, Cambridge University Press, 456 p.

Vine, F.J., 1966, Spreading of the ocean floor—New Evidence: *Science*, v. 154, no. 3755, p. 1405–1415.

Vine, F.J., and Matthews, D.H., 1963, Magnetic anomalies over oceanic ridges: *Nature*, v. 199, no. 4897, p. 947–949.

Werdon, M.B., Newberry, R.J., Athey, J.E., and Szumigala, D.J., 2004, Bedrock geologic map of the Salcha river—Pogo area, Big Delta quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys, Report of Investigations 2004-1b, 28 p.

Manuscript received 18 Aug. 2011; accepted 3 Oct. 2011.



Get published in 2012!

Call for papers: **GSA TODAY**

Publish your hot-topic science to a wide readership* with **free color, no page charges, and open access online**. Upload your article via the *GSA Today* online manuscript tracking system at www.geosociety.org/pubs/gsatguid.htm.

Did you know? The latest report from **SCImago Journal & Country Rank** (www.scimagojr.com/journalrank.php?category=1907) shows that for 2010, *GSA Today* was the third most influential geology journal in the world in terms of how many times its articles were cited in other journals (*Geology* is still no. 1).

**GSA Today* is distributed to more than 24,000 readers and is available online from 1995 through today.



THE GEOLOGICAL SOCIETY
OF AMERICA®

get the inside knowledge

Stable & Cosmogenic Isotope science

Isotopes are the key to knowledge about our past, present and our future. Our isotope analysis services can help you unlock the answers to ecological, geological and environmental history.

We provide carbon, nitrogen, sulphur, oxygen and hydrogen stable isotope analysis, ^{10}Be , ^{26}Al , ^{137}Cs and ^{210}Pb dating, and offer **discounts** for volume submissions.

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

Contact Us

To know more about benefitting from the expertise of the GNS Science Stable Isotope Laboratory and Rafter Radiocarbon Laboratory please visit

www.gns.cri.nz/nic/stableisotopes

www.rafterradiocarbon.co.nz

or Email us at:

stableisotopes@gns.cri.nz

radiocarbon@gns.cri.nz

unlock a moment in time

Rafter Radiocarbon dating services

When you seek knowledge of “a moment in time” Rafter Radiocarbon can provide the answers. We offer world-leading research scientists whose research spans climate, environmental protection and sustainability, archaeology, and geology, supported by expert technicians and modern equipment including a **new AMS**. We have worked with clients world-wide for over 50 years and we are a regular participant in the International Radiocarbon Intercomparisons.

Contact us for a **FREE** consultation on applicability and sampling.

Location

National Isotope Centre
30 Gracefield Road
Lower Hutt 5010
PO Box 31312
Lower Hutt 5040
New Zealand
T +64-4-570 1444
F +64-4-570 4657



2012 Birdsall-Dreiss Distinguished Lecturer



James S. Famiglietti

James S. Famiglietti holds a joint faculty appointment in earth system science and civil and environmental engineering at the University of California, Irvine (UCI), where he is the Founding Director of the UC Center for Hydrologic Modeling. His research group uses satellite remote sensing to track water availability and groundwater depletion on land, and it

has been working for many years toward improving hydrological prediction in regional and global weather and climate models. Famiglietti and his research group have published over 80 papers in the peer-reviewed literature.

Before joining the faculty at UCI in 2001, Famiglietti was an assistant and associate professor in the Dept. of Geological Sciences at The University of Texas at Austin, and was the Founding Associate Director of the UT Environmental Science Institute. He is the past Chair of the Board of the Consortium of Universities for the Advancement of Hydrologic Science Inc. (CUAHSI) and past Editor-in-Chief of *Geophysical Research Letters*. He is currently leading the Community Hydrologic Modeling Platform (CHyMP) effort in the United States to accelerate the development of hydrological models for use in addressing international priorities related to water, food, economic, climate, and global security. Famiglietti has testified before Congress on his recent work on groundwater depletion in California, which was featured in the *New York Times*. Famiglietti appears in the upcoming documentary on water scarcity called *Last Call at the Oasis*, in which he discusses much of the research that he will present in his two Birdsall-Dreiss lectures.

Interested institutions should contact Famiglietti at jfamigli@uci.edu to schedule a lecture on one of the following topics:

1. **Water Cycle Change and the Human Fingerprint on the Water Landscape of the 21st Century: Observations from a Decade of GRACE**

Over the last decade, satellite observations of Earth's water cycle from NASA's GRACE (Gravity Recovery and Climate Experiment) mission have provided an unprecedented view of global hydrological change and freshwater availability. Since its launch, the mission has helped to confirm that precipitation, evaporation, and continental discharge rates are increasing, that the mid-latitudes are drying while the high and low latitudes are moistening, and that the hydrologic extremes of flooding and drought are becoming even more extreme. Importantly, GRACE has exposed the human fingerprint of water management practices such as groundwater use and reservoir storage, which raises many important issues for climate, water, food, and economic security. Moreover, the GRACE mission has enabled us to peer beneath Earth's surface and characterize the worldwide depletion of groundwater aquifers, raising significant concerns about the potential for heightened conflict over trans-boundary water resources. In this talk, Famiglietti will review the basics of how the GRACE mission observes terrestrial and global hydrology, what new information the mission has provided since its launch in 2002, and the implications for the future of water availability and sustainable water resources management.

2. **A Strategy for Accelerating the Development of Hydrological Models: Societal Needs, Observational Requirements and Public Communication**

While the development of hydrological and land surface models has progressed rapidly over the past few decades, a significant acceleration in model development is required in order to address critical societal issues of water, energy, and food availability and security. In particular, major advances are needed in the areas of observations (e.g., of water cycle variability and change, of subsurface soils and hydrogeology, and of stream-flow and groundwater levels), model development (e.g., of models that integrate the major components of the human and managed water cycles), data assimilation (e.g., of algorithms that can readily incorporate *in situ* and remote observations of asynchronous space-time frequency), and of a framework for integrating models and data (e.g., for access to data and simulation results, for running models, and for performing analyses). In this presentation, Famiglietti will discuss these needs in detail, as well as highlight recent efforts in California and at the national scale (i.e., with the Community Hydrologic Modeling Platform [CHyMP]) to develop a modeling and data integration framework that can be applied across scales up to continental and global scales. Finally, the responsibility of the hydrologic research community to convey such important observational and simulation needs to resource managers, environmental decision and policy makers, and the general public, is underscored.



Recent, Rare, And Out-Of-Print Books



geoscience, paleontology, mineralogy, mining history,
ore deposits, USGS and USBM publications, petroleum,
Trails illustrated and National Forest Service Maps

<http://booksgeology.com>

msbooks@booksgeology.com

WE PURCHASE BOOKS AND ENTIRE COLLECTIONS

MS Book and Mineral Company
P.O. Box 6774, Lake Charles, LA 70606-6774 USA.

UPCOMING AWARD, RECOGNITION & GRANT DEADLINES



For details on the following awards and grants, see the October *GSA Today* or go to www.geosociety.org/awards/nominations.htm.

Information and nomination forms can also be obtained from GSA Grants, Awards, and Recognition, P.O. Box 9140, 3300 Penrose Place, Boulder, CO 80301-9140, USA, +1-303-357-1028, awards@geosociety.org.

2012 GSA MEDALS AND AWARDS

Nomination deadline: 1 Feb. 2012

- Penrose Medal
- Day Medal
- Young Scientist Award (Donath Medal)
- GSA Public Service Award
- The Bromery Award for the Minorities
- GSA Distinguished Service Award
- Subaru Outstanding Woman in Science Award



GSA FELLOWSHIP

Nomination deadline: 1 Feb. 2012

Elevation to GSA Fellowship is an honor bestowed on the best of our profession at each spring GSA Council meeting. **GSA Fellows** may support two nominees each year but only one as a primary nominator. **GSA members** who are not Fellows may be secondary nominators for up to two nominees.



AGI MEDAL IN MEMORY OF IAN CAMPBELL

Nomination deadline: 1 Feb. 2012

The AGI Medal in Memory of Ian Campbell recognizes singular performance in and contributions to the profession of geology. To submit a nomination, go to www.agiweb.org/direct/awards.html.



AGI MARCUS MILLING LEGENDARY GEOSCIENTIST MEDAL

Nomination deadline: 1 Feb. 2012

This award recognizes consistent, high-quality scientific achievements and service to the Earth sciences of lasting, historic

value. The recipient should be a senior scientist nearing completion or having completed full-time regular employment who has been recognized for accomplishments in his or her field(s) of expertise by professional societies, universities, or other organizations. To submit a nomination, go to www.agiweb.org/direct/awards.html.



2012 POST-DOCTORAL RESEARCH AWARDS

Application deadline: 1 Feb. 2012

The following post-doctoral research awards are managed by the GSA Foundation. Learn more at www.geosociety.org/grants/postdoc.htm.

- The **Gladys W. Cole Memorial Research Award** for research on the geomorphology of semiarid and arid terrains in the United States and Mexico is awarded annually to a GSA member or Fellow between 30 and 65 years of age who has published one or more significant papers on geomorphology.
- The **W. Storrs Cole Memorial Research Award** for research on invertebrate micropaleontology is awarded annually to a GSA member or Fellow between 30 and 65 years of age who has published one or more significant papers on micropaleontology.



JOHN C. FRYE ENVIRONMENTAL GEOLOGY AWARD

Nomination deadline: 31 Mar. 2012

In cooperation with the Association of American State Geologists and supported by endowment income from the GSA Foundation's John C. Frye Memorial Fund, GSA makes an annual award for the best paper on environmental geology published either by GSA or by a state geological survey.



34th International Geological Congress (IGC)

**Brisbane, Australia
5–10 August 2012**

The Geological Society of America is accepting applications for the 34th IGC Students and Early Career Scientists Travel Grant and Mentoring Program. This program is organized in collaboration with the U.S. National Committee for Geological Sciences (National Academy of Sciences). To be eligible, applicants must be U.S. residents or citizens and be enrolled in or employed at a U.S. institution. Early career scientists are defined as those within seven years of receiving their Ph.D. Each award is anticipated to be a maximum of US\$3,000.

Applications open 12 Dec. at www.geosociety.org/grants/travel.htm. In addition to the online form, the following supplemental information is required: a cover letter addressing reasons for attending the meeting and a prioritized budget of expenses; proof of abstract submission and a copy of the submitted abstract; and two letters of reference.

The online application and supplemental material must be received electronically no later than **17 Feb. 2012**. Applicants will be notified of the results by 15 Apr. 2012.

Questions?

Please contact Jennifer Nocerino,
jnocerino@geosociety.org.

Penrose Conference and 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 information.

QUESTIONS?

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



2012 Student Research Grants

GSA is proud to offer research grants to its highly qualified student members. Students must be GSA members to apply and may only receive a grant once at the master's level and once at the Ph.D. level. Those who have applied for grant funding but have not received a grant are welcome to apply again. **The maximum award per grant is US\$2,500.**

The GSA student research grant application process is available online only; no paper applications or letters will be accepted. Apply at www.geosociety.org/grants/gradgrants.htm starting late November 2011. Online submission must be completed by Wed., 1 Feb. 2012, at 11:59 p.m. MST.

www.geosociety.org/grants/gradgrants.htm

+1-303-357-1028

awards@geosociety.org



**find your
SCIENCE
at GSA**

▶▶ 2012 Section Meeting Mentor Programs ◀◀

Plan now to attend a Shlemon and/or a Mann Mentor luncheon at your 2012 Section Meeting to chat one-on-one with professional geoscientists. These volunteers will answer your questions and share insights on how to get a job after graduation.

Lunches served at these events are FREE. Students will receive lunch tickets with their registration badge. These events are very popular, and space is limited, so try to arrive early to ensure your participation.

The **John Mann Mentors in Applied Hydrogeology Program** is designed to acquaint undergraduate, graduate, and recent graduate students with careers in applied hydrogeology through mentoring opportunities with practicing professionals. The **Roy J. Shlemon Mentor Program in Applied Geoscience** is designed to acquaint advanced undergraduate and beginning graduate students with careers in applied geoscience. For further information, contact Jennifer Nocerino at jnocerino@geosociety.org.



SOUTH-CENTRAL SECTION MEETING

7–9 March • Alpine, Texas, USA

Shlemon Mentors Luncheon: Thurs., 8 March

Mann Mentors Luncheon: Fri., 9 March

Big Bend, Alpine, Texas. Photo courtesy USGS.



NORTHEASTERN SECTION MEETING

18–20 March • Hartford, Connecticut, USA

Shlemon Mentors Luncheons: Sun. & Mon., 18 & 19 March

Mann Mentors Luncheon: Tues., 20 March

Boudins in metaigneous rocks, Tolland, Connecticut; photo by Tim Byrne.

CORDILLERAN SECTION MEETING

29–31 March • Querétaro, México

Shlemon Mentors Luncheon: Thurs., 29 March

Mann Mentors Luncheon: Fri., 30 March

Spectacular skies over Querétaro, México. Photo by Michelangelo Martini.



SOUTHEASTERN SECTION MEETING

1–2 April • Asheville, North Carolina, USA

Shlemon Mentors Luncheon: Sun., 1 April

Mann Mentors Luncheon: Mon., 2 April

Looking Glass Rock. Photo courtesy Blair Tormey.



NORTH-CENTRAL SECTION MEETING

23–24 April • Dayton, Ohio, USA

Shlemon Mentors Luncheon: Mon., 23 April

Mann Mentors Luncheon: Tues., 24 April

Wright Flyer with crowd. Photo courtesy Dayton Montgomery County and Visitors Bureau.



ROCKY MOUNTAIN SECTION MEETING

9–11 May • Albuquerque, New Mexico, USA

Shlemon Mentors Luncheon: Thurs., 10 May

Mann Mentors Luncheon: Fri., 11 May

Petroglyph National Monument. Credit: Petroglyph National Monument.

▶▶ STUDENTS—*Mark Your Calendars!* ◀◀

GSA DIVISION AWARDS

•••••

Coal Geology Division

Award: Gilbert H. Cady Award

Nominations due 1 March 2012

Submit three copies of the following to Jack C. Pashin, Energy Investigations Program, Geological Survey of Alabama, P.O. Box 869999, Tuscaloosa, AL 35486-6999; jpashin@gsa.state.al.us: (1) name, office or title, and affiliation of the nominee; (2) date and place of birth; (3) education, degree(s), honors, and awards; (4) major events in his or her professional career; and (5) a brief bibliography noting outstanding achievements and accomplishments that warrant nomination.

The Gilbert H. Cady Award is given for outstanding contributions in the field of coal geology. The first award, established by the Division in honor of Gilbert H. Cady, was presented in 1973. The award recognizes contributions that advance the field of coal geology within and outside North America. Monies for the award are derived from the annual interest income of the Gilbert H. Cady Memorial Fund, administered by the GSA Foundation.

•••••

Geophysics Division

Award: George P. Woollard Award

Nominations due 15 February 2012

Submit online at http://gsageop.org/index.php?option=com_content&view=article&id=49:gsa-geophysics-division-george-p-woollard-award&catid=34:awards&Itemid=58. Nominations should include a description of the nominee's specific contributions and their scientific impact.

The George P. Woollard Award recognizes outstanding contributions to geology through the application of the principles and techniques of geophysics. A highlight of the presentation is the honorary George P. Woollard Technical Lecture by the recipient before the award ceremony. Award funds are administered by the GSA Foundation.

•••••

Geoscience Education Division

Award: Biggs Award for Excellence
in Earth Science Teaching

Nominations due 1 February 2012

Submit nominations and supplemental materials (see <http://gsaged.org/biggsaward/award2012.htm>) to Elizabeth A. Heise, elizabeth.heise@utb.edu.

The Biggs Award recognizes innovative and effective teaching in college-level earth science. Earth-science instructors and faculty from any academic institution engaged in undergraduate

education who have been teaching full time for 10 years or fewer are eligible (part-time teaching is not counted in this requirement). Both peer and self-nominations will be accepted.

