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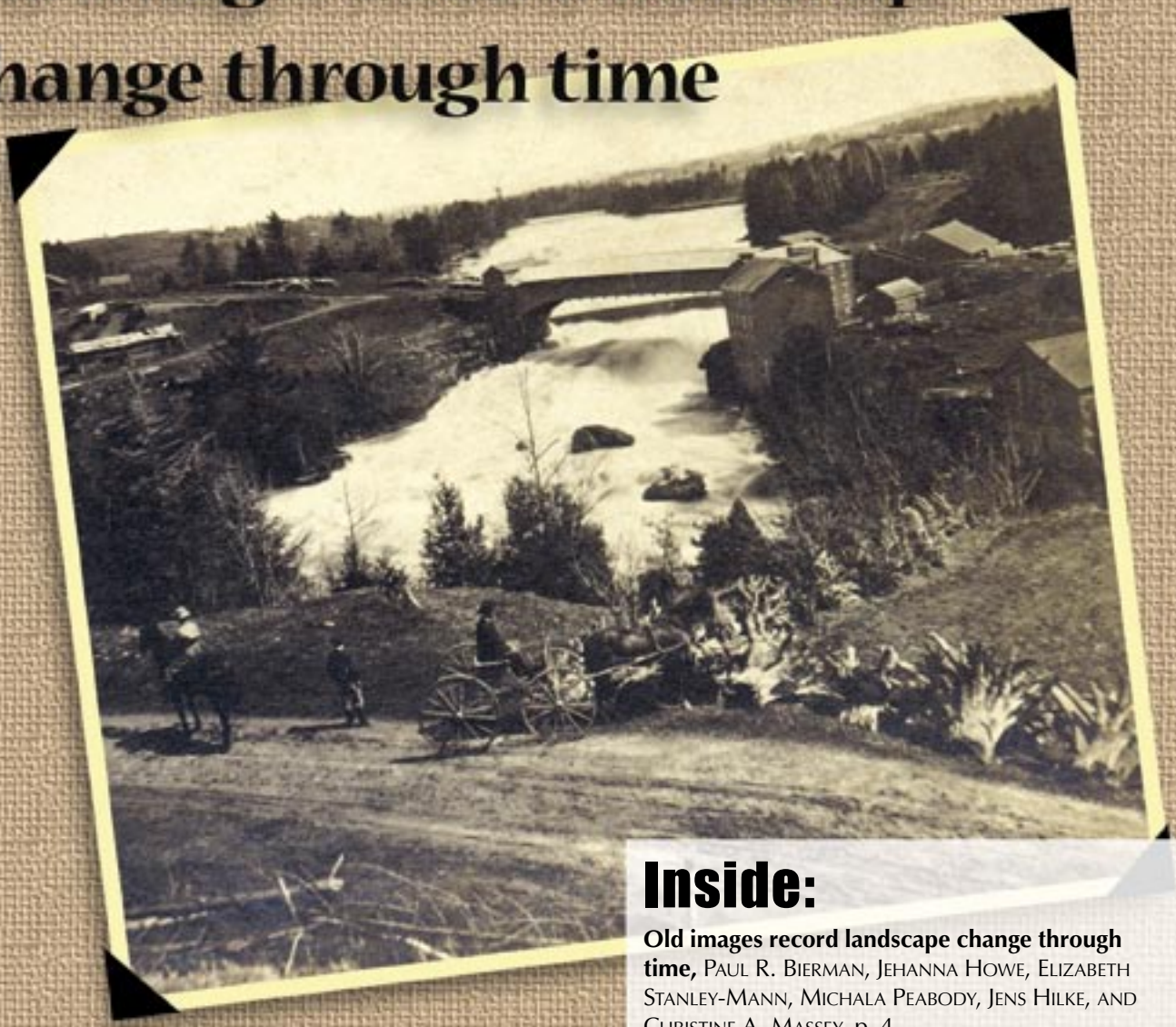
GSA TODAY

VOL. 15, No. 4/5 A PUBLICATION OF THE GEOLOGICAL SOCIETY OF AMERICA APRIL/MAY 2005

Old images record landscape change through time



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

by L. Bruce Railsback

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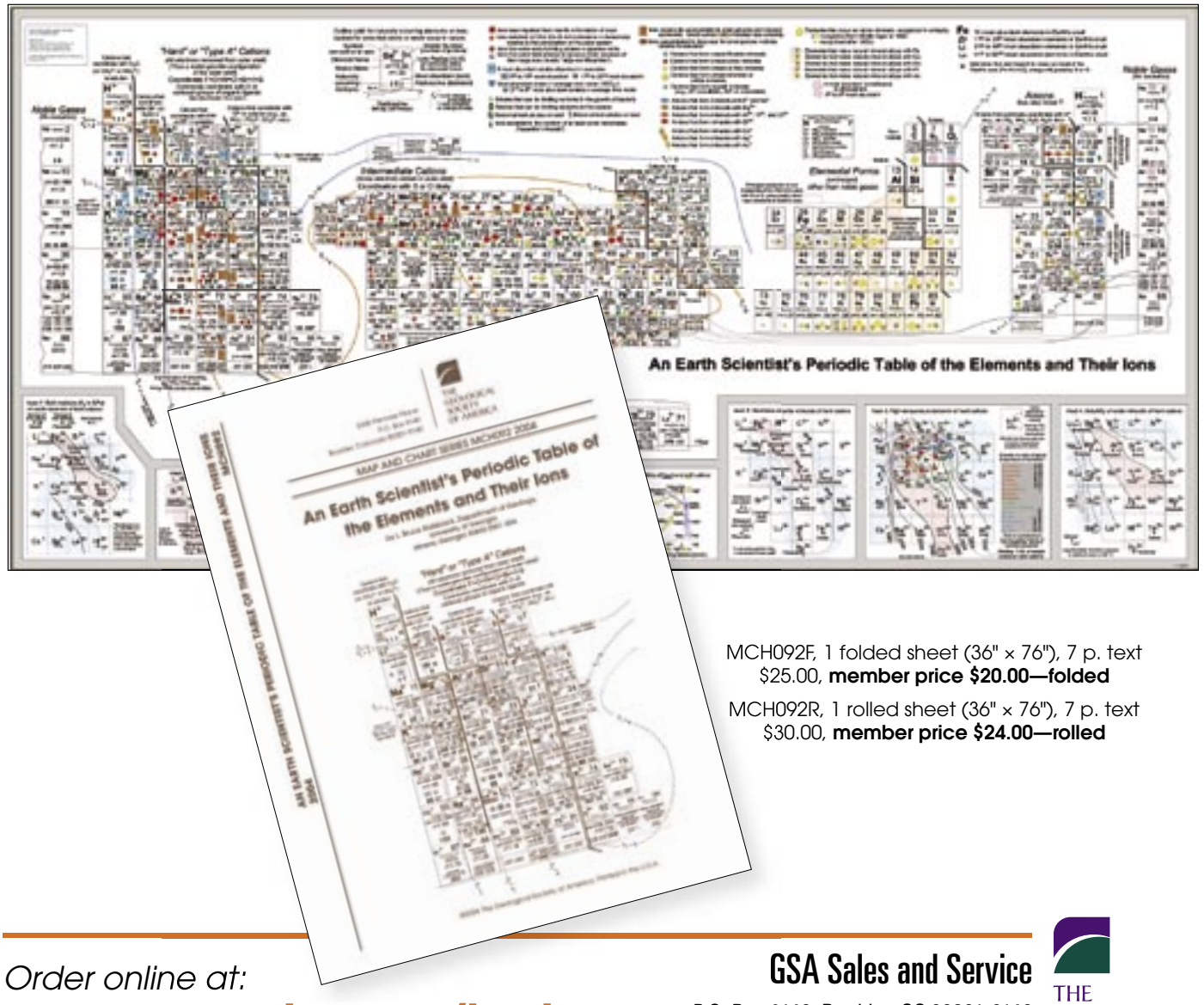

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Science Editors: Keith A. Howard, U.S. Geological Survey, MS 919, Menlo Park, CA 94025, USA, khoward@usgs.gov; and Gerald M. Ross, Kupa'a Farm, Box 458, Kula, HI 96790, lavaboy@verizon.net.
Director of Publications: Jon Olsen
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Cover: People change landscapes. The stump fence at the right suggests that tree roots, which once bound the soil, are gone, allowing steep, sandy, rain-soaked slopes to erode in shallow landslides. Stacks of cut lumber and bare hillsides are indicative of nineteenth century deforestation, but the riparian zone is well-forested—an exception for the time. The high river stage, muddy dirt road, and leafless trees suggest it's spring. Image of Highgate Falls on the Missisquoi River, Vermont (http://www.uvm.edu/perkins/landscape/LS_View.php?FileName=LS04684). Image property of University of Vermont, Special Collections, Bailey Howe Library. See "Old images record landscape change through time" by Paul R. Bierman et al., p. 4–10.

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Old images record landscape change through time

Paul R. Bierman, *pbierman@uvm.edu,* ***Jehanna Howe,*** *Department of Geology and Natural Resources, University of Vermont, Burlington, Vermont 05405, USA,*
Elizabeth Stanley-Mann, Michala Peabody, Jens Hilke, *and* ***Christine A. Massey,*** *Department of Geology, University of Vermont, Burlington, Vermont 05405, USA*

ABSTRACT

Historical photographs are a powerful tool for examining and understanding the distribution of surficial processes, both physical and biological, on the timescale of decades and centuries. Such imagery is particularly valuable for understanding human-landscape interaction. Here, we present several examples of quantitative, image-based, landscape-scale analyses made using hundreds of different images, each taken at a different place. This analysis takes advantage of a large, searchable, Web-based image archive that contains enough images to allow testing of specific hypotheses regarding landscape change over time. For example, analysis of Vermont landscape images dated between 1860 and 1990 demonstrates that erosion is more common in clear-cut areas than in partially or wholly forested sites. We find that the quality of riparian buffers increased slowly over the past 184 years, with a dramatic improvement after 1980. Oblique aerial imagery taken after the 1927 flood of record and recently rephotographed demonstrates the frequency of near-channel land-use change over the past century. Together, these examples show the value of readily searchable image archives in allowing scientists, planners, and land managers to approach problems of significant societal relevance.

Keywords: Erosion, landslide, flood, hazard, mapping, historical landscapes.

INTRODUCTION

For millennia, people have altered the landscapes on which they are born, live, and die. Such alteration began with clearance of valleys and slopes for agriculture at least 9000 years ago and was soon followed by the construction of roads, buildings, and cities (Hooke, 2000). Today, people are the most active geomorphic force on the planet, moving more mass every year than all other natural processes combined (Cronon, 1996; Hooke, 1994).

There is clearly a linkage between human actions and landscape response in areas as diverse as desertification (Zheng and Eltahir, 1997), road building (Wemple et al., 2000), and in the relationship between clear-cutting and mass movements (Montgomery et al., 2000). Such linkages have been made for more than a century. Marsh, writing *Man and Nature* in the 1850s, lamented the clearing of hillslopes and the erosion that followed. Beginning in the 1960s, the environmental movement brought these impacts clearly into the public eye, and debate has raged ever since over logging, road building on wild lands, and the alteration and restoration of river channels in the context of protecting endangered species (Montgomery, 2004).

Geoscientists are key providers of data for environmental management and disaster prevention because they understand relevant deep earth and surficial processes (Schneiderman, 2000). Without denying the value of both physical and mathematical models, much of what we know about Earth is rooted in the mapping of rock and surficial materials (e.g., volcanic mudflow deposits). Such mapping, often coupled with geochronology, lets geologists infer both the spatial and temporal distribution of near-surface geologic processes over millennia.

This paper presents a different way of looking back through time and space to understand both the style and tempo of landscape change. Here, we show that a searchable archive of historical images can be used to understand the distribution of surface processes and landscape characteristics. By examining cultural features and actions, we can infer how societal changes have shaped landscapes as well as how landscapes have shaped societies. Our approach is applicable over much of the past 200 years, providing a bridge between short-term instrumental records and geologic techniques that are often more useful over longer time frames. The approach we lay out could easily be applied to different questions in a wide variety of tectonic and climatic zones.

THE LANDSCAPE CHANGE PROGRAM VIRTUAL ARCHIVE

The Landscape Change Program is a community archive containing more than 10,000 images of Vermont landscapes from before 1810 to the present. It is freely available at http://uvm.edu/perkins/landscape. Each image in the archive is key-worded, and more than 60% of the holdings are now described in detail, allowing efficient online searching of the archive. More than half the images are dated to the year and >98% are located to the town level. The earliest images are drawings; the first reliably dated photographs are from the 1850s. As of January 2005, the number of dated images in the collection increases exponentially between 1810 and 1910, peaks in the 1920s, and then declines. Nearly 600 images have been rephotographed since the year 2000, providing a contrasting view of earlier landscape imagery. The distribution of images over time reflects both the mid-1800s' popularization of photography and the particular archives from which many of the images were acquired: a collection of stereoviews (late 1800s), the State Agency of Transportation (1910–1970), and the State Division of Tourism (1960–1970).

The Landscape Change collection is particularly rich in images of rural areas, typically underrepresented in many historical archives. Such images typically show subjects of interest to natural scientists. For example, by late 2004, the archive contained >400 images of rivers, >340 images of eroding hillslopes, >660 images of floods and flood damage, >200 images of quarrying and mining, >1000 images of bridges, and >3000 images of roads (Fig. 1).

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Figure 1. Images from the Landscape Change Program archive depicting landscape features, changes, and processes of interest to geoscientists. (A) Photograph of a large landslide that occurred in Burlington, Vermont, in December 1955. Slide is in glacial-lacustrine and glacial-marine silt and clay and was triggered by a leaking drain pipe. LS01781, image property of Bailey Howe Library, Special Collections, University of Vermont. (B) Hand-colored lanternslide of a horse and buggy on a washed-out road in St. Johnsbury, Vermont, 1914. LS06469, image property of Vermont State Archives. (C) Quarrying marble, West Rutland, Vermont. Stereoview shows structure of rock in high wall of quarry. LS05073, image property of Bailey Howe Library, Special Collections, University of Vermont. (D) Photograph showing erosion undercutting railroad tracks in Barton, Vermont, after 1927 flood of record. Slopes above tracks are unvegetated and failing. LS02477, image property of Old Stone House Museum.

Vermont has an exceptionally strong, town-centered governmental system, which favors the preservation of imagery at a local level in town halls and historical societies. Thus, both Vermont and the Landscape Change Program archive have exceptional documentation of major cultural transitions (forest clearance, industrialization, suburbanization, and road building) stretching back two centuries. It is these changes that have shaped both today's landscape and society as we know it. In many ways, Vermont is also physiographically representative of much of the United States, a humid, temperate sample of America where metamorphic, sedimentary, and igneous rocks crop out both in rugged mountains and flat-lying low lands.

PHOTOGRAPHS AND GEOLOGY

Many kinds of scientific analysis and hypothesis testing can be done by looking back in time using images. Indeed, rephotography is a powerful way by which to study landscape change (Rogers et al., 1984), both physical (Harrison, 1950) and ecological (Hart and Laycock, 1996). Some of the earliest photographic documentation is that of G.K. Gilbert, who set up marked stations to document change in glacier extent over time (Gilbert, 1904). His well-documented sites can still be located and, together with his original images, have been used to show the dramatic shrinkage of small alpine glaciers over the past century (Harrison, 1974).