This award, administered by the GSA Foundation, is made possible by the Donald and Carolyn Biggs Fund, the GSA Geoscience Education Division, and GSA's Education & Outreach program. An additional travel reimbursement is also available to enable the recipient to attend the award presentation at the GSA Annual Meeting.

•••••

History and Philosophy of Geology Division

Award: Mary C. Rabbitt

History and Philosophy of Geology Award

Nominations due 1 February 2012

Submit nominations to Jane P. Davidson, University of Nevada, Reno, NV 89557-0001, USA; +1-775-747-2252; jldhexen@unr.edu.

The Mary C. Rabbitt History and Philosophy of Geology Award is presented annually to recognize an individual for exceptional scholarly contributions of fundamental importance to our understanding of the history of the geological sciences. Achievements deserving of the award include, but may not be limited to, publication of papers or books that contribute new and profound insights into the history of geology based on original research or a synthesis of existing knowledge. The award was established by the History of Geology Division in 1981 and renamed in memory of Mary C. Rabbitt in 2005. For more information, please see <http://gsahist.org/HoGaward/awards.htm>. Neither the nominator nor the nominee need be a member of the Division or of GSA. Monies for the award are administered by the GSA Foundation.

•••••

Quaternary Geology and Geomorphology Division

Award: Farouk El-Baz Award
for Desert Research

Nominations due 2 April 2012

Submit nominations, including (1) a statement of the significance of the nominee's research, (2) a curriculum vitae, (3) letters of support, and (4) copies of no more than five of the nominee's most significant publications related to desert research to Jim O'Connor, U.S. Geological Survey, 2130 SW 5th Ave., Portland, OR 97201, USA; oconnor@usgs.gov. Please submit electronically unless hardcopy previously approved.

The Farouk El-Baz Award for Desert Research rewards excellence in desert geomorphology research worldwide. It is intended to stimulate research in desert environments by recognizing an individual whose research has significantly advanced the

understanding of the Quaternary geology and geomorphology of deserts. Although the award primarily recognizes achievement in desert research, the funds that accompany it may be used for further research. The award is normally given to one person but may be shared by two people if the recognized research was the result of a coequal partnership. Any scientist from any country may be nominated. Because the award recognizes research excellence, self-nomination is not permitted. Neither nominators nor nominees need be GSA Members. Monies for the award are derived from the annual interest income of the Farouk El-Baz Fund, administered by the GSA Foundation.

.....
Sedimentary Geology Division

Award: Laurence L. Sloss Award
 for Sedimentary Geology

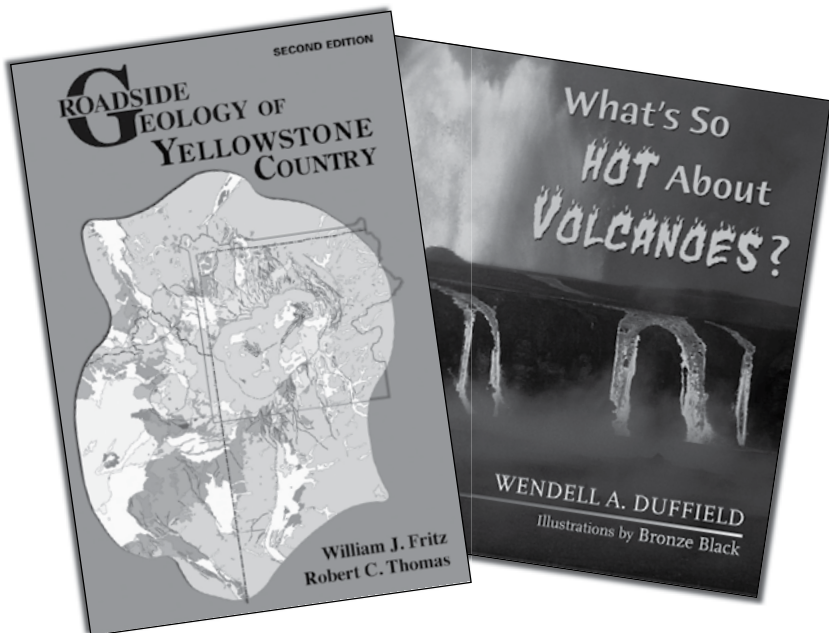
Nominations due 20 February 2012

Submit (1) a cover letter describing the nominee's accomplishments in sedimentary geology and contributions to GSA and (2) a curriculum vitae electronically to Paul Link, secretary, Sedimentary Geology Division, linkpaul@isu.edu.

The Laurence L. Sloss Award for Sedimentary Geology is given annually to a sedimentary geologist whose lifetime achievements best exemplify those of Larry Sloss—i.e., achievements that contribute widely to the field of sedimentary geology and service to GSA. Monies for the award are derived from the annual interest income of the Laurence L. Sloss Award for Sedimentary Geology Fund, administered by the GSA Foundation.



Look What's Hot at Mountain Press!



**ROADSIDE
 GEOLOGY**

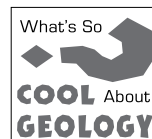
of Yellowstone Country

William J. Fritz

Robert C. Thomas

Explore the broad and deep geologic story that is Yellowstone.

328 pages • 6x9 • paper, \$24.00
 Over 200 color photos and illustrations



**What's So Hot
 About Volcanoes?**
Wendell A. Duffield

Readers from age 14 to adult will enjoy learning about the creative forces of volcanoes.

96 pages • 9 x 8⁵/₈ • paper, \$16.00
 Full color throughout

MP Mountain Press
 PUBLISHING COMPANY

P.O. Box 2399 • Missoula, MT 59806 • 406-728-1900
 800-234-5308 • info@mtnpres.com
 www.mountain-press.com

ROCKY MOUNTAIN

64th Annual Meeting of the Rocky Mountain
Section, GSA

Albuquerque, New Mexico, USA

9–11 May 2012

www.geosociety.org/Sections/rm/2012mtg/



The Rio Grande in autumn. Credit: MarbleStreetStudio.com.

Rio GeoFiesta!

LOCATION

Albuquerque is situated along the Rio Grande, near the juncture of five physiographic provinces: the southern Rocky Mountains, the Great Plains, the Colorado Plateau, the Rio Grande Rift, and the Basin and Range. The meeting venue, Hotel Albuquerque, is a unique blend of Native American, Mexican, Spanish, and Western cultural traditions situated in historic Old Town.

CALL FOR PAPERS

Abstract deadline: 14 Feb. 2012

Submit abstracts at www.geosociety.org/sections/rm/2012mtg/

Abstract submission fee: US\$10 for students; US\$15 for all others

If you cannot submit an abstract online, please contact Linda Battan, +1-303-357-1018, lbattan@geosociety.org.

THEME SESSIONS

1. **Geoscience Education: Current Practice and Research.** Steve Semken, Arizona State Univ.; Matt Nyman, Univ. of New Mexico.

2. **Undergraduate Research in the Rocky Mountains (Posters).** David Mogk, Montana State Univ.; Darrell Henry, Louisiana State Univ.; Paul Mueller, Univ. of Florida; David Foster, Univ. of Florida.
3. **Geologic Mapping in the Digital Era: Integrating Research, Modern Mapping Techniques and Map Products (Posters).** Mike Timmons, New Mexico Bureau of Geology and Mineral Resources.
4. **Water Quality and Biogeochemistry Before and After the Los Conchas Fire, Jemez Mountains, New Mexico.** Cliff Dahm, Univ. of New Mexico; Jon Chorover, Univ. of Arizona.
5. **Arsenic, Uranium, and Radionuclides: Geology and Health Impacts in the Southwest and Rocky Mountains.** Malcolm Siegel, Sandia Laboratories.
6. **Hydrogeology of the Sierra Blanca, Sacramento Mountains, and Tularosa Basin, New Mexico.** Geoffry Rawling, New Mexico Bureau of Geology and Mineral Resources; Mike Darr, USGS New Mexico Water Science Center.
7. **Surface to Groundwater Interactions in New Mexico and Southern Colorado.** Mark Person and Emily Woolsey, New Mexico Institute of Technology.
8. **Multidisciplinary Studies of the Rio Grande Rift: Basins, Volcanism, Geophysics, and Hydrogeology.** S.D. Connell, New Mexico Bureau of Geology and Mineral Resources; D.J. Koning, New Mexico Bureau of Geology and Mineral Resources; V.J.S. Grauch, U.S. Geological Survey.
9. **Cenozoic Landscape Evolution in the Rocky Mountains and Colorado Plateau: Deciphering the Interplay between Mantle Buoyancy and Surface Processes.** Eric Kirby, Pennsylvania State Univ.; Andres Aslan, Colorado Mesa Univ.
10. **Deep Lithospheric Structure of the Rocky Mountain Region.** Rick Aster, New Mexico Institute of Technology; Jolante van Wijk, Univ. of Houston.
11. **Advances in Our Understanding of Paleogene Climate and Vegetative Change in the North American Mid-Continent and Rocky Mountain Region.** Grant Boardman, Univ. of Nebraska; William Lukens, Temple Univ.
12. **Basin-Scale Sedimentology and Stratigraphy of Continental Strata in the Rocky Mountain Region.** Gary Weissmann, Univ. of New Mexico; Kate Zeigler, New Mexico Highlands Univ.; Kevin Hobbs, Univ. of New Mexico.
13. **Detrital Zircons Studies in the Western Interior U.S. and Their Implications for Ancient Landscape Evolution.** Carol Dehler, Utah State Univ.; Mark Pecha, Univ. of Arizona; Timothy Lawton, New Mexico State Univ.
14. **From the Archean to the Eocene and from the Surface to the Mantle: New Perspectives on Laramide Orogenesis in the Rocky Mountain Region.** Jeff Bader, AECOM Technology Corp.

2012



15. **Exploring Stratigraphic, Geochemical, and Paleobiologic Records in Phanerozoic Marine Systems of the Rocky Mountain Region.** Maya Elrick, Univ. of New Mexico.
16. **Paleoproterozoic Orogeny and Mesoproterozoic Enigmas: Constraints on the Formation, Assembly, and Evolution of the Precambrian Rocks in the Rockies.** Chris Andronicos, Cornell Univ.; Chris Daniel, Bucknell Univ.

Field Trips

1. **Sedimentation, Tectonics, and Landscape Evolution of the Albuquerque and Española Basins.** Sun.–Tues., 6–8 May. Three days; departs 7:30 a.m. Sun.; returns 3 p.m. Tues. Max.: 30. Sean Connell, Dan Koning, New Mexico Bureau of Geology and Mineral Resources; Jason Ricketts, Univ. of New Mexico.
2. **Geology of Mount Taylor, a Large Composite Volcano, West-Central New Mexico.** Mon.–Tues., 7–8 May. Two days; departs 8 a.m. Mon; returns 6 p.m. Tues. Max.: 30. Larry Crumpler, New Mexico Museum of Natural History and Science; Fraser Goff, Univ. of New Mexico.
3. **Water Quality, Hydrology, and Biogeochemistry of the Valles Caldera.** Tues., 8 May. One day; departs 7:30 a.m.; returns 4:30 p.m. Max.: 30. Cliff Dahm and Lauren Sherson, Univ. of New Mexico; Robert Parmenter, Valles Caldera National Preserve.
4. **A Midcrustal Transect across the Yavapai-Mazatzal Transition Zone: Investigating the Timing and Nature of Paleoproterozoic-Mesoproterozoic Sedimentation, Deformation, and Regional Metamorphism in North-Central New Mexico.** Fri.–Mon., 11–14 May. Three days; departs 5:30 p.m. Fri.; returns 5 p.m. Mon. Max.: 45. Christopher Daniel, Bucknell Univ.; Karl Karlstrom, Univ. of New Mexico; Lincoln Hollister, Princeton Univ.
5. **Shatter Cones and Possible Impact Breccias Associated with the Santa Fe Impact Structure.** Sat., 12 May. One day; departs 7:45 a.m.; returns 6 p.m. Max.: 24. Shawn Wright and Horton Newsom, Univ. of New Mexico; Tim McElvain.
6. **Volcanic, Structural, and Geothermal Evolution of the Valles Caldera.** Sat.–Sun., 12–13 May. Two days; departs 8 a.m.; returns 6 p.m. Max.: 40. Fraser Goff, Univ. of New Mexico; Jamie Gardner, Consultant.
7. **Albuquerque Volcanoes: A Fissure-Type Eruption at the Center of the Rio Grande Rift.** Sat., 12 May. Half-day; departs 8:30 a.m.; returns 1:30 p.m. Max.: 22. Jayne Aubele and Larry Crumpler, New Mexico Museum of Natural History and Science.

Proposed Workshops

1. **Facilitating Classroom Innovation in the Geosciences: The TUES and Other NSF Educational Funding Programs and Strategies for Successful TUES Proposals.** Jeff Ryan, University of South Florida; Jill Singer, Buffalo State College.
2. **Active Learning Strategies for Geoscience Teaching.** Steven Semken, Arizona State University.

REGISTRATION

Early registration deadline: 9 April 2012

Cancellation deadline: 16 April 2012

Registration opens in March 2012. For further information or if you need special accommodations, please contact the general chair, Laura Crossey, at lcrossey@unm.edu.

ACCOMMODATIONS

Hotel registration deadline: 16 April 2012

A block of rooms has been reserved at Hotel Albuquerque at Old Town, located at 800 Rio Grande Blvd. NW, Albuquerque, NM 87104, USA. The meeting rate is US\$129 per night plus tax.

**SOUTH-CENTRAL
7–9 March 2012**
Alpine, Texas, USA
Local Committee Chair: Kevin Urbanczyk
Abstracts deadline: 6 Dec. 2011
Early reg. deadline: 6 Feb. 2012

**NORTHEASTERN
18–20 March 2012**
Hartford, Connecticut, USA
Local Committee Chair: Jean Crespi
Abstracts deadline: 13 Dec. 2011
Early reg. deadline: 13 Feb. 2012

**CORDILLERAN
29–31 March 2012**
Querétaro, Mexico
Local Committee Chair: Luca Ferrari
Abstracts deadline: 10 Jan. 2012
Early reg. deadline: 27 Feb. 2012

**SOUTHEASTERN
1–2 April 2012**
Asheville, North Carolina, USA
Local Committee Co-Chairs: Blair Tormey;
Cheryl Waters-Tormey
Abstracts deadline: 17 Jan. 2012
Early reg. deadline: 27 Feb. 2012

**NORTH-CENTRAL
23–24 April 2012**
Dayton, Ohio, USA
Local Committee Chair:
Charles Ciampaglio
Abstracts deadline: 24 Jan. 2012
Early reg. deadline: 19 Mar. 2012

**ROCKY MOUNTAIN
9–11 May 2012**
Albuquerque, New Mexico, USA
Local Committee Chair: Laura Crossey
Abstracts deadline: 14 Feb. 2012
Early reg. deadline: 9 Apr. 2012

GSA Section Meeting Schedule

THE GEOLOGICAL SOCIETY

24,000+ Members from 97 Countries • 17 Geoscience Divisions

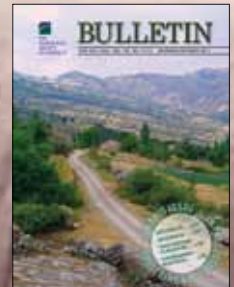
Renew your Membership for 2012

- Journal Subscriptions
- Division Memberships
- Section Affiliations
- GSA Foundation Support



Indulge your Professional Interests Join GSA Divisions

Archaeological Geology	History and Philosophy of Geology
Coal Geology	Hydrogeology
Environmental and Engineering Geology	Limnogeology
Geobiology & Geomicrobiology	Mineralogy, Geochemistry, Petrology, and Volcanology
Geoinformatics	Planetary Geology
Geology and Health	Quaternary Geology & Geomorphology
Geology and Society	Sedimentary Geology
Geophysics	Structural Geology & Tectonics
Geoscience Education	



Where geology and people come together



THE GEOLOGICAL SOCIETY
OF AMERICA®

SOCIETY OF AMERICA

7 Regional Sections • 59 Associated Societies



Student, Recent Grads, and K-12 Teacher Extras

The GSA Membership Advantage

- **Premier Journals**
Geology, GSA Bulletin, Lithosphere, Geosphere
- **Scientific Exchange**—
GSA meetings and
17 Geoscience Divisions
- **Publish and Present
Research**
- **Public Policy Updates**
- **Member-Only Discounts**
GSA Meetings, Journals,
Online Bookstore
- **FREE Online Access
to Journals**
(more than US\$190 annual value)
- **Research Funding**
(geographic restrictions may apply)
- **Mentor Programs and
Employment Contacts**



www.geosociety.org/members/

NORTHEASTERN

47th Annual Meeting of the Northeastern Section, GSA
Hartford, Connecticut, USA
18–20 March 2012

www.geosociety.org/Sections/ne/2012mtg/



Hartford riverfront. Photo courtesy of the Greater Hartford Convention & Visitors Bureau.