Some geologic studies use a few historic images. For example, the stripping of trees and consequent landscape response in Colorado is documented and quantified by a series of images taken over a 115-year period (Graf, 1979). These images were used along with hydraulic models to explain the distribution of stream incision over time and space. This and many other previous uses of historic imagery have focused on western North America, often concentrating on important natural areas photographed by early explorers (Griffiths et al., 2004; Meagher and Houston, 1998; Stephens and Shoemaker, 1987; Webb, 1996).

Other studies use many images. Meagher and Houston investigated primarily biologic change in Yellowstone through image comparisons from two or three different time periods, usually the late 1800s, and before and after the 1988 fire. Webb's interest is more geologic, as he investigated a century of change in the Grand Canyon by rephotographing images of the Stanton Expedition a century later. Both Webb (1996) and Meagher and Houston (1998) summarize changes in tabular form, and Meagher and Houston go on to do statistical analysis. The analysis of Griffiths et al. (2004) goes a step further. Analyzing over 1300 paired images of scenes first photographed as early as 1871, they calculate average debris-flow recurrence intervals in the Grand Canyon. Using these data, they develop a regression model suggesting where such flows are most likely to originate.

USING A DIGITAL IMAGE ARCHIVE TO DO SCIENCE

Widespread adoption of photography in the mid-1800s generated immense numbers of images. Glass plates, negatives, or prints, whether taken of a family picnic by the river or a hotel in the mountains, include far more information and incidental detail than one might suspect, because the resolution of photographic emulsions is so high (Strausz, 2001). For example, images faithfully record in their backgrounds season, vegetation, road types and orientations, stream flows and morphology, and hillslope condition (Fig. 1). Captions and titles can provide even more information, although they may carry the subtle or not-so-subtle biases of the time (Doel and Henson, 2005). Next, we provide three examples of how a searchable Web-based archive can be used to approach scientific and land management questions by analyzing images for the details they contain.

Erosion—The Tree Connection

Based on contemporary studies (Montgomery et al., 2000) as well as studies of geologic archives (Jennings et al., 2003), we reasoned that more erosion would be recorded in deforested than in forested Vermont landscapes. To test this hypothesis, we searched the Landscape Change Program archive using the keywords *clear-cutting*, *landslide*, and *erosion*. From the search results, we categorized images with respect to date, the amount of tree coverage, the size of the eroded area, and other landscape characteristics, including clear-cut slopes, roads, and farming.

We find an inverse relationship between landscape tree cover and the number of images showing erosion (Fig. 2A), suggesting that relationships determined by modern processes studies hold true over 150 years. Of the 342 images in the Landscape Change Program archive that show erosion, 222 had no trees or almost no trees near the eroded site (65%). Conversely, only nine images showing erosion had complete forest cover near the eroded site (3%). Smaller areas of erosion are always more common than larger areas of erosion, no matter what the tree cover. If we normalize for

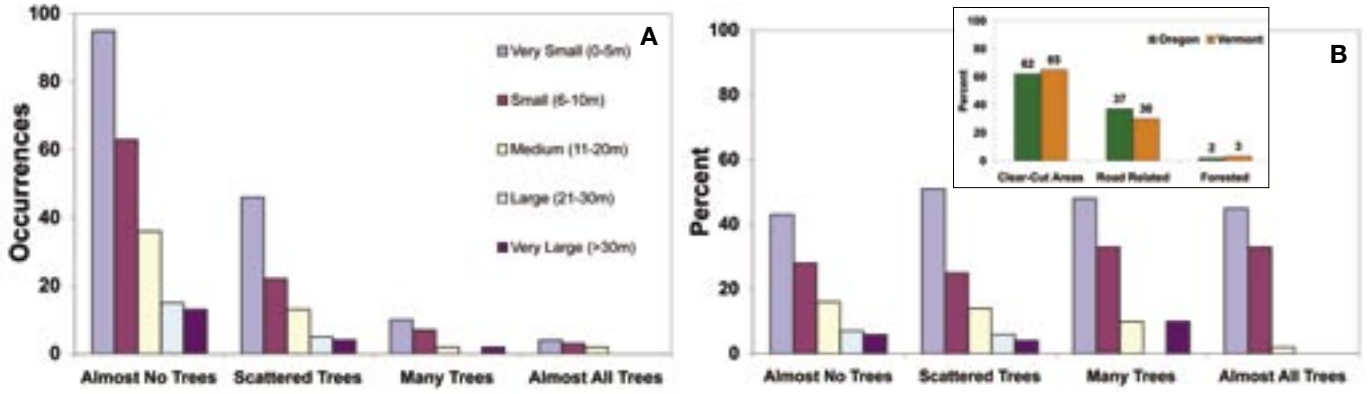

Figure 2. Relationship between tree cover category, erosion, and estimated width of eroded area. (A) Areas of erosion (all width classes) are most common in images with few trees and least common in images with full tree cover. Color key indicates approximate width of eroded area. (B) When normalized for the number of images showing erosion, the size distribution of eroded areas does not depend on the amount of forest cover (i.e., there are fewer large areas of erosion and more small areas of erosion independent of the number of trees on the landscape). Inset compares percentage of images showing erosion classified by land-use/cover classes (Vermont historical image analysis) to percentage distribution of erosion by land-use/cover in Oregon after the intense 1996 storm cycle (Association of Forest Service Employees for Environmental Ethics, 1996). In both studies, the presence of roads and the absence of trees are correlated with erosion.

the frequency of erosion in each tree cover class, the size distributions of erosion areas are similar (Fig. 2B).

From the analysis of these images, we conclude that the removal of woody vegetation from Vermont slopes increased the frequency of erosion. This finding echoes contemporary studies done in the Pacific Northwest (Montgomery et al., 2000) and provides additional support for the suggestion, based on analysis of alluvial fan and lake sediment archives, that New England landscapes eroded rapidly in response to settlement and continued land clearance through the nineteenth century (Bierman et al., 1997; Jennings et al., 2003; Noren et al., 2002). Photographic data from Vermont, spanning nearly 150 years, clearly indicate where, and thus why, such erosion happens (Fig. 2, inset). People catalyze erosion by clearing slopes and building roads (Wemple et al., 2000).

Simple, infinite slope, force-balance models for shallow planar landslides suggest one process by which removal of trees reduces slope stability (Montgomery et al., 2000; Roering et al., 2003). Measurements suggest that tree roots provide 1–12 kPa of effective cohesion (Selby, 1993). Although these values are only a small portion (<1%–30%) of the cohesion (Selby, 1993) of glacial clay (30–70 kPa) or till (150–250 kPa), so common in New England, calculations show that tree roots provide just enough cohesion to hold steep (25–35°), sandy slopes together and thus prevent shallow landsliding during saturated conditions for low cohesion materials such as sand (Fig. 3). Many nineteenth century images show shallow planar landslides on steep, deforested, sandy Vermont hillslopes (e.g., Fig. 4), landsliding we attribute to the loss of effective root cohesion. The process is simple. People clear trees from

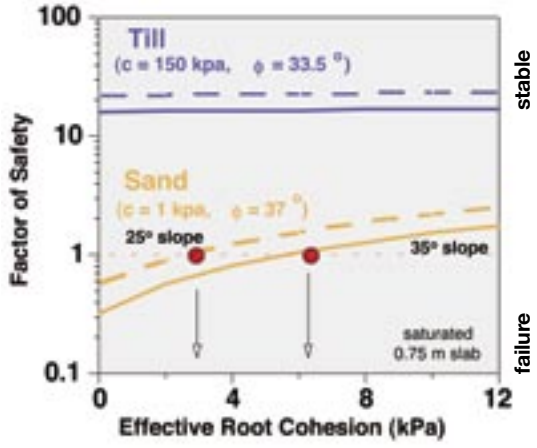

Figure 3. Results of infinite slope stability model. Slopes will fail if factor of safety drops below 1. Till slopes (25° = dashed line and 35° = solid line) have large factors of safety even when saturated and do not fail. Sandy slopes, with little or no cohesion (c), require only the modest effective cohesion provided by tree roots (3–6 kPa) to remain stable when saturated on 25° (dashed line) to 35° slopes (solid line). Red dots represent onset of stable conditions; factor of safety (resisting/driving force) = 1.