200 Years of Geology in the Northeast

REGISTRATION

Early registration deadline: 13 Feb. 2012

Cancellation deadline: 21 Feb. 2012

Register at www.geosociety.org/Sections/ne/2012mtg/.

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

	Early		Standard	
	Full Mtg.	One Day	Full Mtg.	One Day
Professional Member	\$170	\$120	\$200	\$140
Professional Member 70+	\$100	\$80	\$130	\$100
Professional Nonmember	\$190	\$140	\$220	\$170
Student Member	\$55	\$45	\$75	\$65
Student Nonmember	\$65	\$55	\$85	\$75
K–12 Professional	\$65	\$50	\$75	\$60
Guest or Spouse	\$40	\$30	\$40	\$30
Field Trip/Workshop Only	N/A	\$30	N/A	\$30

ACCOMMODATIONS

Hotel reservation deadline: 24 Feb. 2012

The NE-GSA meeting rate at the **Hartford Marriott Downtown** (200 Columbus Blvd., Hartford, CT 06103, USA) is \$129 per night plus tax (incl. free Wi-Fi). The following reservation website and phone numbers are dedicated to the NE-GSA meeting: https://resweb.passkey.com/Resweb.do?mode=welcome_ei_new&eventID=3421743; +1-800-266-9432; +1-506-474-2009 (local). Reservations made via the hotel website or direct phone number will not fall under the NE-GSA room block discount.

TECHNICAL PROGRAM

Abstracts deadline: 13 Dec. 2011; for more information, go to www.geosociety.org/Sections/ne/2012mtg/techprog.htm.

Symposia

- Modern and Ancient Orogenic Belts.** Tim Byrne, Univ. of Connecticut; Yu-Chang Chan, Academia Sinica; Clark Burchfiel, MIT.
- New Advances in the Stratigraphic Record and Chronology of Pleistocene Glacial/Interglacial Events in the Southeastern Laurentide Ice Sheet Region.** Byron D. Stone, USGS; Janet R. Stone, USGS.
- The CAMP Province: Compositional Variation, Sources, and Environmental Effects.** Johan (Joop) C. Varekamp, Wesleyan Univ.; Anthony R. Philpotts, Univ. of Connecticut; Paul E. Olsen, Columbia Univ.

Theme Sessions

- Future Directions in Appalachian Tectonics: Building on Recent Lithotectonic Syntheses.** Sandra M. Barr, Acadia Univ.; James P. Hibbard, North Carolina State Univ.; Margaret D. Thompson, Wellesley College.
- High-Strain Zone Kinematics, From the Microscopic to the Macroscopic Scale.** Yvette Kuiper, Colorado School of Mines; Scott Giorgis, SUNY Geneseo.
- Modeling Deformation from the Micro to the Macro.** Phil Resor, Wesleyan Univ.; Michele Cooke, Univ. of Massachusetts.
- The Legacy of Humans and Glaciation in Northeastern Rivers.** Will Ouimet, Univ. of Connecticut; Denise Burchsted, Univ. of Connecticut; Jon Woodruff, Univ. of Massachusetts.
- Using Ground-Penetrating Radar to Analyze Geomorphic and Sedimentary Records of Environmental Change.** James A. Hyatt, Eastern Connecticut State Univ.; Peter A. Drzewiecki, Eastern Connecticut State Univ.
- State and Fate of Urban Watersheds in the Northeast.** Jonathan R. Gourley, Trinity College; Suzanne O'Connell, Wesleyan Univ.
- Environmental Impact of Historical Landfills.** Rudolph Hon, Boston College; William C. Brandon, USEPA; Marcel Belaval, USEPA.

8. **Human Impacts on Estuaries.** Vincent T. Breslin, Southern Connecticut State Univ.; Johan (Joop) C. Varekamp, Wesleyan Univ.
9. **Mercury Dynamics in Northeastern North America.** Johan (Joop) C. Varekamp, Wesleyan Univ.; Robert Mason, Univ. of Connecticut.
10. **Can the Fractured Bedrock Water Resource Be Sustained Given Trends in Rural Development?** Gary Robbins, Univ. of Connecticut.
11. **News from the Newark Supergroup.** *Cosponsored by Eastern Section SEPM.* Elizabeth Gierlowski-Kordesch, Ohio Univ.
12. **Where It All Began: Trace Fossil Research in Northeastern North America.** *Cosponsored by Eastern Section SEPM.* Patrick R. Getty, Univ. of Connecticut; Jacob S. Benner, Tufts Univ.
13. **Microbial Mats and Microbialites: From Ancient to Modern.** *Cosponsored by Eastern Section SEPM.* Kristen L. Myshrall, Univ. of Connecticut; Natalie J. Stork, Univ. of Connecticut.
14. **Mineralogy in Health Sciences: Sources to Applications.** Catherine Skinner, Yale Univ.; John A. Smoliga, Boehringer Ingelheim Pharmaceuticals Inc.
15. **Historical Perspectives—250 Years of Geology in the Northeast.** William R. Brice, Univ. of Pittsburgh; Sally Newcomb.
16. **Women in the Geosciences: Past, Present, and Future.** *Cosponsored by AWG.* Kristine Larsen, Central Connecticut State Univ.; Heidi Hoffower, Chevron Corp.
17. **Inquiry-Based Activities: Examples and Effectiveness.** *Cosponsored by NAGT.* Karen Kortz, Community College of Rhode Island; Ann Hadley, Manchester Community College.
18. **Technology Integration in K–16 Geoscience Education.** *Cosponsored by NAGT.* Christine Witkowski, Middlesex Community College; Dawn Cardace, Univ. of Rhode Island.
19. **Presenting Geoscience Digitally: For the Classroom, Workplace, and/or Outreach.** Stephen A. Nathan, Univ. of Massachusetts; Chris Condit, Univ. of Massachusetts.
20. **Geologic Hazards and Climate Change in the Northeast: Impacts and Opportunities.** *Cosponsored by Eastern Section SEPM.* Nicholas K. Coch, CUNY Queens College; Laurence R. Becker, Vermont Geological Survey.
21. **Energy Geoscience and Climate Change Issues in the Northeast.** Fred Loxsom, Eastern Connecticut State Univ.; Stephen A. Nathan, Univ. of Massachusetts.
22. **Geothermal Potential in the Northeast: A Quixotic Quest or Reality?** J. Michael Rhodes, Univ. of Massachusetts; Stephen B. Mabee, Office of the Massachusetts State Geologist.
23. **Seeing Through the Haze: Remote Sensing, Geophysical Investigations, Paleoseismology, and Neotectonics in Northeastern North America.** Robert J. Altamura, Consulting Geologist; John E. Ebel, Boston College.

FIELD TRIPS

All trips will take place on Saturday, 17 March. For more information, go to www.geosociety.org/Sections/ne/2012mtg/fieldTrips.htm.

1. **Were Early Jurassic Dinosaurs Gregarious? Reexamining the Evidence from Dinosaur Footprint Reservation in Holyoke, Massachusetts.** Cost: US\$80; includes transportation, lunch, and field guide. Patrick R. Getty, Univ. of Connecticut; Aaron I. Judge, Univ. of Massachusetts; Jayme Csonka, Univ. of Connecticut; Andrew Bush, Univ. of Connecticut.
2. **In the Footsteps of Dinosaurs: A Guided Tour of Dinosaur State Park for K–16 Educators.** *Cosponsored by NAGT.* Cost: US\$15; includes transportation, admission to Dinosaur State Park, and materials. Christine Witkowski, Middlesex Community College; Margaret Enkler, Dinosaur State Park; Karen Kortz, Community College of Rhode Island.
3. **The Hartford Basin from the Hanging Hills to the Sound.** Cost: US\$80; includes transportation, lunch, and field guide. Brian Skinner, Yale Univ.; Leo Hickey, Yale Univ.; Anthony R. Philpotts, Univ. of Connecticut; Jay Ague, Yale Univ.
4. **Tying the Tales of Two Basins: Relation of Temperature-Time Paths in the Bronson Hill Terrane to the Narragansett and Hartford Basins.** Cost: US\$80; includes transportation, lunch, and field guide. Robert P. Wintsch, Indiana Univ.; Mary K. Roden-Tice, SUNY Plattsburgh; Michael J. Kunk, USGS; John N. Aleinikoff, USGS.
5. **Unraveling Alleghanian Orogenesis in Southern Connecticut: The History of the Lyme Dome.** Cost: US\$80; includes transportation, lunch, and field guide. Gregory J. Walsh, USGS; John N. Aleinikoff, USGS; Robert P. Wintsch, Indiana Univ.
6. **The Geology of Walden Pond.** Cost: US\$80; includes transportation, lunch, and field guide. Robert Thorson, Univ. of Connecticut.

OPPORTUNITIES FOR STUDENTS

Mentor Luncheons: *Cosponsored by GSA Foundation.* Learn more at www.geosociety.org/mentors/ or contact Jennifer Nocerino, jnocerino@geosociety.org.

Sun. & Mon., 18 & 19 March: Roy J. Shlemon Mentor Program in Applied Geoscience. Students will have the opportunity to discuss career prospects and challenges with professional geoscientists from multiple disciplines over a FREE lunch.

Tues., 20 March: John Mann Mentors in Applied Hydrogeology Program. Students interested in applied hydrogeology or hydrology as a career will have the opportunity to network with professionals in these fields over a FREE lunch.

Travel Grants: www.geosociety.org/grants/negrant.htm (application deadline: 13 Feb. 2012).

Volunteer & Save on Registration: www.geosociety.org/sections/ne/2012mtg/students.htm.



Larry Meinert

Reflections on a Year with Congress

As previous GSA-USGS Congressional Science Fellows have stated, “This fellowship will be the best year of your life.” I can only agree, and my life has been longer than most fellows, at least at the time of appointment! As I have recounted in previous columns, my year as a Congressional Science Fellow has been a roller coaster of highs and lows, with the tragic shooting of my boss, Congresswoman Gabrielle Giffords, being a pivotal event. Although no one could have predicted nor wished for such a tragedy, the events of the year exposed me to many things that few inside or outside of Congress get to experience.

Overnight, I went from working for a very well-respected, but not widely known, Congresswoman to working for the most famous member of Congress and one whose name is instantly recognized throughout the United States and much of the world. From 8 Jan. 2011 on, I could not go to any meeting wearing my nametag (Office of Rep. Gabrielle Giffords) without the conversation immediately focusing on the events of that day and the aftermath. Conversations with people I had never met, not to mention friends and professional colleagues who knew of my deeper association with the Congresswoman, would come to a halt as people reflected on the meaning of that moment. Like the events of 9/11, the Apollo Moon landing, and the assassination of President Kennedy, the shooting of Representative Giffords changed people’s lives and the American political landscape.

I continued working in Rep. Giffords’ office for another four months, and much of my efforts centered on the emerging issue of rare earth elements (REE) and critical materials. The phrase “critical materials” describes non-fuel natural resources that are important to domestic industry and technology, but that may also be scarce or subject to supply restrictions. Critical materials include rare earth elements, rare metals, and other key materials for which there are no readily available substitutes. Criticality involves two factors: (1) the likelihood of a supply disruption, and (2) the consequences of a supply disruption.

What are REEs?

The REEs are a group of 17 elements in the periodic table of elements: 15 within the chemical group called lanthanides, plus yttrium and scandium. Two specific REEs, neodymium and dysprosium, are essential for the high-strength magnets used in hybrid cars, such as the Toyota Prius, and wind turbines, such as those that are supplying an increasing share of America’s renewable energy. “Rare earth elements” are not actually very rare. They are moderately abundant in Earth’s crust—some even more so than copper, lead, gold and platinum—but REEs typically are widely dispersed and not commonly concentrated by geologic processes in specific deposits that can be mined economically.

Until the mid-1990s, the United States was the global leader in REE production and was self-reliant in domestically produced REEs. Over the past 25 years, domestic production declined to the point that the U.S. has become 100% reliant on imports, almost entirely from China, partly because of China’s lower-cost operations. China supplies roughly 97% of global REE demand. China is also the global leader in REE consumption at 60% of global supplies, followed by Japan (22%), the U.S. (9%), and others (9%) (USGS, 2010, Scientific Investigations Report 2010-5229).

On 22 Sept. 2010, *The New York Times* reported that China had blocked REE exports to Japan as part of a bilateral marine border dispute. The Chinese government has denied any direct export intervention, but the situation had the effect of underscoring China’s dominant position in REEs. These events also raised the specter of China leveraging its control of REE supplies in international affairs and using the associated competitive advantages of such control to facilitate the location of manufacturing and other industries within its borders. As a result, there has been great interest throughout the world and especially in the U.S. Congress in REE and critical materials. At least nine bills concerning REEs have been introduced in the House and Senate, and part of my contribution as the GSA-USGS Congressional Science Fellow was to help organize a congressional briefing on this subject, which was attended by more than 100 congressional staff, as well as the general public.

The last four months of my congressional fellowship were spent in the office of Senator Chris Coons (D-DE). Although I had hoped that some of this time would be devoted to the very serious matter of U.S. energy policy, that turned out not to be the case and instead just about all of Congress’ attention was focused on budgets and debt ceilings. The former is a serious issue that did not receive the action that it deserved and the latter is somewhat a technical, manufactured issue that was more about partisan politics than attempting to address real

problems. In political speak, the can was kicked down the road; further wrestling with budget issues will be required in the fall legislative session.

Reflecting back on my year as a Congressional Science Fellow, there are many things that stand out. Probably the most fundamental insight is that successful legislation does not happen quickly or the first time it is put forward. Rather, it reflects years of work by many staff and offices, and then some event, usually a “crisis” allows/causes the legislation to finally move forward. This is not as negative as it might sound. In fact, I would argue that it was precisely the intent of the founding fathers; based upon their experience with the excesses of English monarchy, they did not want the legislative process to be easy or easily subject to what has been referred to as the tyranny of the majority. Rather, they intended legislation to be difficult and slow, such that only the test of time would allow a very few ideas to make it through the process. In this sense, they succeeded and although the general public can be forgiven for lambasting a congress which appears to have accomplished little, my year as a Congressional Science Fellow has taught me that perhaps that is not such a bad thing.

A second lesson is that Congressional staff members are always “behind the scenes.” Success is measured by the success of our office and our bosses. It is not about us. My offices and bosses have been very successful and I am proud to have contributed to that success. With great humility, I hand the mantle of this Congressional Science Fellowship to Kelly Kryc, the very talented person who will succeed me. I have no doubt that GSA, USGS, and the nation will be well served.

This manuscript is submitted for publication by Larry Meinert, 2010–2011 GSA-USGS Congressional Science Fellow, with the understanding that the U.S. government is authorized to reproduce and distribute reprints for governmental use. The one year fellowship is supported by GSA and by the U.S. Geological Survey, Department of the Interior, under Assistance Award no. G10AP00128. The views and conclusions contained in this document are those of the author and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. government. Meinert has been appointed Program Coordinator for the USGS Mineral Resources Program and can be reached at LDmeinert@gmail.com.

GeoCorps™ America Summer 2012



GSA is now accepting applications for paid geoscience opportunities on public lands managed by the National Park Service, the U.S. Forest Service, and the Bureau of Land Management.



All levels of geologists—students, educators, professionals, retirees, and others—are encouraged to apply.

The summer 2012 positions will include Guest Scientist positions, Diversity Internships, and American Indian Internships.

www.geosociety.org/geocorps/

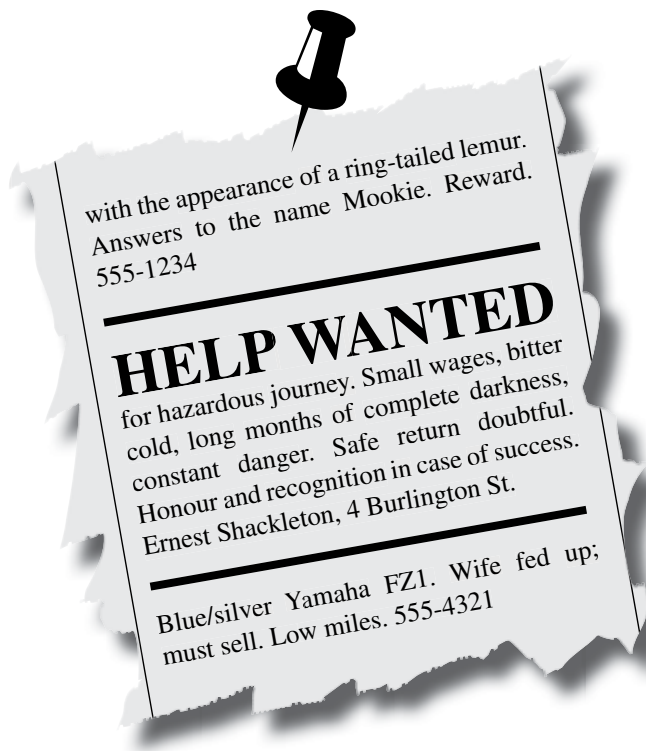


THE
GEOLOGICAL
SOCIETY
OF AMERICA®



Application deadline: 1 Feb. 2012

Call for Applications and Nominations



www.gsapubs.org

GSA is soliciting applications and nominations for science co-editors for *Geology*, *Geosphere*, and *Lithosphere*, with four-year terms beginning 1 January 2013. Duties include: ensuring stringent peer review and expeditious processing of manuscripts; making final acceptance or rejection decisions after considering recommendations of reviewers; and maintaining excellent journal content through active solicitation of diverse and definitive manuscripts.

Positions Available

Research interests that would best complement those of the continuing editors include—but are not necessarily limited to—the disciplines listed in parentheses.

Geology, 2 positions (tectonics, deformation, tectonophysics, structural geology, geodynamics, geophysics, Quaternary geology/geomorphology, thermochronology, neotectonics/paleoseismicity, remote sensing/GIS, hydrogeology, economic geology, engineering geology)

Geosphere, 1 position (geodynamics, geophysics, marine geology, tectonics, tectonophysics)

Lithosphere, 1 position (deformation [crustal, lithosphere, petrofabrics]; geodynamics; geophysics [gravity and geoid, marine geophysics]; seismology [crust and lithospheric structure, seismic anisotropy, seismotectonics, tomography]; structural geology; tectonics [flexure and isotasy, geodesy, neotectonics, plate motions]; tectonophysics)

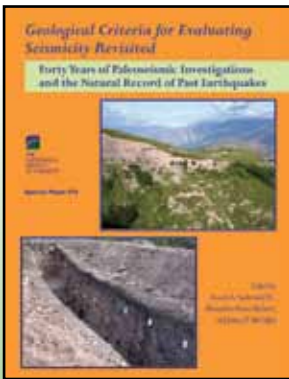
Desirable characteristics for a successful editor include:

- a broad interest and experience in geosciences, including familiarity with new trends;
- international recognition;
- a progressive attitude and a willingness to take risks and encourage innovation;
- familiarity with many geoscientists and their work (essential for soliciting and encouraging reviewers);
- comfortable working with online systems, able to make timely decisions, organized; and
- a sense of perspective and humor.

Interested?

Each editor will work out of his or her current location at work or at home. GSA provides an annual stipend and funds for office expenses; for specifics, contact Jeanette Hammann, +1-303-357-1048, jhammann@geosociety.org. If you wish to be considered, please submit a curriculum vitae and a brief letter describing why you are suited for the position. To nominate another, submit a letter of nomination and the individual's written permission and CV. Send nominations and applications to Jeanette Hammann, GSA Publications, P.O. Box 9140, Boulder, CO 80301, USA; jhammann@geosociety.org. Nominations or applications received by 15 February 2012 will be given first consideration.

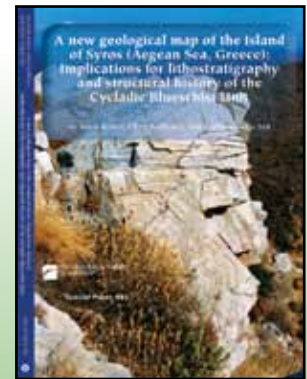
New from the GSA Bookstore!



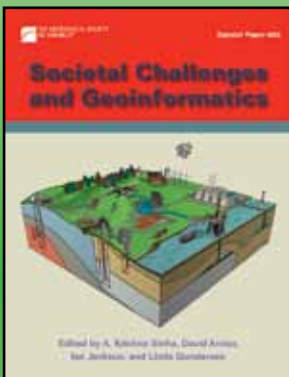
Geological Criteria for Evaluating Seismicity Revisited: Forty Years of Paleoseismic Investigations and the Natural Record of Past Earthquakes
 edited by Franck A. Audemard M., Alessandro Maria Michetti, and James P. McCalpin
 SPE479, 204 p., ISBN 9780813724799
 \$80.00 | member price \$56.00



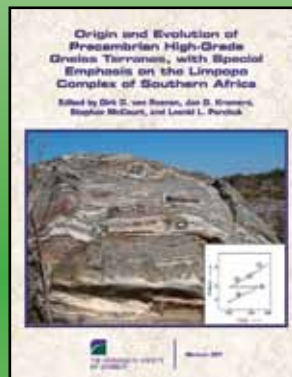
Mélanges: Processes of Formation and Societal Significance
 edited by John Wakabayashi and Yildirim Dilek
 SPE480, 277 p., ISBN 9780813724805
 \$90.00 | member price \$63.00



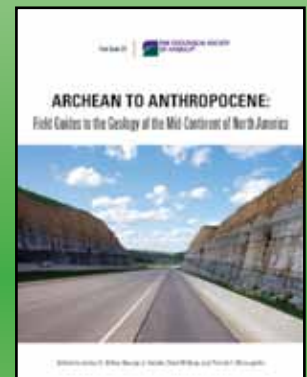
A new geological map of the Island of Syros (Aegean Sea, Greece): Implications for lithostratigraphy and structural history of the Cycladic Blueschist Unit
 by Mark Keiter, Chris Ballhaus, and Frank Tomaschek
 SPE481, 43 p. plus CD-ROM, ISBN 9780813724812
 \$40.00 | member price \$32.00



Societal Challenges and Geoinformatics
 edited by A. Krishna Sinha, David Arctur, Ian Jackson, and Linda Gundersen
 SPE482, 191 p., ISBN 9780813724829
 \$90.00 | member price \$63.00



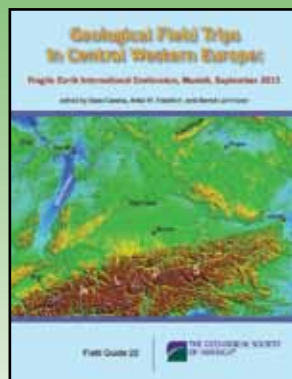
Origin and Evolution of Precambrian High-Grade Gneiss Terranes, with Special Emphasis on the Limpopo Complex of Southern Africa
 edited by Dirk D. van Reenen, Jan D. Kramers, Stephen McCourt, and Leonid L. Perchuk
 MWR207, 324 p., ISBN 9780813712079
 \$99.00 | member price \$73.00



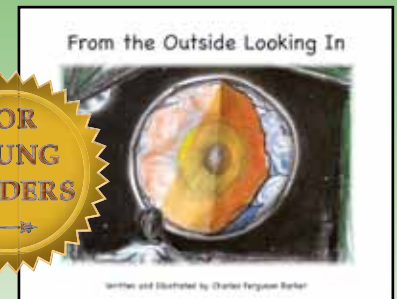
Archean to Anthropocene: Field Guides to the Geology of the Mid-Continent of North America
 edited by James D. Miller, George J. Hudak, Chad Wittkop, and Patrick I. McLaughlin
 FLD024, 544 p., ISBN 9780813700243
 \$60.00 | member price \$45.00



Field Guide to Samos and the Menderes Massif: Along-Strike Variations in the Mediterranean Tethyan Orogen
 by Klaus Gessner, Uwe Ring, and Talip Güngör
 FLD023, 52 p., ISBN 9780813700236
 \$25.00 | member price \$20.00



Geological Field Trips in Central Western Europe: Fragile Earth International Conference, Munich, September 2011
 edited by Sara Carena, Anke M. Friedrich, and Bernd Lammerer
 FLD022, 125 p., ISBN 9780813700229
 \$40.00 | member price \$35.00



From the Outside Looking In
 written and illustrated by Charles Ferguson Barker
 OUTSIDE, 28 p., 9.75" x 7.75" paperback
 with black-and-white illustrations,
 ISBN 9780813760339
 \$9.95 (sorry, no additional discounts)

www.geosociety.org/bookstore



GSA FOUNDATION WELCOMES NEW TRUSTEES

At the Foundation's 8 Oct. 2011 Board meeting in Minneapolis, Minnesota, USA, we welcomed the following Trustees to the Board, each for a five-year term.

J. Christopher Hepburn

GSA Fellow J. Christopher "Chris" Hepburn is a professor of geology in the Dept. of Earth and Environmental Sciences at Boston College. He serves as chair of the Provost's University Council on Teaching and was department chair there for more than 15 years. Hepburn's research focuses on the tectonics of the northern Appalachians, particularly the use of geochemistry and metamorphic petrology to analyze the origin and accretional history of the geological terranes in New England. His more recent work has concentrated on the Nashoba terrane.

Hepburn received a B.A. in geology from Colgate University and an M.A. and Ph.D. in geology from Harvard University. His Ph.D. work was a field, metamorphic, and structural study of the Brattleboro area, southeastern Vermont. He is a Fellow of the American Association for the Advancement of Science and the Geological Society of London and a member of the American Geophysical Union.

Hepburn currently serves as chair of GSA's Annual Program Committee. Prior service to GSA includes Section representative on GSA Council (2002–2006), member of the Executive Committee (2003–2006), chair of the Nominations Committee (2004–2006), and general chair of the 2001 Annual Meeting in Boston.

Virginia B. Sisson

GSA Fellow Virginia Sisson is a research associate professor of geology, director of summer field geology, and co-director of Geoscience Learning Center at the University of Houston. She earned an M.A. at Princeton University in 1981 as well as a Ph.D. there in 1985 with the dissertation: "Contact

Metamorphism and Fluid Evolution Associated with the Ponder Pluton, Coast Plutonic Complex, British Columbia, Canada." She earned her A.B. from Bryn Mawr College, graduating with cum laude honors in geology in 1979. Sisson's research interests include field-oriented petrotectonic studies in Alaska and Guatemala on convergent margins, triple junction interactions, granite emplacement, subduction zone metamorphism and exhumation processes, and jadeitite formation. She has also done field work in Venezuela, British Columbia, India, Malaysia, Norway, California, Washington, Montana, Nevada, Maine, Pennsylvania, and Myanmar.

A. Wesley Ward Jr.

GSA Fellow A. Wesley "Wes" Ward Jr. served most recently as the Western Regional Geologist for the USGS (2003–2008), capping a 33-year career with the Survey. Prior to that, he was the chief of the Survey's Astrogeology Program for seven years and served on central and western regional geological mapping teams before that. Ward received his Ph.D. in geomorphology and planetary geology from the University of Washington in 1978. He earned his M.S. from the University of Washington in 1975 while studying volcanic geology and earned a B.S. in geology from Washington State University in 1973. Ward's primary research interests are the history of the Columbia River Basalts and eolian depositional and erosional features and patterns on Earth and Mars.

In addition to USGS research and leadership duties, Ward has served on many external community, academic, and scientific advisory panels, including service to AGI, AZGS,



Donate Today!

SUPPORT GSA PROGRAMS

1 Enclosed is my contribution in the amount of \$ _____

2 Please credit my contribution to the:

- Greatest Need
- _____ Fund
- I've named GSA Foundation in my Will

3 _____

Name _____

Address _____

City / State / Zip _____

Phone _____

4 **Mail to:**
GSA Foundation
P.O. Box 9140
Boulder, CO 80301



cut out or copy

Or donate online at www.gsafweb.org

Congresswoman Gabrielle Giffords (AZ), GSA, NASA, NSF, Northern Arizona University, and the University of Arizona. He served two terms as president of the National Association of Black Geologists and Geophysicists (NABGG) and was a member of the Presidential Commission on Environmental Sustainability (1996–2000), the GSA Nominations Committee (2005–2007), and the Committee on Women and Minorities (now called the GSA Diversity Committee) (1989–1994, including two terms as chair).

Carl Fricke and **Pat Leahy** renewed for an additional five-year term on the Board. **Michael A. Manship** has completed his term as Trustee and we thank him sincerely for his service as a Treasurer for the Foundation.

CURRENT FOUNDATION BOARD OF TRUSTEES

- CHAIR: **Margaret Eggers**, Oceanside, Calif., USA
 VICE CHAIR: **George O. Linkletter**, Irvine, Calif., USA
 TREASURER: **Charles B. Andrews**, Bethesda, Md., USA
Mohamed El-Ashry, Washington, D.C.
Carl A. Fricke, San Rafael, Calif., USA
J. Christopher (Chris) Hepburn, Boston, Mass., USA
Thomas Holzer, Palo Alto, Calif., USA
P. Patrick Leahy, Alexandria, Va., USA

- Judith Totman Parrish**, Moscow, Idaho, USA
Douglas W. Rankin, Washington, D.C.
Lisa A. Rossbacher, Marietta, Ga., USA
John F. (Jack) Shroder Jr., Omaha, Neb., USA
Virginia B. Sisson, Houston, Tex., USA
Robert J. Sterrett, Lakewood, Colo., USA
Harvey Thorleifson, Minneapolis, Minn., USA
A. Wesley (Wes) Ward Jr., Phoenix, Ariz., USA

For further information on the current Foundation Board of Trustees, go to the Foundation's website at gsafweb.org.



Most memorable early geologic experience:

An early geology memory I have is collecting Devonian fossils with my brother when I was 13 years old. We were written up in the local newspaper and our collection was displayed in the Wyckoff, N.J., Library. WOW!!!

—Arthur P. Schultz

Share your love of geology with a child

ONLY \$9.95

From the Outside Looking In
 Written and Illustrated by Charles Ferguson Barker

Too sick to go to school, Sean is entertained when his fisherman puppet comes to life and they leave the Earth to see it from the outside looking in. This book, which is told mainly in rhyme, introduces young readers (ages 4–8) to plate tectonics. The detailed black-and-white pencil drawings are sure to delight readers of all ages.