Figure 4. View of clear cut area, Champlain Spring, Highgate, Vermont, late 1800s. In the background are landslides on a steep, cleared slope. Field work suggests failures are in silty, fine sand, glacial lake deposits of the Champlain lowland. These shallow planar slides were likely catalyzed by loss of effective root strength after clear-cutting of the slope (see Fig. 3). In the middle ground are many stumps and much slash, the remains of cutting second-growth timber. There is a spring house at the center of the image. Note the tremendous size of the stump on which the man is sitting; it is likely all that remains of the old growth, pre-settlement forest that once covered Vermont lowlands like this. Image property of University of Vermont, Special Collections, Bailey Howe Library (LS03668).

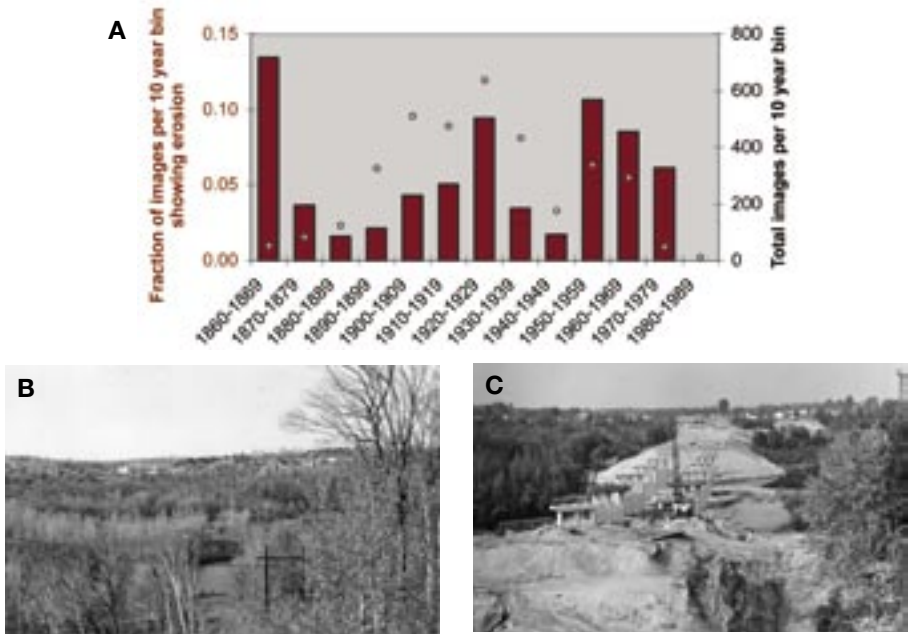

Figure 5. The frequency of images showing erosion has changed over time. (A) Percentage of images in the archive (binned in 10 yr intervals) that show erosion. Open circles show total number of images per bin. (B) Photograph (May 11, 1961) of South Burlington before interstate construction showing wooded slopes above Winooski River. (C) Same view as B but during construction of I-89 (Oct. 10, 1961), showing scale of disturbance and erosion related to road building. Images by D. Wiedenmayer; property of Vermont State Archives.

Figure 6. Examples of riparian zone images used to calculate riparian buffer quality index. (A) Category 1 (score = 1 pt): no riparian buffer. Montpelier, Vermont (LS04060; no date). View across the Winooski River from a farm field. Note large glacial erratics in foreground. Image property of Vermont Historical Society. (B) Category 2 (score = 2 pt): ≤50% riparian buffer. Barton, Vermont (LS03795; no date). Image shows a bend in a river with complete riparian buffer on the left and no buffer on the right. Grazing cows on the cleared bank keep pasture open. Image property of Old Stone House Museum. (C) Category 3 (score = 3 pt): >50% riparian buffer. Bolton, Vermont (LS06204; 1960). Oblique aerial photo shows the construction of I-89 at Bolton flats. Winooski River at right. Farms and fields in the valley bottom with extensive riparian buffer. Image property of Vermont State Archives. (D) Category 4 (score = 4 pt): 100% riparian buffer. Hartford, Vermont (LS01482, 2004). A full riparian buffer is present along both sides of the Connecticut River.

slopes and keep the slopes clear for grazing, preventing regrowth of new trees and new roots. Once the old roots rot or the stumps are pulled, root strength is gone, and the treeless hillslopes are primed for failure, awaiting only a storm large enough to saturate the ground (D'Odorico and Fagherazzi, 2003).

The distribution over time of images depicting erosion reveals relationships to both significant natural and human events and suggests the influence of major cultural transitions. The frequency distribution of erosion images has three peaks (the 1860s, the 1920s, and the 1960s; Fig. 5A). The first peak just predates maximum land clearance in Vermont. The second peak is coincident with the 1927 flood of record, and the third peak occurs during construction of the interstate highway system. Broader cultural changes also influence the timing of erosion maxima. The steady rise in the frequency of erosion images from 1900 to 1930 probably reflects the advent of the automobile and the road building and improvement that followed. Similarly, we suspect that the rapid rise in erosion frequency after 1960 and the slow decline thereafter reflects the massive land disturbance occasioned by building the interstate highways (Fig. 5B and 5C).

Riparian Buffers—Coming Back

Riparian buffers, the woody vegetation found along streams and rivers, serve a number of important roles, including stabilization of stream banks, moderation of stream flow, provision of habitat, and recruitment sources for large woody debris (Abbe and Montgomery, 1996; Wagner, 1999). Buffers are often destroyed by agriculture and forestry practices (Robbins, 1997) as well as by residential development. Although riparian zones are the focus of extensive protection and restoration efforts (Langston, 2003), there appears to be little documentation of how the extent of buffers has changed over decadal timescales.

We analyzed over 400 photographs of streams and rivers from the Landscape Change Program archive to determine how the continuity of woody riparian buffer vegetation changed over the past 150 years. To quantify change over

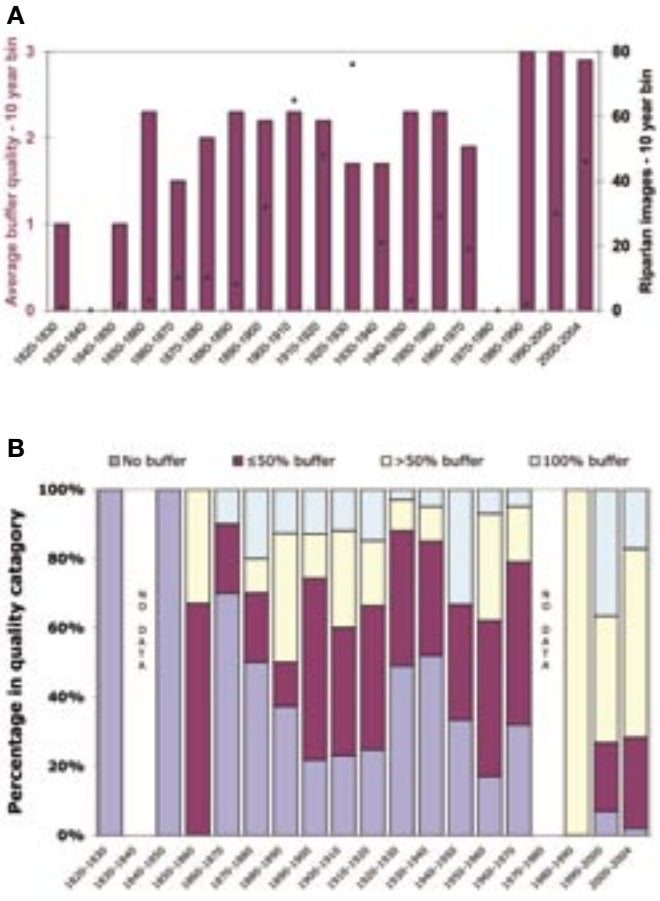

Figure 7. Riparian zone quality has changed over time. (A) Between 1850 and 1970, the average riparian zone quality index (shown by plum bars) varied between 1.5 and 2.3; after 1980, the index rises to ~3. Black circles indicate number of images analyzed per 10 yr bin. Riparian images not available for times with no data. (B) The distribution of riparian zone quality in Vermont has changed through time. The prevalence of river margins with no buffer decreased between 1850 and today. In the past 25 yr, the prevalence of river margins with >50% tree cover has increased.

time, we defined a riparian buffer quality index, in which images showing no buffer (Fig. 6A) were assigned to category 1 (and given a score of 1). Images showing a fully forested buffer along the river or stream banks were assigned a rank and score of 4 (Fig. 6D). Sorting the images by decade, we calculated an average quality index for every 10 yr interval (Fig. 7A).

Dozens of nineteenth century images document riparian zones along Vermont streams with little or no buffering by woody vegetation. Similar impacts on riparian zones from settlement, agriculture, mining, and forestry practices in the 1800s and early 1900s have been noted in the Pacific Northwest (Langston, 2003; Robbins, 1997; Taylor, 1999). The continuity of vegetated, riparian zone buffers along Vermont streams and rivers has improved over time; specifically, the prevalence of river margins with no buffer at all (category 1) decreased over the past 150 years (Fig. 7B). The decrease in completely cleared riparian zones may reflect the move away from wood as both a source of energy and as the dominant structural material for building and fencing (Robbins, 1997).

From 1850 to 1970, the average riparian buffer quality index we defined varied between 1.5 and 2.3 with no trend. After 1980, the average rose and remained at ~3, a substantial increase (Fig. 7A). This step-function increase in the riparian vegetation quality index occurred during the 1980s, ~20 years after community forests were planted, the environmental movement started, and the decline of the Vermont dairy farm began. In the past 25 years, the prevalence of river margins with greater than 50% tree cover has also increased. A similar trend of recently increased riparian vegetation has been identified by analyzing >3000 repeat photography images from the southwestern United States (Webb and Leake, 2005).

The in-stream effects of increasing riparian zone vegetation could be significant. Although it may not be possible to tease apart the effects of changing sediment delivery over time related to reforestation (Trimble, 1999) and watershed development (Wolman and Schick, 1967), the increase in riparian buffer zone continuity over time is likely to affect channel geometry, including width and depth (Hession et al., 2003; Trimble, 1997), as well as improve aquatic ecosystem function (Sweeney et al., 2004).

Characterizing Flood Effects

In 1927, a November flood, with peak flows typically two times higher than other recorded events, struck Vermont (http://www.uvm.edu/perkins/landscape/1927_flood/flood.htm). The flood destroyed more than 1000 bridges and caused significant channel change and channel bank erosion. October 1927 had been very wet, leaving soils saturated. The storm dropped up to 22 cm of rain in central Vermont, with at least 12.5 cm falling over most of the state (National Weather Service, 2002). Within days of the devastating flood, the U.S. Army flew over Vermont, photographing the damage. Of the 90 images taken, 67 are extant. During the summer of 2004, these 67 historical images were rephotographed to show the changes in riparian corridors, development, and channel characteristics. We also examined hundreds of ground-level images taken both during and after the flood. Many of these images allow identification of flood heights; river stage determined this way is a valuable tool for flood hazard evaluation.

Modern rephotography of flood and post-flood aerial images allows us to quantify changes that have occurred since 1927 (Fig. 8). Examination of the 67 pairs of aerial images shows that between 1927 and 2004, forest cover increased in 70% of the images, new roads were built in almost 60%, development altered the landscape in almost 50%, and vegetation cover in riparian zones increased in over 60% of the images. These changes have differing effects on surface water hydrology, with reforestation tending to reduce peak flows and storm flow volumes, whereas development and road building both tend to increase runoff and storm peaks (Dunne and Leopold, 1978). The increase in riparian zone cover is consistent with the data from ground photos (Fig. 7).

IMPLICATIONS

The rapid expansion of the World Wide Web, and the consequent ability of anyone to find and analyze large numbers of images, opens up a new way of looking at landscapes over space and time (see GSA Data Repository Item Table

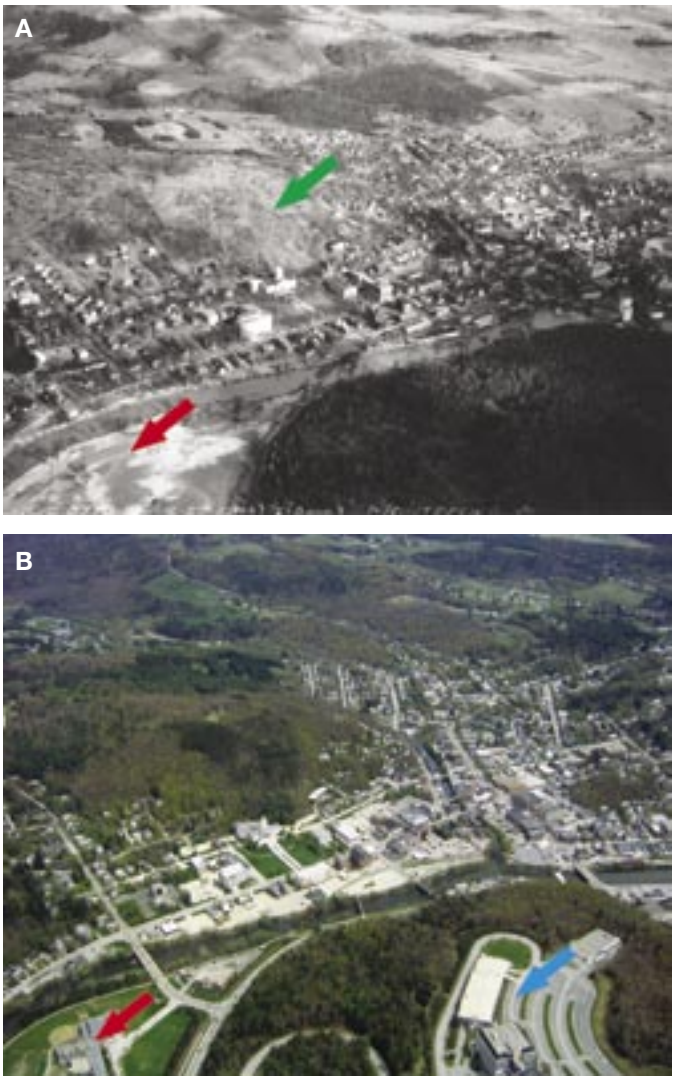

Figure 8. Paired oblique aerial images of Montpelier including the Winooski River. (A) Photograph from several days after the 1927 flood shows overbank deposits alongside the channel and over point bars (red arrow). Much of the hills remain deforested, including the area behind the Vermont State House (green arrow). All bridges over the river have been destroyed. LS01429, image property of Special Collections, Bailey Howe Library, University of Vermont. (B) Similar view photographed in summer 2004. Significant reforestation has covered many slopes with trees. A high school now occupies the point bar (red arrow) and forest cover in the lower right is broken by parking lots and a large office complex (blue arrow). Bridges again cross the river and the riparian zone is better vegetated. (C) Characterization of image pairs (n = 67) showing percentage in which characteristics studied (forest cover, development, riparian cover, and roads) either remained similar (no change) or increased.