OUTSIDE, 28 p., 9.75" x 7.75" paperback, ISBN 9780813760339
\$9.95 (sorry, no additional discounts)

this holiday season.

www.geosociety.org/bookstore

GSA SALES AND SERVICE P.O. Box 9140, Boulder, CO 80301-9140, USA
 +1.303.357.1000, option 3 • toll-free +1.888.443.4472 • fax +1.303.357.1071

THE GEOLOGICAL SOCIETY OF AMERICA®

Positions Open

ASSISTANT RESEARCH PROFESSOR SEQUENCE STRATIGRAPHY NORTHERN ARIZONA UNIVERSITY

We invite applications from individuals with research experience and expertise in sequence stratigraphy. Minimum qualifications include an earned doctorate conferred by 1 Aug. 2012 in the geosciences; teaching experience at the college level; and research experience using modern methods of sequence stratigraphy. Preferred qualifications include: experience with integrated field and subsurface research in sequence stratigraphy; demonstrated use of seismic reflection data in research; demonstrated use of state-of-the-art subsurface exploration and production software; demonstrated ability to teach (a) advanced undergraduate and graduate courses on sequence stratigraphy, and (b) specialized topics courses; experience or potential for multidisciplinary collaboration with individuals within and outside of academia including the oil and gas industry; experience or interest in advising and mentoring graduate students; demonstrated experience in effective science communication; and, demonstrated experience in, or commitment to, working with diverse communities. NAU is an AA/EEO/WMDV Employer. For a full position description and application instructions, visit the university website at <http://hr.nau.edu/>.

ASSISTANT PROFESSOR SEDIMENTOLOGIST AND STRATIGRAPHER TENNESSEE TECH UNIVERSITY

The Dept. of Earth Sciences at Tennessee Tech University invites applications for a tenure-track position at the rank of Assistant Professor with expertise in sedimentology and stratigraphy to begin August 2012. A Ph.D. in geology and a commitment to excellence in teaching, research, and service are required. The successful candidate will be expected to teach introductory geoscience courses and upper-level undergraduate courses in sedimentology and stratigraphy. The ability to teach an undergraduate paleontology course is desired as well as an upper-level course in the candidate's specialty that complements the department's environmental geology curriculum. The successful candidate will be expected to teach laboratory sections, lead field trips, and advise undergraduate senior theses. Applicants must submit the following information at jobs.tntech.edu/applicants/Central?quickFind=50595: (1) cover letter addressing the essential functions and qualifications required for the position as stated online; (2) personal statement that includes a teaching philosophy and research plan; (3) curriculum vitae; (4) copies of undergraduate and graduate transcripts (official transcripts required upon hire); and (5) name and contact information (including email address) of 3 professional references who will be asked to provide letters. Review of applications will begin 15 Dec. 2011 and continue until the position is filled. For more information about the department, visit www.tntech.edu/earth. AA/EEO.

CHAIR, DEPT. OF EARTH AND ENVIRONMENTAL SCIENCES, UNIVERSITY OF TEXAS, ARLINGTON

The University of Texas at Arlington seeks an eminent scientist to lead its expanding programs in the Dept. of Earth and Environmental Sciences. A Ph.D. in geosciences is required, along with a proven record of excellence in research, teaching, and service. The successful candidate will have demonstrated academic leadership experience or show potential to assume such a role as well as a clear vision for the development of the EES department as part of a rapidly expanding, research-oriented university. The position is offered at the rank of full professor with tenure, with a start date as early as August 2012. The EES department is simultaneously seeking an additional assistant professor and interested parties should refer to our companion announcement.

The successful candidate is expected to maintain a creative, independent, and externally funded research program, contribute to formal undergraduate and graduate teaching, as necessary, engage in long-term strategic planning, as well as mentor junior faculty. The new chair will also play a leadership role in shaping future hiring, curriculum development, broadening alumni-related initiatives, and will be expected to participate in an emerging collaboration with UT Dallas to develop a vibrant geoscience center in North Texas. While the geoscience sub-discipline of the chair is open, we seek a geoscientist whose research will build upon existing strengths in EES. Women and minorities are strongly encouraged to apply.

UT Arlington, situated on a cloistered, urban campus in the Dallas-Fort Worth Metroplex, is a vital and diverse

academic community of over 33,000 undergraduate and graduate students working together with faculty committed to outstanding teaching, research and scholarship. The EES Dept. is home to interdisciplinary MS and Ph.D. programs as well as a vibrant and rapidly growing undergraduate program. Additional information can be found at: www.uta.edu/ees/.

Completed application should consist of: curriculum vitae, statement of research interests and goals, statement of teaching interests and evidence of teaching quality, statement of leadership experience and vision of the future of academic geosciences, and the names and contact information of at least five references.

Applications should be submitted by 15 Dec. 2011, but applications will continue to be reviewed until the position is filled. A criminal background check will be conducted on finalists. Inquiries about this position may be directed to Dr. Alexander Weiss (email: weiss@uta.edu, phone: 817-272-2459), or Ms. Amy Osborn (email: osborn@uta.edu, phone: 817-272-3444). We prefer applications in Adobe PDF format submitted electronically to osborn@uta.edu. Print applications may be mailed to: EES Chair Search Committee, 501 S. Nedderman Drive, Box 1947, Arlington, TX 76019, USA.

UT Arlington is an Affirmative Action/Equal Opportunity Employer. Women, minorities, veterans, and individuals with disabilities are encouraged to apply. The use of tobacco products is prohibited on UT Arlington properties.

DIRECTOR NEW MEXICO BUREAU OF GEOLOGY & MINERAL RESOURCES, NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY (NEW MEXICO TECH)

The New Mexico Bureau of Geology and Mineral Resources is seeking a new director and state geologist. The bureau is a research and service division of the New Mexico Institute of Mining and Technology (New Mexico Tech), located in Socorro, New Mexico. With close to 60 employees, the bureau serves as the state geological survey, with a long-standing reputation for excellence in research, service, and outreach. Our mission includes research on the geologic framework of the state, with an emphasis on applied geosciences and the state's geologic resources; and the gathering, preservation, and dissemination of geologic information to the geoscience community, state and federal agencies, and the general public. The director manages the administrative, personnel, and financial affairs of the bureau, including direct supervision of a significant portion of the professional staff, and must be proactive in seeking additional, external funding to support new and ongoing programs. As a division of the university, the bureau works in collaboration with other divisions of the university. The director reports directly to the university president. As state geologist, the director serves on several state advisory commissions. Requirements include a Ph.D. in the geosciences, ten years of professional experience, and five years of administrative experience. Anticipated appointment date: as soon as filled, but no later than Sept. 2012. Salary: Negotiable. Full details of the position and information regarding application procedures may be found at www.geoinfo.nmt.edu/DirectorSearch and at www.nmt.edu/hr-jobs-at-nmt. For more information about the application process, contact JoAnn Salome in Human Resources at 575-835-5955 (JSalome@admin.nmt.edu). For more information about the position itself, contact L. Greer Price, search committee chair, at +1-575-835-5752 (gprice@gis.nmt.edu). For full consideration, application materials must be received by 1 March 2012.

ENVIRONMENTAL GEOCHEMIST UNIVERSITY OF SASKATCHEWAN

The Dept. of Geological Sciences at the University of Saskatchewan is accepting applications for a chair at the Assistant or Associate Professor level in the area of environmental geochemistry, with particular focus on mine waste and decommissioning. The successful candidate will join a University with a strong commitment to water research. There are significant opportunities for collaboration with faculty in other departments and colleges, especially the College of Engineering, where a senior IRC chair in this research area will be located.

Initial research funding will be provided by Syncrude, but the successful candidate will apply for an NSERC Associate Industrial Research Chair, and to develop a vigorous, externally funded research program. We seek candidates with a demonstrated record of research addressing fundamental problems in environmental geochemistry who are also committed to quality undergraduate and graduate teaching. A reduced teaching load will be defined at appointment, although teaching in our core undergraduate program will be required. Candidates must have a Ph.D., an established repu-

tion for research, a demonstrated ability to secure research funding and experience with teaching and research supervision.

The College of Arts & Science offers a dynamic combination of programs in the humanities and fine arts, the social sciences and the sciences. There are over 8,000 undergraduate and graduate students in the College and 325 faculty, including 12 Canada Research Chairs. The College emphasizes student and faculty research, interdisciplinary programs, community outreach and international opportunities.

The Dept. of Geological Sciences in the Division of Science has 16 full-time faculty, including two Canada Research Chairs, two endowed research chairs, one of which is a senior Industrial Research Chair and excellent analytical, and computing facilities. For detailed information about the department, applicants are encouraged to visit www.usask.ca/geology/.

The University of Saskatchewan is located in Saskatoon, Saskatchewan, a city with a diverse and thriving economic base, a vibrant arts community and a full range of leisure opportunities. The University has a reputation for excellence in teaching, research and scholarly activities and offers a full range of undergraduate, graduate, and professional programs to a student population of about 20,000. The university is one of Canada's leading research-intensive universities.

Applications, including résumé, statement of research interests and teaching philosophy, and three letters of reference, should be sent to: Search Committee, Dept. of Geological Sciences, College of Arts & Science, University of Saskatchewan, 114 Science Place, Saskatoon, SK S7N 5E2, Canada. Email: jim.merriam@usask.ca, Fax: 306-966-8593. We will begin reviewing applications after 20 Jan. 2012.

The University of Saskatchewan is committed to employment equity. Members of designated groups (women, people with aboriginal ancestry, people with disabilities and visible minorities) are encouraged to self-identify in their applications. All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority.

BASIN RESEARCH AND ENERGY GEOLOGY STATE UNIVERSITY OF NEW YORK, BINGHAMTON

Binghamton University seeks applications for a tenure-track position in sedimentary basin research at the assistant or associate professor level. We seek exceptional candidates with research and teaching interests in basin-scale processes. Areas of interest include but are not limited to: clastic depositional systems; basin-scale diagenesis; geophysical modeling; depositional modeling; tectonic modeling; and modern stratigraphic analysis. A fundamental understanding of well logs and seismic analysis is essential, although candidates need not be expert in these petrophysical tools.

The successful candidate must develop and sustain a nationally recognized, externally funded research program in basin analysis. We also expect the candidate to develop a strong record of teaching and mentoring students and teach an undergraduate course in structural geology and undergraduate and graduate level courses in his/her area of expertise. We are seeking candidates who will strengthen existing research programs in geochemistry, sedimentary geology, or Earth surface processes with the potential to interact with geologists, environmental scientists and engineers on the Binghamton University campus.

Candidates must have a Ph.D. with a focus in basin research or a related field, at the time of appointment; preference will be given to candidates with post-doctoral research or industry experience. Interested candidates should submit a letter of application, curriculum vitae, statements of research and teaching interests, and names and contact information of at least three references to the Binghamton University Interview Exchange site at <http://binghamton.interviewexchange.com>. For further information about the position, visit the Geological Sciences and Environmental Studies website (www.geology.binghamton.edu) or contact Professor Karen Salvage by email: ksalvage@binghamton.edu.

Women and minorities are encouraged to apply. Binghamton University is an equal opportunity/affirmative action employer. Applications will be considered until the position is filled, but priority will be given to those received by 15 Jan. 2012.

SEDIMENTARY GEOLOGY UNIVERSITY OF IOWA

The Dept. of Geoscience at the University of Iowa invites applications for a full time tenure-track position in Sedimentary Geology at the Assistant Professor level. The appointment will begin in August 2012. We seek an outstanding researcher and teacher whose approach is quantitative, integrative, and preferably field-based.

Areas of interest might include but are not limited to: sequence stratigraphy, basin analysis, quantitative stratigraphy, clastic or carbonate sedimentology, petroleum geology, and depositional environments. The successful candidate is expected to establish an active, externally funded research program that complements existing strengths within the department as well as interdisciplinary initiatives across the University. In addition to attracting and mentoring graduate students, the successful candidate will be expected to teach at the undergraduate and graduate levels, including our required undergraduate majors course: "Sedimentary Geology." A Ph.D. in geoscience or a related field is required by the time of appointment. Candidates must submit applications online at <http://jobs.uiowa.edu/> (requisition 60159). Attachments to the application should include a letter of interest, curriculum vitae, a statement of teaching interests, and a statement that describes current and future research activities. Three letters of recommendation should be sent to Dr. Bill McClelland, Search Committee Chair, Dept. of Geoscience, University of Iowa, Iowa City, IA 52242 (Phone: 1-319-335-1827; e-mail: bill-mcclelland@uiowa.edu). Screening of applications begins 7 Dec. 2011 and will continue until the position is filled. Questions regarding this position can be directed to Dr. McClelland or Dr. Mark Reagan (Geoscience Dept. Chair; 319-335-1820; mark-reagan@uiowa.edu). The department and the College of Liberal Arts and Sciences are strongly committed to gender and ethnic diversity. Women and minorities are encouraged to apply. The University of Iowa is an affirmative action/equal opportunity employer.

**HYDROGEOLOGIST
(ASSISTANT PROFESSOR, TENURE-ELIGIBLE)
WICHITA STATE UNIVERSITY**

The Dept. of Geology at Wichita State University invites applications for a faculty position in hydrogeology beginning August 2012. We are seeking to hire a tenure-eligible assistant professor. In particular, we seek a candidate with research expertise in environmental and ground water issues, complemented with a knowledge of computer modeling and an interest in sustainability. In addition to developing an externally funded research program, successful candidates will be expected to teach introductory, major, and graduate level classes. The candidate must have a Ph.D. in the Geosciences, an established record of publication commensurate with the applicant's career stage, and is expected to complement our existing departmental strengths in low-temperature geochemistry, paleontology, petroleum geology, sedimentology, stratigraphy, and structural geology and interact with broader segments of the WSU community.

Candidates must go on line at <http://jobs.wichita.edu> to apply for the position. Interested applicants should submit cover letter, curriculum vitae, statements of research and teaching interests, and contact information for at least three references. Applicants should also send copies of relevant publications to the Search Committee Chair, Dept. of Geology, 1845 Fairmount Ave., Wichita State University, Wichita, KS 67260-0027. We will begin review of applications after 1 Jan. 2012; however, applications will be accepted until the position is filled. Wichita State University is an equal employment opportunity/affirmative action employer. Applicants with an interest in broadening participation in higher education and members of underrepresented groups are encouraged to apply. Offers of employment are contingent upon completion of a satisfactory criminal background check as required by Board of Regents policy.

**FACULTY POSITION, SEDIMENTARY GEOLOGY
TEXAS CHRISTIAN UNIVERSITY**

Position: The TCU School of Geology, Energy, and the Environment (SGEE) invites applications for a tenure-track position within or closely related to the broadly defined area of sedimentary geology. The position begins Fall 2012. This person will be responsible for teaching introductory geology and advanced undergraduate and graduate courses in their specialty, as well as supervising graduate students and undergraduate research. The normal teaching load is two courses per semester. TCU operates on a teacher-scholar model. Faculty are expected to excel in the classroom, seek external funding, and maintain a vigorous student-involved research program resulting in publication in peer-reviewed national and international journals. Applicants should have an interest in energy and/or subsurface studies. The applicant should be motivated to utilize the recently acquired TCU Core Facility. The Core Facility is supported by industry partners and, among other research and teaching opportunities, houses one of the best available collections of core from shale. An ability to teach introductory subsurface techniques (e.g.,

exploration geophysics, well logging, etc.) and an interest in shale reservoirs would also be desirable.

School of Geology, Energy, and the Environment (SGEE): We are housed in the College of Science & Engineering at TCU (www.tcu.edu/). Our School merges several academic programs and research facilities to create unique educational and research opportunities for students and faculty, ranging from traditional degree paths in geology and environmental science to broader multidisciplinary options in energy and environmental resource management. The School presently has 14 faculty members, additional adjunct faculty from industry and other backgrounds, 40 graduate students, and 200 undergraduates. In addition to the Energy Institute and Core Facility, SGEE houses the Institute for Environmental Studies, the Center for GIS and Remote Sensing, and the Monning Meteorite Gallery. For more information about our School and these associated academic and research programs, please visit our websites listed at www.cse.tcu.edu/.