DR1[1] for examples of online image archives). In this paper, we present several examples of science that can now be done because such image archives exist. Without the ability to study at least hundreds of relevant images, results such as those we present would have little statistical significance.

As online archives grow in popularity and size, similar types of analyses should be feasible all over the world, with increasing statistical power as sample sizes grow larger. The range of image-based, interdisciplinary research projects that can be undertaken will increase. Images could be used to examine tree species distribution over time in response to landscape disturbance (Cogbill et al., 2002), link landscape disturbance to changing settlement dynamics (Wessels, 1999), and find long-ago-demolished gasoline stations to map the distribution of environmentally hazardous, abandoned underground storage tanks (Vermont Agency of Natural Resources, 2004, personal commun.).

The approach we describe here could be replicated in other physiographic provinces and climatic zones. Research questions would differ in arid, tropical, or subpolar regions, and the length of the photographic record varies from place to place, but much of the world has archives of landscape images. These images, as they move out of attics, onto the Web, and into the hands of natural scientists and others, have many important geologic, environmental management, and ecologic stories to tell. The impact of such research could be very broad, encompassing related disciplines such as historical ecology (Cronon, 1983; Russell, 1998) and the historical evolution of human-landscape interaction over time (Nash, 1967).

ACKNOWLEDGMENTS

The Landscape Change Program is supported by Lintilhac and National Science Foundation grants EAR-9907724 and EAR-0122005, including a Research Experience for Undergraduates supplement. We thank L. Mallard, D. Elvin, W. Wright, L. Persico, C. Burns, G. Sanford, C. Manduca, C. Carter, S. Snyder, M. McGee, and K. Lenorovitz for their contributions to this project. Insightful reviews by R. Webb, T. Hanks, K. Howard, and R. Doel greatly improved earlier versions of this paper.

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[1]GSA Data Repository Item 2005065, Table DR1, Examples of online image archives potentially useful for geologic analysis, is available on request from Documents Secretary, GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA, editing@geosociety.org, or at www.geosociety.org/pubs/ft2005.htm.

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Manuscript received December 6, 2004; accepted January 4, 2005. ◎

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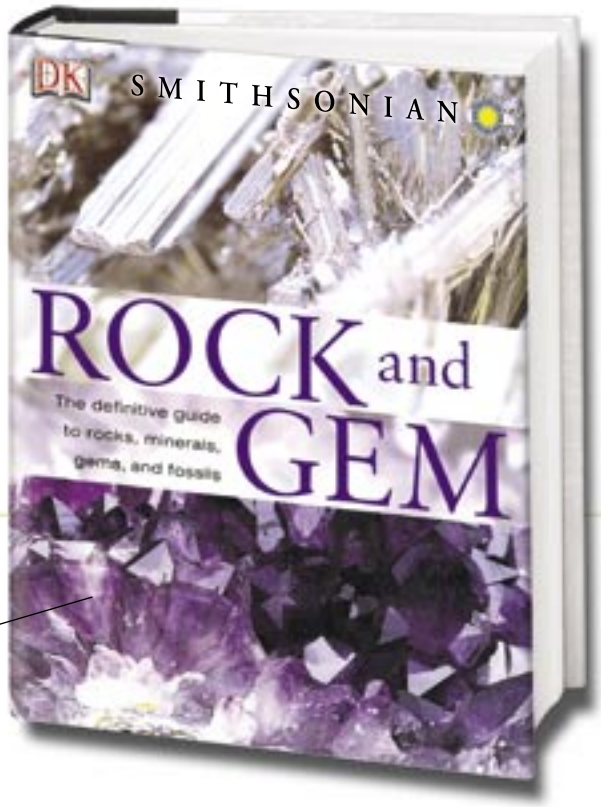

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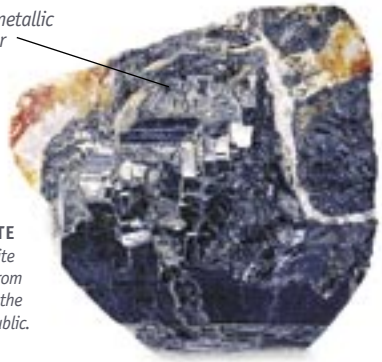
Adamantine luster

RED CROCOITE
These well-formed prismatic crocoite crystals are from the classic Dundas, Tasmania, locality.

Prismatic crystals

Submetallic luster

FERBERITE
This ferberite crystal is from Cínovec in the Czech Republic.



Iron oxide groundmass

Greasy luster

WULFENITE
The wulfenite crystals on this groundmass composed principally of iron oxides show classic square, platy development.

Tabular wulfenite crystal

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Letter

Dear Editor,

In the October issue*, Paul Renne and Igor Villa urge the GSA to abandon what they feel is unofficial (non-SI [Sisteme International]) usage to express "time differences" (millions of years) as opposed to ages (Ma or million anna). They are confusing intervals with points. A physical analogy is mileposts. Each carries a number chosen to identify the post and to coincide with a distance from a chosen point measured in SI units (kilometers). Similarly, anna are not units but designators of points in time (events). For obvious utility, they are chosen to also designate an interval of years from a chosen point, the present. It is meaningless to subtract one point value from another to obtain an interval.

As for the SI definition, the supplementary, widely used English unit is the year, annum being only the Latin equivalent. The year is defined relative to the SI second but also, especially for geological processes, astronomically. Although the astronomical year likely varied over geological time, making the exact link between the present year and those in the distant past imprecise, for most practical purposes this can be ignored.

The traditional bipartite usage thoroughly embedded in the English geological literature suggests that retaining it would minimize confusion and retain the necessary distinction between points and intervals.

Sincerely,
Andrew V. Okulitch, Emeritus Scientist
Geological Survey of Canada

*October 2004 *GSA Today*, v. 14, no. 10, p. 62

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SLC 2005

Science • Learning • Colleagues

GSA Annual Meeting & Exposition

16–19 October 2005, Salt Palace Convention Center, Salt Lake City, Utah

Greetings!

From surprising discoveries on Titan to the devastation of the December tsunami to climate change, recent events remind us of the intricacy and power of nature and the need to better understand our dynamic world. We face difficult challenges and exciting opportunities. How will our growing population interact with complex earth systems? What can we learn from the past to help us understand our future? How can we better utilize natural resources and more safely cope with geologic hazards? How should we be educating our children and our communities about science? How will we utilize evolving technologies and better communicate across disciplines?

The 2005 Annual Meeting is shaping up to be a truly exciting opportunity to explore these challenges and opportunities, by sharing our Science, expanding our Learning, and collaborating with our Colleagues. Combine a diverse range of special topic and discipline sessions with stimulating Hot Topic dialogues on controversial issues, season with great field trips, add the dramatic geologic backdrop of Salt Lake City, and you have all the ingredients for a great meeting!

Your participation will help make this a vibrant time where we can share new ideas and build new bridges. Submit an abstract to one of the many topical sessions or to an open discipline session and then encourage your students and colleagues to do the same. At the meeting, plan to attend a Pardee Symposium, Hot Topics session, or Public Forum, and explore sessions outside your area. Attend a workshop to expand your horizons, visit exhibits, take advantage of special events, and at the end of the day, explore fine microbreweries and restaurants.