Applications: A Ph.D. is required. The position is expected to be filled at the Assistant Professor rank. Salary will be commensurate with experience and qualifications of the successful applicant. TCU is an EEO/AA employer and encourages a diversity of applicants. Review of applications will begin immediately and continue until the position is filled. All application materials and supporting documents (letter of application, statement of teaching and research interests, current vita, and 3 letters of recommendation) must be submitted online at https://tcu.igreentree.com/CSS_faculty. The letters of recommendation should be sent to j.curry@tcu.edu.

**TENURE-TRACK FACULTY POSITION
UNIVERSITY OF TEXAS, ARLINGTON**

The Dept. of Earth and Environmental Sciences (EES) at the University of Texas at Arlington anticipates additional expansion of its tenure-track faculty with a new faculty appointment beginning as soon as August 2012. The position is offered at the assistant professor level, although especially strong candidates may be considered for appointment at higher rank. EES is simultaneously seeking a senior scholar to be department chair and interested parties are referred to our companion announcement.

UT Arlington, situated on a cloistered, urban campus in the Dallas-Ft. Worth metroplex, is a vital and diverse academic community of over 33,000 students working together with faculty committed to outstanding teaching, research and scholarship. The EES department is home to a dynamic and interdisciplinary Ph.D. program as well as vibrant and growing undergraduate and master's degree programs. Additional information can be found at www.uta.edu/ees/.

We seek a geoscientist whose research will build upon existing strengths in EES. Areas of interest include: petrological and geochemical methods applied to tectonic or magmatic systems, tectonic geomorphology, characterization and modeling of modern or ancient sedimentary systems, innovative approaches to climate change with emphasis on regional to global climate system interactions, carbon sequestration, energy and the environment, and integrated studies of the atmospheric, oceanic, cryospheric and the solid Earth systems.

The successful candidate is expected to establish a creative and externally funded research program, contribute to undergraduate and graduate teaching as well as supervise graduate students. In addition, the successful candidate will be expected to participate in an emerging collaboration with UT Dallas to develop a vibrant geoscience center in North Texas. A Ph.D. in Earth Sciences or a related field is required. Post-doctoral experience, and a strong publication and funding record, consistent with experience, are desired. Women and minorities are strongly encouraged to apply.

Completed applications consist of: a curriculum vitae; statement of research vision; statement of teaching interests and experience; names and contact information of at least five persons who will be willing to provide letters of recommendation.

Applications should be submitted by 15 Dec. 2011, but applications will continue to be reviewed until the position is filled. A criminal background check will be conducted on finalists. We prefer applications in Adobe PDF format submitted electronically to ees@uta.edu. Print applications may be mailed to: Dr. Glen S. Mattioli, Chair, Search Committee, Dept. of Earth and Environmental Sciences, University of Texas at Arlington, 500 Yates St., Arlington, Texas 76019

Effective 1 Aug. 2011, the use of all tobacco products by students, faculty, staff, and visitors are prohibited on all UT Arlington properties. UT Arlington does not discriminate on the basis of race, color, national origin, sex,

religion, age, disability, veteran status or sexual orientation in employment or in the provision of services.

**ASSISTANT PROFESSOR OF GEOLOGY
UNIVERSITY OF ARKANSAS-LITTLE ROCK**

The University of Arkansas at Little Rock Dept. of Earth Sciences invites applications for a tenure-track assistant professor position in either Mineralogy/Petrology or Environmental Geology/Geochemistry. We seek a broadly trained scientist who will complement existing faculty strengths.

We expect faculty to develop and maintain an innovative, extramurally funded research program, to supervise student research projects, and to publish results in refereed journals. The successful applicant should have a Ph.D. degree at the time of employment and demonstrated potential to perform teaching duties. Teaching duties will include introductory geology and courses in the candidate's specialty.

The Dept. of Earth Sciences, with over 70 undergraduate geology majors, offers a BS in Geology, a Graduate Certificate in Geospatial Technology, and participates in college graduate programs. Research facilities include geochemical instrumentation, mineral separation equipment, and a state-of-the-art spectroscopy and microscopy facility (<http://ualr.edu/nanotechnology/>).

Submit applications electronically in PDF format to jbconnelly@ualr.edu. Please use the subject line Assistant Professor Geology-R97703-01. Applications should include a cover letter, curriculum vitae, statement of teaching and research interests and goals, and contact information for at least three professional references. The position begins 15 Aug. 2012. Review of applications will begin 1 Dec. 2011 and will continue until the position is filled. For more information, please contact Dr. Jeffrey Connelly, Chair, Dept. of Earth Sciences, jbconnelly@ualr.edu.

The University of Arkansas at Little Rock is an equal opportunity, affirmative action employer and actively seeks candidacy of women, minorities and individuals with disabilities. Persons hired must provide proof of legal authority to work in the United States. Under Arkansas law, all applications are subject to disclosure.

**ASSISTANT PROFESSOR, PLANETARY SCIENCES
PURDUE UNIVERSITY**

Purdue University is building a strong new effort in Planetary Sciences. Jay Melosh has joined the Purdue Faculty and, together with Andy Freed, Marc Caffee, and David Minton, has a mandate to expand Planetary Sciences by adding an additional faculty member this year. We seek a broadly based individual for a tenure-track position at the Assistant professor level. The successful candidate will be an outstanding researcher with potential for excellence in teaching at both the graduate and undergraduate levels. We seek someone who will complement our existing strengths in modeling, geodynamics, atmospheric science and isotopic cosmochemistry. In harmony with Purdue's traditional emphasis on science, mathematics and engineering, we seek a quantitatively focused researcher with an interest in planetary surface processes. The Dept. of Earth and Atmospheric Sciences presently has outstanding programs in geodynamics, isotope geochemistry, terrestrial climate and extreme weather systems.

Applicants must have a Ph.D. in a field related to Planetary Science. Salary and benefits are highly competitive. The appointment will begin in August 2012. Candidates are expected to develop a vigorous research program, obtain external funding, supervise graduate students, and teach undergraduate and graduate courses. Interested candidates should submit their curriculum vitae, publication list, and brief descriptions of their planned research program and teaching philosophy to planetarysearch@purdue.edu. Names and contact information for at least three referees must be included in the application. Information on the EAS department can be found at www.purdue.edu/eas/. Applications completed by 15 Jan. 2012 will be given full consideration, although the search will continue until the position is filled. A background check will be required for employment in this position.

Purdue University is an Equal Opportunity/Equal Access/Affirmative Action employer fully committed to achieving a diverse workforce.

**GEOPHYSICIST
UNIVERSITY OF WISCONSIN-MILWAUKEE**

The Dept. of Geosciences at the University of Wisconsin-Milwaukee welcomes applications for a tenure-track faculty position in geophysics at the rank of Assistant Professor with a start date of August 2012. Applicants must hold a Ph.D. in geology/geophysics or

related field at the time of appointment, and have demonstrated research experience in geophysics.

Post-doctoral and teaching experience (TA and/or lecture experience) are desirable. Scientific publications, conference publications, and funding experience are preferred but not necessary. The successful candidate is expected to conduct an active, internationally recognized, externally funded research program. The successful candidate will teach a required introductory survey course in geophysics to undergraduate majors, upper level undergraduate and graduate level courses in their field of expertise, an introductory service course, and advise graduate student thesis projects. A standard teaching load is three 3-credit courses per academic year. This job posting is available online along with information regarding the Dept. of Geosciences and the College of Letters and Sciences at http://www4.uwm.edu/letscl/geosciences/dept_life/job_ad.cfm.

Review of applications will begin 23 Jan. 2012. Priority will be given to applications received by that date, but the position will remain open until filled. To apply, please go to <http://jobs.uwm.edu/postings/7222>. Candidates should upload a cover letter, curriculum vitae, statement of teaching philosophy, research interests, and examples of published works with the online application. Published works may be uploaded with the application as "Other Document." In addition, three letters of recommendation are required and should be mailed to: Lisa Alzalde, Search & Screen Support, Dept. of Geosciences, University of Wisconsin-Milwaukee, P.O. Box 413, Milwaukee, WI 53201, or emailed to lalzalde@uwm.edu.

The University of Wisconsin-Milwaukee is a large, research-oriented institution located on the northeast side of Milwaukee, five blocks from Lake Michigan. The Dept. of Geosciences offers B.S./B.A., M.S., and Ph.D. degree programs and is staffed by 12 full-time faculty. UWM is an AA/EEO employer.

TENURE-TRACK ASSISTANT PROFESSOR OHIO UNIVERSITY

The Dept. of Geological Sciences at Ohio University invites applications for a Tenure-track Assistant Professor to begin in August 2012. We are seeking an individual whose research interests are in igneous petrology, or a closely allied field, and who is qualified to teach courses such as petrology, earth materials, and petrography. The successful applicant will possess a Ph.D. in geology, be committed to excellence in teaching at both the undergraduate and graduate level, develop a strong research program supported by external funding, and augment our planetary and structural / metamorphic expertise. Candidates must have outstanding leadership, management, and interpersonal skills to relate to a wide diversity of faculty, staff, students and community members.

Ohio University is a Research-Extensive institution, enrolling 19,500 students on the Athens campus and more than 8,000 students on five regional campuses. The College of Arts and Sciences includes 340 tenured and tenure-track faculty members and contains 19 departments, 8 of which offer the doctoral degree. Further information about Ohio University may be found at the university's website: www.ohio.edu.

Applicants must apply online (www.ohiouniversityjobs.com/postings/1048) and attach a vita, description of research interests, statement of teaching philosophy, and the names and addresses of three referees. An electronic copy of a proposed course syllabi and a recent paper may be attached.

Position will remain open until filled; for full consideration, apply by 15 Dec. 2011. For further information concerning the department and its faculty, visit www.ohio.edu/geology.

Ohio University is an affirmative action/equal opportunity employer.

PETROGRAPHER/CONSULTANT, WALTHAM, MASS. SIMPSON GUMPERTZ & HEGER (SGH)

Simpson Gumpertz & Heger (SGH) is actively recruiting an experienced candidate for a position as Petrographer/Consultant in our Waltham, MA office. SGH is a nationally known civil and structural engineering firm that works in all aspects of design, investigation, and rehabilitation of structures. At SGH, petrographers provide front-line collaborative support to our investigative teams as well as for external clients, including other engineering firms. The successful candidate will work on investigations of concrete, masonry, stone, and related construction materials.

Applicants should have at least 10 years of experience with stone and concrete petrography; meet the requirements of ASTM C856 and C295; and understand the use of supplemental testing and analytical techniques such as XRD, IR, SEM/EDS, and chemical

testing. Exceptional communication skills, experience in research and investigations, and a demonstrated ability for managing and developing staff are also required skills.

To learn more about SGH and to apply for this position, please visit our website at www.sgh.com or email your resume to Stella Mereves-Carolan, Corporate Recruiter at smereves-carolan@sgh.com or Apply online at www.sgh.com.

Equal Employment Opportunities Employer.

HASLEM POSTDOCTORAL FELLOW/ ASSISTANT PROFESSOR, GEOLOGY AND GEOLOGICAL ENGINEERING/ MUSEUM OF GEOLOGY, SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY

The Haslem Postdoctoral Fellow/Assistant Professor is available in the Department of Geology and Geological Engineering and the Museum of Geology at the South Dakota School of Mines and Technology. A Ph.D. with specialization in paleontology is required. The Haslem Postdoctoral Fellow/Assistant Professor is a research position, and candidates with research experience and expertise that complement that of departmental faculty and museum personnel are especially encouraged to apply. Occasional teaching opportunities may be available, based on the Fellow's desire for teaching experience and on the department's need and resources.

This nine-month appointment is renewable annually for up to three years, with annual performance review and with a possibility of appointment extension. Base salary is US\$32,000-US\$35,000, depending upon qualifications and experience.

The South Dakota School of Mines and Technology is a public state university offering bachelor, masters, and doctoral degrees in engineering and science. The University's research programs focus on the following four areas: Energy and Environment; Materials and Manufacturing; Underground Science and Engineering; and Science, Technology, Engineering, and Mathematics (STEM) Education. The School of Mines' ~2,300 students include traditional and non-traditional learners from 38 states and 32 countries. For more information about the School of Mines and Rapid City, visit: www.sdsmt.edu and <http://visitrapidcity.com/>

The School of Mines is committed to recruiting and retaining a diverse workforce. Individuals interested in this position must apply online at <http://sdsmine.sdsmt.edu/sdsmt/employment>. Human Resources can provide accommodation to the on-line application process and can be reached at (605) 394-1203. Review of applications will begin on 1 Dec. 2011, and will continue until the position is filled. Employment is contingent upon completion of a satisfactory background investigation. This position is funded through an endowment in the SDSMT Foundation.

SDSM&T is an EEO/AA/ADA employer & provider.

R.S. YEATS PROFESSOR OF EARTHQUAKE GEOLOGY AND ACTIVE TECTONICS OREGON STATE UNIVERSITY

Full-time, 9-month, Assistant/Associate Professor, Dept. of Geosciences, College of Earth, Ocean, and Atmospheric Sciences at Oregon State University in Corvallis, Oregon. We seek an outstanding scholar who will develop a strong teaching, research, and service program. The ideal candidate will integrate earthquake geology and active tectonic research with other disciplines, e.g. seismology, GPS-satellite geodesy, structural geology, tectonics and sedimentation, Quaternary age-dating techniques, regional tectonics, and remote sensing. The successful candidate is expected to teach graduate courses in his/her field of expertise and contribute to the undergraduate structural geology and field geology curriculum. The R.S. Yeats Endowment provides a substantial stipend for use in support of the endowed professor's research, teaching, and service. Requires a Ph.D. in geology, geophysics, or a closely related field. Must demonstrate ability or significant potential for teaching excellence, be committed to educational equity in a multicultural setting, have a strong scholarly potential that includes an active research agenda, peer-reviewed publications, and ability to obtain external research funds. For complete position description and to apply, see <http://oregonstate.edu/jobs> (posting 0008277). For additional information please contact Dr. John Dilles, Search Chair, (541) 737-1245, dillesj@geo.oregonstate.edu. For full consideration, applications must be received by 16 Jan. 2012. OSU is an AA/EEO.

ROGER E. DEANE POSTDOCTORAL FELLOW DEPT. OF GEOLOGY, UNIVERSITY OF TORONTO

The Dept. of Geology at the University of Toronto invites applications for the Roger E. Deane Postdoctoral

Fellowship, a highly competitive fellowship in any field of Earth Science. This fellowship, generously endowed by the late Mrs. Dorothy M. Deane, is named in memory of her husband, a faculty member from 1956 to 1964 who died in a tragic, research-related boating accident near Tobermory, Ontario. The department is interested in supporting innovative research and outstanding young geoscientists to work in collaboration with one or more faculty members. Applicants are encouraged to contact prospective hosts in advance to discuss areas of common interest. The Deane Postdoctoral Fellowship has an annual salary of \$50,000 and is awarded for a one-year period, with an anticipated extension for a second year.

Application: A complete application includes: a curriculum vitae, a research proposal (2 pages maximum excluding references), and the names & addresses of at least three references.

Deadline: Applications are due 15 Jan. 2012.

Submit applications to Ampy Tolentino, geo1_sec@geology.utoronto.ca (subject line: Deane Postdoctoral Fellowship). Or mail to Deane Postdoctoral Committee, University of Toronto, Dept. of Geology, Earth Science Centre, 22 Russell Street, Toronto, ON, Canada M5S 3B1.