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Adolph Yonkee
General Chair, Salt Lake City Local Committee

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Registration Opens:	Early June
Abstracts Deadline:	12 July
Standard Registration Deadline:	12 Sept.
Cancellation Deadline:	19 Sept.
Premeeting Field Trips:	Thurs.–Sat., 13–15 Oct.
Short Courses & Workshops:	Fri.–Sat., 14–15 Oct.
Presidential Address & Awards Ceremony:	Sat., 15 Oct., 7–9 p.m.
Welcoming Party & Exhibits Opening:	Sun., 16 Oct., 5:30–7:30 p.m.
Technical Program:	Sun.–Wed., 16–19 Oct.
Pardee Keynote Symposia:	Sun.–Wed., 16–19 Oct.
Private Alumni Reception:	Mon., 17 Oct., 5:30 p.m.–1 a.m.
Group Alumni Reception:	Mon., 17 Oct., 7–9:30 p.m.
Exhibit Hall Hours:	Sun., 16 Oct., 5:30–7:30 p.m.
	Mon.–Tues., 17–18 Oct., 9 a.m.–5:30 p.m.
	Wed., 19 Oct., 9 a.m.–2 p.m.
Hot Topics:	Sun.–Wed., 16–19 Oct., 12:15–1:15 p.m.
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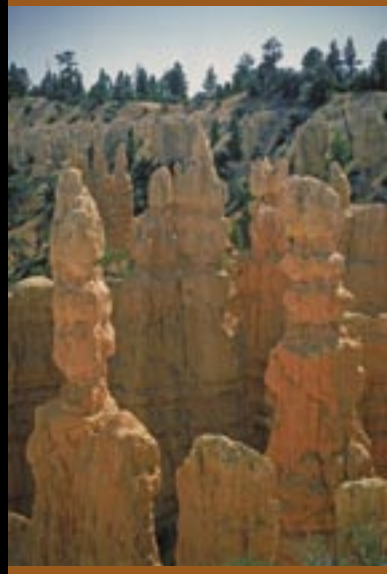

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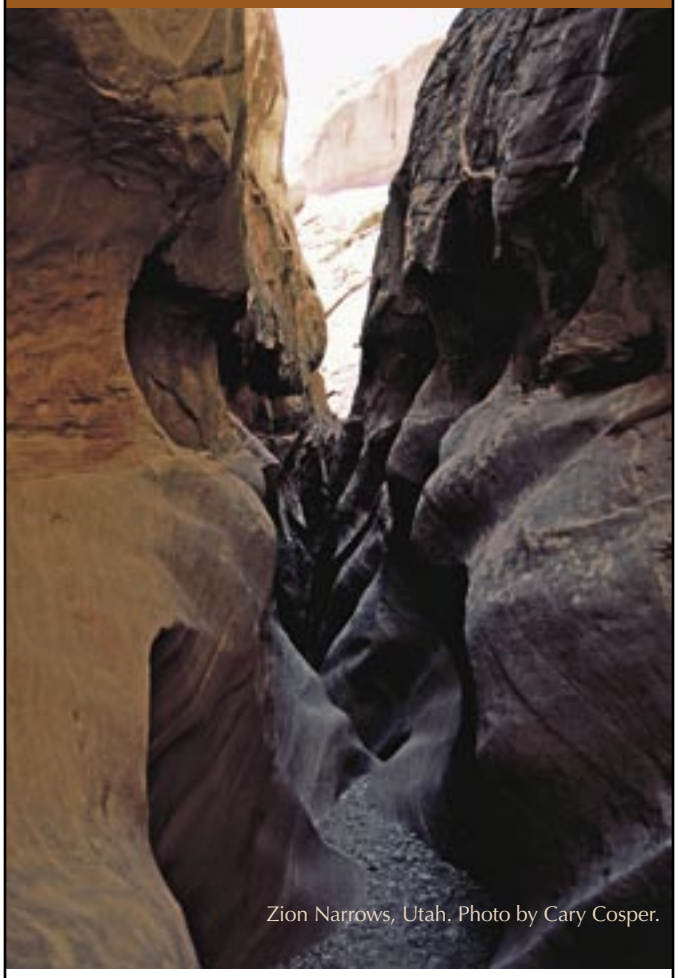

Zion Narrows, Utah. Photo by Cary Cosper.

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Thank you!

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***GSA welcomes these new Associated and Allied Societies!**

Pardee Keynote Symposia

INVITED PAPERS

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

These Pardee keynote sessions are *special events* of broad interest to the geoscience community. They represent hot issues on the leading edge in a scientific discipline or area of public policy, address broad fundamental issues, and are interdisciplinary. Selection was on a competitive basis. This year's eight Pardee Symposia were reviewed and accepted by the Annual Program Committee. ***(All speakers are invited.)***

P1. 2004 South Asian Tsunami
GSA Geophysics Division; GSA International Division; GSA Sedimentary Geology Division; GSA Structural Geology and Tectonics Divisions; GSA Geology and Society Division

Marine/Coastal Science; Neotectonics/Paleoseismology; Public Policy

Joanne Bourgeois, University of Washington, Seattle, Wash.; Brian F. Atwater, U.S. Geological Survey, Seattle, Wash.

The South Asian Tsunami of 26 December 2004 raises questions about the parent earthquake, the tsunami's generation and runup, and global access to the benefits of science.

P2. Research Opportunities, New Frontiers, and the Questioning of Paradigms in Structural Geology and Tectonics: Celebrating the 25th Anniversary of the SGT Division
GSA Structural Geology and Tectonics Division; NSF Tectonics Program

Structural Geology; Tectonics; Neotectonics/Paleoseismology

William Matthew Dunne, University of Tennessee, Knoxville, Tenn.; John Geissman, University of New Mexico, Albuquerque, N.Mex.; David Lageson, Montana State University, Bozeman, Mont.; Elizabeth Schermer, Western Washington University, Bellingham, Wash.; Peter Vrolijk, ExxonMobil Upstream Research Co., Houston, Tex.

The Structural Geology and Tectonics Division will use the opportunity of its 25th anniversary to convene a group of 12 leading geoscientists to present papers about exciting new opportunities and frontiers for the future of structural geology and tectonics, while encouraging all to challenge existing paradigms.

P3. Science, Politics, and Environmental Policy
GSA Geology and Society Division; Geology and Public Policy Committee; U.S. Geological Survey Science Impact Program

Public Policy; Geoscience Information/Communication; Geoscience Education

Herman A. Karl, Massachusetts Institute of Technology and U.S. Geological Survey, Cambridge, Mass.; Judith A. Layzer, Massachusetts Institute of Technology, Cambridge, Mass.

Too often scientists find their work ignored, marginalized, or misrepresented in environmental policy debates. This session explores the relationship between science and politics and describes emerging processes that aim to improve the effectiveness of science in environmental problem solving.

P4. Speaking Out for Evolution: Rationale and Resources for Supporting the Teaching of Evolution
Paleontological Society; Society of Vertebrate Paleontology

Geoscience Education; Paleontology, Diversity, Extinction, Origination; Stratigraphy

Judy Scotchmoor, University of California Museum of Paleontology, Berkeley, Calif.; Carol M. Tang, California Academy of Sciences, San Francisco, Calif.

Hear the latest efforts to strengthen the teaching of evolution, deep time, and geologic history in American classrooms. Through talks and a panel discussion, understand the relevance, strategies, resources, rationale, and support for teaching evolution.

P5. The 2004–2005 Eruption of Mount St. Helens: New Insights and Hazard Management of an Extraordinary Dacitic Dome-Growth Eruption
GSA Quaternary Geology and Geomorphology Division; GSA Geophysics Division; GSA Engineering Geology Division

Volcanology; Geophysics/Tectonophysics/Seismology; Geoscience Information/Communication

Jon Major, U.S. Geological Survey, Vancouver, Wash.; Cynthia Gardner, U.S. Geological Survey, Vancouver, Wash.

The 2004–2005 eruption of Mount St. Helens afforded unprecedented documentation of uncommonly rapid, steady-state growth of a lava dome. This session explores connections among petrology, geodesy, geochemistry, seismicity, mechanics, hydrology, hazard management, and public communication associated with dacitic dome growth.