Opportunities for Students

Graduate Assistantship, New Mexico Highlands University

Graduate assistantships are available for students wishing to pursue an MS in Geology beginning Fall 2012 term. The NMHU Environmental Geology Program strengths are in mineralogy, petrology, geochemistry, rock-paleomagnetism, structural geology, volcanology, and collaborative endeavors with the Forestry and the New Mexico Forest and Watershed Restoration Institute. The new NSF-Funded Paleomagnetism-Rock Magnetism, Powder X-Ray Diffraction, and Water Chemistry laboratories support wide-ranging analytical research. The NMHU campus in Las Vegas, NM, is situated at the boundary of the Great Plains and the Sangre de Cristo Mountains and is located within one to two hours from Cenozoic volcanic fields, Precambrian rock exposures, glaciated valleys, desert terrains, and several world-renowned geologic features—the Valles Caldera, the Rio Grande Rift, and the Harding Pegmatite. A low student:faculty ratio, state-of-the-art laboratory facilities, and committed faculty provide students with a superior learning experience. The graduate assistantship includes a nine-month stipend and tuition waiver per academic year. Application review begins 01/15/12. For more information, contact Dr. Michael Petronis, Environmental Geology, Natural Resource Management Dept., New Mexico Highlands University, Box 9000, Las Vegas, New Mexico 87701, mmpetro@nmhu.edu. For disabled access or services call 505-454-3513 or TDD# 505-454-3003. AA/EOE Employer.

The Jonathan O. Davis Scholarship (Desert Research Institute)

supports graduate students working on the Quaternary geology of the Great Basin. The national scholarship is US\$4,000 and the University of Nevada-Reno stipend is US\$1,500. The national scholarship is open to graduate students enrolled in an M.S. or Ph.D. program at any university in the United States. The stipend is open to graduate students enrolled in an M.S. or Ph.D. program at the University of Nevada-Reno. Details on application requirements can be found at www.dri.edu/GradPrograms/Opportunities/JonathanDavis. Applications must be postmarked by 2 Feb. 2012. Proposal reviews will not be returned. Applications should be addressed to: Executive Director Division of Earth and Ecosystem Sciences, Desert Research Institute, 2215 Raggio Parkway, Reno NV 89512.

Ph.D. and M.Sc. student opportunities in uranium geochemistry, University of Manitoba.

The Dept. of Geological Sciences at the University of Manitoba invites applications for graduate (M.Sc. and Ph.D. level) studies in uranium related research. We are interested in individuals that have an interest in uranium geochemistry, particularly related to ore deposits and nuclear forensics. The research will involve both laboratory and field studies in the US and Canada, including the application of secondary ion mass spectrometry (SIMS) and synchrotron methods. All qualified candidates are encouraged to apply; however Canadian and U.S. citizens will be given priority. Please contact Dr. Mostafa Fayek (fayek@cc.umanitoba.ca) for more information. Stipends are competitive. Positions are available starting January 2012.

Ph.D. Research Assistantships Integrated Natural, Social, and Economic Sciences of Arid Lands. The

Arid Lands Resource Sciences Interdisciplinary Ph.D. Program at the University of Arizona is seeking highly motivated individuals to apply for admission and opportunities for first year assistantships. ALRS is a unique program designed to address the complex problems associated with the sustainability of arid lands. For more information visit www.alrs.arizona.edu/ or Dr. Stuart Marsh smarsh@email.arizona.edu.

MS and Ph.D. Opportunities, Syracuse Univ., Earth Sciences. The Dept. of Earth Sciences at Syracuse University seeks applicants for fully funded MS and Ph.D. assistantships in geodynamics, thermochronology, tectonics, geochemistry, paleobiology, paleoclimatology and other fields, starting Fall 2012. Opportunities include interdisciplinary collaboration, international fieldwork, and use of extensive state-of-the-art analytical and computing facilities. For more info, visit <http://earthsciences.syr.edu>.

Graduate Student Opportunities, Earth and Ocean Sciences, University of Oregon, Eugene. MS and Ph.D. graduate student assistantships are available for oceanographic research in the Dept. of Geological Sciences at the University of Oregon in Eugene, Oregon. Ongoing research exists in exploring ice-ocean interactions in Greenland fjords, dynamics of estuaries and the coastal ocean, and high-resolution numerical modeling of the ocean. We are looking for highly motivated students with a quantitative geology/oceanography background that could thrive in an interdisciplinary setting. The department is a small, diverse, and energetic group of faculty and students with broad research interests in earth and ocean sciences. The campus is located in beautiful Eugene at the foot of the Cascades in a geologically active setting and with extraordinary opportunity for outdoor activities.

Interested students should contact Prof. David Sutherland (<http://pages.uoregon.edu/dsuth/>) for more information and with questions. Applications for Fall 2012 are due in January 2012 and are available online (<http://pages.uoregon.edu/dogsci/>).

The University of Oregon is an Equal Opportunity/Affirmative Action Institution committed to cultural diversity and compliance with the Americans with Disabilities Act. We invite applications from qualified candidates who share our commitment to diversity.

Graduate Student Opportunities, Case Western Reserve University. Students with backgrounds in geology, physics, chemistry, biology, engineering and related fields are encouraged to apply for our Ph.D. and MS programs in Earth, environmental, and planetary sciences. Areas of active research in the department include planetary geology and geophysics, igneous geochemistry, mineral physics, sediment transport, aqueous geochemistry and carbon sequestration. For more information, see <http://geology.case.edu> or write to geo-gradinfo@case.edu. Financial assistance is available. Application deadline: 1/15/2012.

CALL FOR PAPERS



GSA Today's Groundwork series offers you the chance to help lay the groundwork for furthering the influence of earth science on education, policy, planning, and funding. Learn more and submit a manuscript at www.geosociety.org/pubs/gsatguid.htm.

UNIVERSITY OF MICHIGAN Turner Postdoctoral Fellowship

The Department of Earth & Environmental Sciences at the University of Michigan invites applications for the Turner Postdoctoral Fellowship, a highly competitive fellowship in any field of earth science. The Department is interested in innovative research proposals that can be pursued in collaboration with a faculty member. Applicants are encouraged to contact prospective hosts in advance to discuss areas of common interest (<http://www.lsa.umich.edu/earth/people/faculty>).

The Turner Postdoc is a two-year position with an annual salary of \$55,000, discretionary research funds totaling \$10,000, and a generous benefits package. The University of Michigan is an equal opportunity/affirmative action employer; women and minorities are encouraged to apply.

Application Deadline: January 6, 2012

Complete application includes: curriculum vitae, research proposal (5 page max), and the names & addresses of at least 3 references.

Email applications to: turnerpdf@umich.edu

Turner Postdoctoral Committee, Dept. of Earth & Environmental Sciences, 1100 N. University Ave., Ann Arbor, MI 48109

GSA ON THE WEB

Website:

www.geosociety.org

E-news magazine:

www.geosociety.org/GSA_Connection/

Blog: Speaking of Geoscience:

<http://geosociety.wordpress.com/>

Facebook:

www.facebook.com/GSA.1888

Jobs RSS Feed:

www.geosociety.org/classiads/

LinkedIn:

www.linkedin.com/company/52036

Twitter:

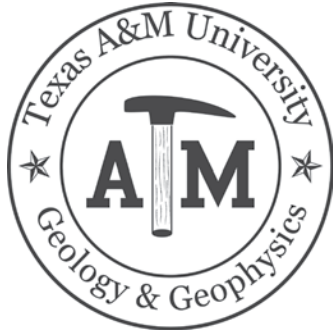
Follow @geosociety

YouTube:

www.youtube.com/geosociety



www.geosociety.org/community/



TWO TENURE-TRACK FACULTY POSITIONS

Siliciclastic Sedimentology/Stratigraphy Reflection Seismology

The Department of Geology and Geophysics at Texas A&M University invites applications from individuals for two tenure-track faculty positions as assistant professors in (a) **Siliciclastic Sedimentology/Stratigraphy** and (b) **Reflection Seismology**. Both positions begin September 2012.

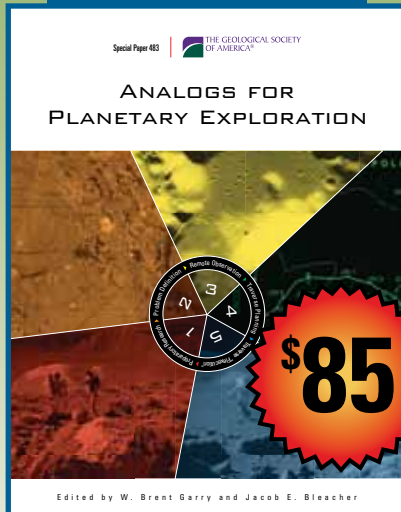
Siliciclastic Sedimentology/Stratigraphy — We seek candidates who will develop an externally-funded research program in the general area of Siliciclastic Sedimentology/Stratigraphy. This includes but is not limited to one or more of the following research topics: sequence stratigraphy, the sedimentary record of long-term climate change, depositional processes, and diagenesis. We seek applicants with strong potential to collaborate with current faculty as well as potential to interact with the Integrated Ocean Drilling Program and the Berg-Hughes Center for Sedimentary and Petroleum Systems, both of which are housed within the College of Geosciences at Texas A&M.

Reflection Seismology — The successful applicant will establish an active, innovative research program while complementing current departmental strengths in petroleum geology and geophysics, sedimentology, stratigraphy, and structural geology and will participate actively in the Berg-Hughes Center for Petroleum and Sedimentary Systems.

Applicants for both positions must have a Ph.D. at the time of appointment. Post-doctoral research and teaching experience are desirable for each position. Successful applicants will be expected to teach effectively at the undergraduate and graduate levels in their specialty, including classes in the Petroleum Certificate curriculum; supervise undergraduate, M.S. and Ph.D. research, including students who are interested in pursuing careers in the petroleum industry. Each candidate is expected to initiate and maintain a vigorous, externally funded research program. Opportunities exist to participate in and build on collaborative programs with colleagues in the College of Geosciences, Petroleum Engineering, and elsewhere at Texas A&M University.

Interested candidates should submit electronic versions of a curriculum vita, statement of research interests and teaching philosophy, the names and email addresses of at least three references, and up to four reprints by email attachments, to either the Chair of the Sedimentology Search Committee (sedsearch@geos.tamu.edu) or Chair of the Reflection Seismology Search Committee (seisearch@geos.tamu.edu). Screening of applications for both positions will begin November 1, 2011 and will continue until the positions are filled. The Department of Geology and Geophysics (geoweb.tamu.edu) is part of the College of Geosciences, which also includes the Departments of Atmospheric Sciences, Geography, and, Oceanography and Sea Grant, the Geochemical and Environmental Research Group (GERG), and the Integrated Ocean Drilling Program (IODP). Texas A&M University, a land-, sea- and space-grant university, is located in a metropolitan area with a dynamic and international community of 172,000 people. Texas A&M University is an affirmative action/equal opportunity employer committed to excellence through the recruitment and retention of a diverse faculty and student body and compliance with the Americans with Disabilities Act. We encourage applications from minorities, women, veterans, and persons with disabilities. Texas A&M University also has a policy of being responsive to the needs of dual-career partners (hr.tamu.edu/employment/dual-career.html).

Special Paper 483



SPE483, 567 p.
ISBN 9780813724836
list price \$100.00

Analogs for Planetary Exploration

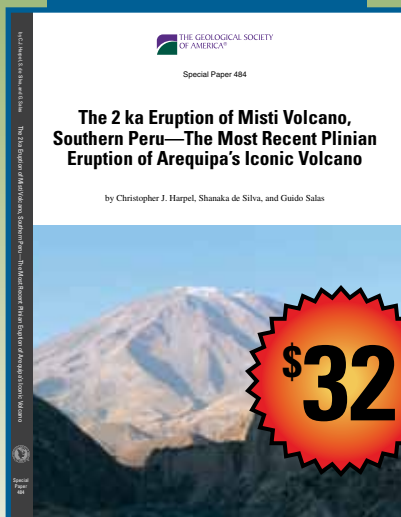
Edited by W. Brent Garry and Jacob E. Bleacher

Where on Earth is it like Mars? How were the Apollo astronauts trained to be geologists on the Moon? Are volcanoes on Earth just like the ones on other planets? The exploration of our solar system begins in our own backyard. Discoveries on other planetary bodies cannot always be easily explained. Therefore, geologic sites on this planet are used to better understand the extraterrestrial worlds we explore with humans, robots, and satellites. *Analogs for Planetary Exploration* is a compilation of historical accounts of astronaut geology training, overviews of planetary geology research on Mars, educational field trips to analog sites, plus concepts for future human missions to the Moon. This Special Paper provides a great overview of the science, training, and planning related to planetary exploration for students, educators, researchers, and geology enthusiasts. After all, as we learn about the solar system we can better understand our own planet Earth.

\$85

MEMBER PRICE

Special Paper 484



SPE484, 72 p.
ISBN 9780813724843
list price \$40.00

The 2 ka Eruption of Misti Volcano, Southern Peru—The Most Recent Plinian Eruption of Arequipa's Iconic Volcano

By Christopher J. Harpel, Shanaka de Silva, and Guido Salas

Misti volcano's last Plinian eruption, which happened ca. 2 ka, emplaced voluminous tephra-fall, pyroclastic-flow, and lahar deposits. Arequipa, located at the foot of the volcano, has a population of over 800,000 people and growing. Misti will erupt explosively again, and it is important to understand the past Plinian eruption. This Special Paper first provides a detailed description and analysis of the lahar deposits from the 2 ka eruption and the flows that emplaced them. Because Misti is located in an arid region, the authors have also included a detailed discussion of the paleoclimate conditions that provided the water for such voluminous lahars. The authors further delineate the complete eruption sequence for the pyroclastic-flow and tephra-fall deposits, providing a narrative of the eruption progression and dynamics. Finally, the book discusses the 2 ka eruption in the context of hazards from a future Plinian eruption and provides hazards maps for the different phenomena.

\$32

MEMBER PRICE

www.geosociety.org/bookstore



Enhancing participation of two-year college faculty in The Geological Society of America

Virginia L. Peterson, *Geology Dept., Grand Valley State University, Allendale, Michigan 49401, USA*; **John I. Garver**, *Dept. of Geology, Union College, Schenectady, New York 12308, USA*; **Steven Semken**, *Arizona State University, School of Earth and Space Exploration, Tempe, Arizona 85287, USA*; and **Wendi J.W. Williams**, *NorthWest Arkansas Community College, Geology Program, Bentonville, Arkansas 72712, USA*

contribute significantly to the development of the STEM skills (NSB, 2010) needed for twenty-first-century learning and for bridging K–12 and higher education institutions, informal science education organizations, business, and industry. Thus, 2YC faculty play an important role in broadening geoscience literacy and attracting students and future teachers to the geoscience workforce (Williams, 2010) but appear to be both underrepresented and underserved within GSA.

ABSTRACT

A strategic goal of The Geological Society of America (GSA) is to increase two-year college (2YC) faculty membership. In 2009, the GSA Committee on Education conducted a survey of 2YC faculty and explored strategies by which GSA might better serve them. We suggest that GSA provide increased professional and networking opportunities for 2YC faculty and encourage GSA members teaching at four-year colleges and universities to engage this cohort through lectures, colloquia, seminars, field trips, and research-teaching collaborations.

INTRODUCTION

Two-year colleges (2YCs) and their faculty are critical to the growth and development of the geoscience workforce (AGI, 2009). Increasing the number of 2YC faculty who are GSA members, enhancing resources for these members and their students, and increasing their participation in both annual and Section meetings are GSA strategic objectives (GSA, 2008). The increase in GSA membership among 2YC faculty (currently 374 members [1.6% of the total membership], an increase of ~100 members since 2006) is modest relative to the strategic goal of 1,000 members by 2011. The GSA Committee on Education (“Committee”) has investigated strategies by which GSA can better serve and attract 2YC faculty members. In late 2008, the Committee conducted a survey of 2YC faculty to better understand the needs of this community. The Committee also organized welcome receptions for 2YC geoscience faculty at GSA’s 2009 and 2010 annual meetings, both for networking and for information gathering. Here, we present Committee findings and suggest strategies for better inclusion of 2YC geoscience faculty.

RATIONALE

In the United States, 2YCs enroll 44% of all undergraduate students (AACC, 2011). Approximately 65% of graduating high school seniors decide to attend college after graduation, and of those students, 30% matriculate to a 2YC (Chen, 2009). 2YCs

REPORT ON THE 2YC FACULTY SURVEY

The Committee designed an online *Zoomerang* (www.zoomerang.com) survey to identify aspects of GSA membership most valued by 2YC faculty and to gain perspectives on how the Society might better serve this population. The survey, made available for two months (December 2008–January 2009), included 26 multiple-choice/fill-in questions plus open-response options for additional comments or clarifications. The absence of a comprehensive national list of geoscience faculty at 2YCs was identified early on as an impediment for communication and networking amongst this cohort, and this limited our ability to involve survey participants beyond the GSA membership. Current GSA members who self-identified as 2YC faculty were invited to participate in the survey; non-GSA members learned of the survey through networking.

Methods

The authors compiled and coded all survey data. Survey questions and responses are available for review on the GSA Education and Outreach website (www.geosociety.org/educate/documents/1106-2YCsurvey.pdf). Multiple-choice responses were automatically tallied, with the sums of each response type reported as a percentage of total responses for a given item. Open responses (textual), ranging from single words to short paragraphs, were reported in the form of lists of responses by item. Each list was coded separately to identify and distinguish the most common themes expressed by respondents. Open responses for each item were grouped by emergent themes and reported as percentages of the total number of open responses for each item. About half of the items were deemed to have too few open responses for meaningful coding.

Results

The survey’s 137 respondents had been teaching on average for 11 ± 8 years. More than 90% were GSA members, and a significant number (60%) had attended GSA meetings at least

GSA Today, v. 21, no. 12, doi: 10.1130/G130GW.1

E-mails: Peterson: petersvi@gvsu.edu; Garver: garverj@union.edu; Semken: semken@asu.edu; Williams: wwilliams@nwacc.edu.

once every 3–4 years. The remaining 40% rarely or never attended a meeting. Among those with a preference, 38% of respondents were more likely to attend a regional meeting compared to 8% who were more likely to attend a national meeting. Two principal reasons cited for not attending GSA meetings were (1) respondents could not afford the time away from class (80%), and (2) respondents did not have financial support to attend (50%). None of the respondents indicated a lack of interest as their reason for non-attendance.

A majority of the respondents (58%) indicated that networking opportunities, professional development, and teaching resources were most likely to influence their decision to become a member of a professional society like GSA. GSA provides these types of resources and opportunities primarily through meetings, workshops, and field trips.

The question that elicited the largest number of open responses related to how GSA can better serve the needs of 2YC faculty and students. Several themes emerged, identifying needs for (1) better dissemination of relevant and current teaching and professional development resources and opportunities; (2) funds for membership, research with students, travel to meetings, and field trips; (3) enhanced professional stature, institutional stature, and salaries for 2YC faculty; (4) enhanced local/regional networking opportunities at regional GSA meetings and between two-year and four-year institutions; and (5) more and better information to share with students regarding career opportunities and the importance of the geosciences.

STRATEGIES FOR CHANGE

We suggest both broad and specific strategies for GSA as a society and for GSA members to improve service and outreach to members of the 2YC community. Our survey efforts highlighted the absence of a list of 2YC geoscience faculty. The AGI Directory of Geoscience Departments includes some 2-year institutions with geoscience faculty, but it is incomplete. Networking opportunities among 2YC geoscience faculty have improved recently through creation of a listserv (<http://serc.carleton.edu/mailman/listinfo/geo2yc>) in connection with a SERC-sponsored workshop (<http://serc.carleton.edu/geo2yc/index.html>) in June 2010. In addition, the National Association of Geoscience Teachers (NAGT) recently established a GEO2YC organization for its 2YC faculty. Partnerships with NAGT on 2YC issues, perhaps cultivating cross-organizational representatives at the national and section levels, might enhance networking opportunities as well as GSA recruitment potential.

Perhaps the most important strategy for GSA is to improve the value of membership and meeting attendance for 2YC faculty. Theme sessions focused on 2YC faculty issues at both the 2009 and 2010 annual meetings were well attended. We strongly encourage more proposals for topical sessions, networking opportunities, and professional development workshops relevant to the 2YC community at annual meetings, and we recommend a continuation of the Two-Year Faculty Welcome Reception, perhaps as a partnership between the Geoscience Education Division and NAGT.

Our survey results indicate that 2YC faculty members are more likely to attend GSA Section meetings than the annual meeting, so it is important that the Sections aim to attract 2YC members to these meetings through workshops, sessions, and

networking or social events. This might be most effective if organized at the national level and then implemented regionally. Regional outreach might be enhanced through partnerships and/or communication with local geological societies.

Partnerships between geoscience faculty at 2YC and four-year institutions should be mutually beneficial. We offer a few strategies for local outreach activities by GSA members at four-year institutions:

1. Plan meetings with local 2YC faculty to understand needs and discuss strategies for improved interactions. These working groups might clarify the path to a four-year geoscience degree for 2YC students with likely benefits of improved student retention and decreased time to graduation.
2. Invite 2YC faculty members to participate in lectures, colloquia, seminars, field trips, and informal gatherings.
3. Create “guest lecture” opportunities between institutions.
4. Share resources for local field trips or class activities with a local or regional focus.
5. Consider research and/or teaching collaborations with 2YC faculty that have the potential to involve 2YC students.
6. Connect 2YC and geographically close four-year college/university GSA Campus Representatives as a valued first step in fostering communication and professional inclusion. We also recommend a concerted effort to establish GSA Campus Reps at as many two-year institutions as possible and to tailor campus representative materials to include information relevant to those institutions.

Our analysis indicates that lack of funds and time are commonly cited barriers to active participation in the Society. In the short term, GSA might consider lowering the costs for membership, journals, or meeting registration for 2YC faculty. Designated travel awards for 2YC faculty presenting at meetings might also provide critical incentive. The issue of time is more challenging but is in part tied to enhancing the perceived professional stature of 2YC faculty as well as the perceived value of GSA to the professional development of 2YC geoscience faculty. This may be achieved in the longer term by including 2YC faculty more broadly in the critical work of the Society, enhancing networking opportunities at a variety of levels, and helping to facilitate participation. In summary, GSA and its members have much to gain and little to lose by embracing activities and strategies that attract and include 2YC faculty.

ACKNOWLEDGMENTS

We thank the members of the GSA Committee on Education, Gary Lewis, Christine McLelland, and the GSA Education & Outreach staff, along with two anonymous reviewers.

REFERENCES CITED

- AACC, 2011, 2011 Community college fast facts: Washington, D.C., American Association of Community Colleges, <http://www.aacc.nche.edu/AboutCC/Pages/fastfacts.aspx> (28 Sept. 2011).
- AGI, 2009, Status of the geoscience workforce: Alexandria, Virginia, American Geological Institute, <http://www.agiweb.org/workforce/reports.html> (28 Sept. 2011).
- Chen, X., 2009, Stats in brief—Students who study science, technology, engineering, and mathematics (STEM) in postsecondary education:

- National Center for Education Statistics (NCES), Institute of Education Sciences, U.S. Department of Education 2009-161, <http://nces.ed.gov/Pubsearch/pubsinfo.asp?pubid=2009161> (28 Sept. 2011).
- GSA, 2008, The Geological Society of America strategic plan: <http://www.geosociety.org/aboutus/stratplan.htm> (28 Sept. 2011).
- NSB, 2010, Preparing the next generation of stem innovators: Identifying and developing our nation's human capital: Washington, D.C., National Science Board, NSB-10-33: <http://www.nsf.gov/nsb/publications/index.jsp> (28 Sept. 2011).
- Williams, W.J.W., 2010, Recognizing opportunities: Expanding earth science literacy by understanding the role of community colleges in U.S. education; the role of two-year colleges in geoscience education and in broadening participation in the geosciences—A planning workshop: NSF and NAGT, <http://serc.carleton.edu/geo2yc/essays/williams.html> (28 Sept. 2011).

Manuscript received 3 June 2011; accepted 25 Aug. 2011. ♦

GSA Today is Open Access Online

Go to www.geosociety.org/pubs/ and click on the *GSA Today* cover.




CALL FOR APPLICATIONS

2012–2013 GSA-USGS Congressional Science Fellowship

Bring your science and technology expertise and passion for shaping the future to Capitol Hill to work directly with national leaders at the interface between geoscience and public policy.

Deadline: 1 Feb. 2012

The GSA-USGS Congressional Science Fellowship provides a rare opportunity for a unique individual to work in a House or Senate office for one year. Prospective candidates are GSA members with a broad geoscience background and excellent written and oral communication skills. The fellowship is open only to U.S. citizens or permanent U.S. residents, with a minimum requirement of a master's degree with at least five years professional experience or a Ph.D. at the time of appointment. **Questions?** Contact Ginger Williams, +1-303-357-1040, gwilliams@geosociety.org.

www.geosociety.org/csf/



Publications Highlights

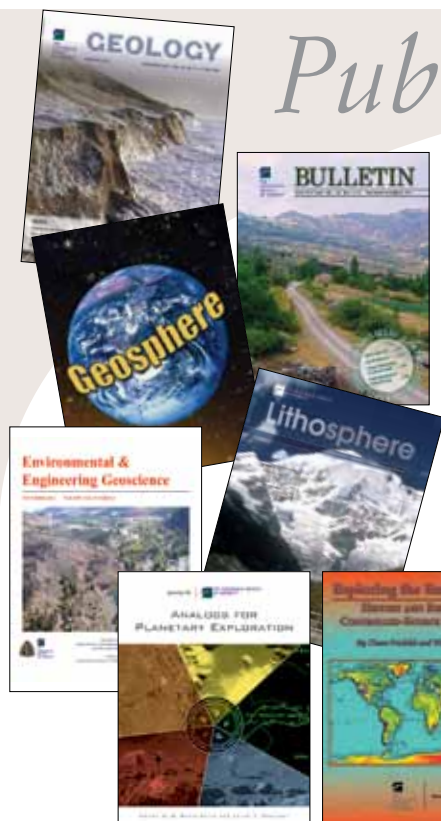
Where You Publish Matters

Last year, two well-known commercial publishers gave out more than \$400 million in shareholder dividends. GSA, on the other hand, gave out more than \$610,000 in student research grants—money that directly supported our science.

This year we will once again host our Annual Meeting and numerous Section Meetings, create educational and outreach products for K–12 students and teachers, and represent the earth sciences on Capitol Hill.

When it comes time to submit your paper, please think about your library and where the subscription money goes.

GSA. Serving science, not shareholders.



To subscribe, contact gsaservice@geosociety.org, or call +1-888-443-4472, or +1-303-357-1000, option 3.

2012 GSA ANNUAL MEETING & EXPOSITION

CHARLOTTE

4-7 NOVEMBER 2012 • CHARLOTTE, NORTH CAROLINA, USA

CALL FOR PROPOSALS

TECHNICAL SESSIONS

Deadline: 10 Jan. 2012

<http://gsa.confex.com/gsa/2012AM/sessionproposal.epl>

Help ensure that your area of research and expertise is represented in next year's technical program. Individuals, groups, and geoscience organizations are welcome to suggest topics and submit proposals for both Topical Sessions and Pardee Keynote Symposia. Pardee Symposia are high-profile sessions on significant scientific developments, with invited speakers only. Topical Sessions are a combination of invited and volunteered papers. Unique formats are allowed, but they must be outlined in the proposal, along with the technical support needs. Sessions that promote discussion are encouraged.

SHORT COURSES

Deadline: 1 Feb. 2012

Have something that your peers need to know? Then lead a Short Course at the 2012 GSA Annual Meeting in Charlotte! Proposals for Short Courses are now being accepted. Courses can be run to develop professional, teaching, and research skills at all levels. Proposal guidelines are available at www.geosociety.org/meetings/2012/scProposals/ or by contacting Jennifer Nocerino at jnocerino@geosociety.org.



THE GEOLOGICAL SOCIETY
OF AMERICA®

Looking ahead to 2012



Photo courtesy of Visit Chimney Rock State

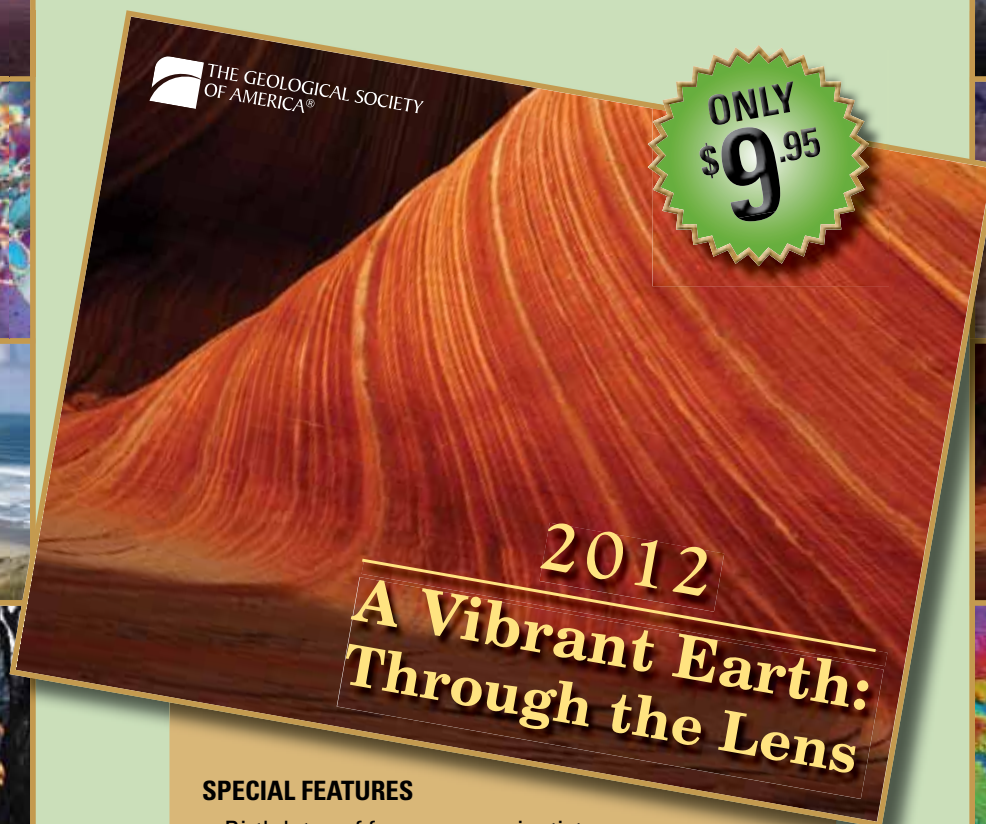
www.geosociety.org/meetings/2012

2012 Calendar

A Vibrant Earth: Through the Lens, 2012

This 12-month calendar features colorful images of all scales, from aerial views to photomicrographs. Photographs were selected from award-winning submissions to the 2010 GSA Annual Meeting Photo Exhibition in Denver, Colorado. Showcasing stunning photographs of Bonita Bend on the Green River, Utah; Sand Fly Bay, South Island, New Zealand; an orbicular rhyolite from Madagascar; sunrise over Merrick Butte, Arizona; and many other landscapes captured by cameras and through microscopes, this useful calendar will spruce up your office or home.

CAL2012, 9.5" × 12.5" calendar | **\$9.95** (sorry, no additional discount)



SPECIAL FEATURES

- Birthdates of famous geoscientists
- Dates of many noteworthy eruptions and earthquakes
- Upcoming GSA meeting dates
- Brief descriptions of moments in geoscience history

GSA SALES AND SERVICE P.O. Box 9140, Boulder, CO 80301-9140, USA
+1.303.357.1000, option 3 • toll-free +1.888.443.4472 • fax +1.303.357.1071

www.geosociety.org

 THE GEOLOGICAL SOCIETY
OF AMERICA®