P6. The Return to Saturn: Results from Cassini-Huygens
GSA Planetary Geology Division

Planetary Geology; Remote Sensing/Geographic Info System; Geoscience Education

Thomas R. Watters, Smithsonian Institution, Washington, D.C.; Louise Prockter, Applied Physics Lab, Laurel, Md.

Twenty-three years after the last robotic probe encountered Saturn, the Cassini-Huygens mission is returning unprecedented views of the gas giant, its rings, and its moons. The session will present the latest results from this international mission of science and exploration.

P7. The Wasatch Range–Great Salt Lake Hydroclimatic System
GSA Hydrogeology Division; International Association of Hydrogeologists/U.S. National Chapter; American Geophysical Union; GSA Quaternary Geology and Geomorphology Division; Friends of the Great Salt Lake

Hydrogeology; Quaternary Geology/Geomorphology; Paleoclimatology/Paleoceanography

(Pardee Symposia, continued)

Christopher J. Duffy, Pennsylvania State University, University Park, Pa.; Danny Marks, Agricultural Research Service, U.S. Department of Agriculture, Boise, Idaho; David G. Tarboton, Utah State University, Logan, Utah; Craig B. Forster, University of Utah, Salt Lake City, Utah

Broadly interdisciplinary session on the dynamic Wasatch Range–Great Salt Lake system will integrate geologic, hydrologic, and ecologic issues of the water cycle, under pressure today from climate change and resource manipulation.

P8. Water Resources Science and Public Policy
GSA Hydrogeology Division; GSA Geology and Society Division; Geology and Public Policy Committee

Hydrogeology; Public Policy; Environmental Geoscience

David M. Diodato, U.S. Nuclear Waste Technical Review Board, Arlington, Va.; Peter F. Folger, American Geophysical Union, Washington, D.C.; Tamara L. Dickinson, National Academy of Sciences, Washington, D.C.

The health and economic security of American citizens depend upon a safe and reliable water supply. At this symposium, prominent national policy makers and scientists discuss present and future challenges and opportunities of water resources science and public policy.

Topical and Discipline Sessions

Abstracts Deadline: July 12

TOPICAL SESSIONS

Below is a listing of all approved topical sessions. These sessions are topically focused with a mix of invited and volunteered papers. Sessions are designed to promote the exchange of interdisciplinary, state-of-the-art information. Papers can be submitted to a specific topical session and you may choose up to three scientific categories. After each topical description below, the categories are identified as they appear on the abstract form. PLEASE SUBMIT ONLY IN THE MODE (oral or poster) AND CATEGORIES INDICATED in the description. An abstract submitted in the incorrect mode will be transferred automatically to a discipline session.

ABSTRACTS DEADLINE: JULY 12

Please use the online electronic abstract form found on the GSA Web site, www.geosociety.org. An abstract submission fee will be charged. The fee is $18 for all students; $30 for all others. If you cannot submit your abstract electronically, contact Nancy Carlson, (303) 357-1061, ncarlson@geosociety.org.

DISCIPLINE SESSIONS

From the list found on the electronic abstract form, you may choose up to three discipline categories you feel your abstract would best fit. Joint Technical Program Committee representatives organize the papers in sessions focused on disciplines (e.g., environmental geoscience, mineralogy).

T1. Centennial Celebration Symposia for the Society of Economic Geologists
Society of Economic Geologists

Economic Geology; Petrology, Igneous; Tectonics

Brian Hoal, Society of Economic Geology, Littleton, Colo.

This session will present speakers from the 100th Anniversary Volume of the Society of Economic Geologists. ORAL

T2. Advances in Geophysics and New Techniques: Lithospheric and Crustal Architecture, Ore Deposit Visualization, and New Technologies in Analytical Techniques and Mineral Processing
Society of Economic Geologists

Economic Geology; Geophysics/Tectonophysics/Seismology; Remote Sensing/Geographic Info System

Joe Inman, Kennecott Exploration, Salt Lake City, Utah; Ricardo D. Presnell, Kennecott Exploration, Salt Lake City, Utah, Albania; Karin O. Hoal, Golden, Colo.

This session will present advances in our understanding of the architecture of the crust and lithosphere from imaging of geophysical and various other datasets and their application and implication to ore deposit formation. ORAL

T3. Advances in the Understanding of Tectonic Settings and Structural Control of Ore Deposits
Society of Economic Geologists

Economic Geology; Tectonics; Structural Geology

John F. Thompson, Teckcominco, Vancouver, British Columbia

This session will present advances in our understanding of the tectonic setting and structural control of ore deposits. ORAL

T4. Sources of Porphyry Copper Deposits: Magmas, Metals, and Fluids
Society of Economic Geologists

Economic Geology; Petrology, Igneous; Geochemistry, Other

Jeff Hedenquist, Ottawa, Ontario; Ricardo D. Presnell, Kennecott Exploration, Salt Lake City, Utah

This session will provide a forum for the presentation of new data on igneous rocks, fluid chemistry, and genesis from porphyry copper deposits. ORAL

T5. The Evolving Earth: Implications for Ore Deposit Formation, Evolution, and Benefaction
Society of Economic Geologists

Economic Geology; Tectonics; Precambrian Geology

Murray Hitzman, Colorado School of Mines, Golden, Colo.

This session will explore the relationship between ore deposit formation and the evolution of the earth. ORAL

T6. Borates, Uranium, Mineral Sands and Bulk Commodities: Deposit Models, Processes, and Descriptions
Society of Economic Geologists

Economic Geology; Limnogeology; Coal Geology

Ricardo D. Presnell, Kennecott Exploration, Salt Lake City, Utah

This session will provide a forum for the presentation of deposit models, processes, and descriptions of non-metallic bulk commodities such as borates, uranium, mineral sands, iron-ore, coal, and other industrial minerals. ORAL

T7. A Tribute to Hans-Olaf Pfannkuch: From Darcy to the Modern World of Environmental and Contaminant Hydrogeology
GSA Hydrogeology Division; American Institute of Hydrology; Minnesota Ground Water Association

Hydrogeology; Environmental Geoscience; History of Geology

E. Calvin Alexander Jr., University of Minnesota, Minneapolis, Minn.; Martin O. Saar, University of Minnesota, Minneapolis, Minn.

Hans-Olaf Pfannkuch and his students have had a large impact on the application of hydrogeologic tools in Minnesota and the United States. Presentations will cover the history, present, and future of environmental and contaminant hydrogeology. ORAL

T8. Artificial Recharge of Groundwater—Hydrogeologic Characterization and Implementation
GSA Hydrogeology Division

Hydrogeology; Environmental Geoscience; Public Policy

Hugh A. Hurlow, Utah Geological Survey, Salt Lake City, Utah; Mike Lowe, Utah Geological Survey, Salt Lake City, Utah; Marek Matyjasik, Weber State University, Ogden, Utah

Topics include the role of geologic, geophysical, and hydrologic characterization in the design and function of artificial recharge projects, and use of artificial recharge as a tool for the conjunctive management of water resources. ORAL and POSTER

T9. Bedrock Infiltration: Advances in Understanding Vadose-zone Processes, Percolation through Macropores and Shallow Soils, and Recharge to Consolidated-Rock Aquifers
International Association of Hydrogeologists; GSA Hydrogeology Division

Hydrogeology; Geochemistry, Aqueous; Geophysics/Tectonophysics/Seismology

Victor M. Heilweil, U.S. Geological Survey, Salt Lake City, Utah; Lorraine E. Flint, U.S. Geological Survey, Sacramento, Calif.

This session focuses on understanding bedrock infiltration and recharge in a variety of climates and geologic settings. We encourage papers on field studies, macropore flow, soil physics, plant dynamics, contaminant transport, environmental tracers, and modeling. ORAL

T10. Chemistry, Ecology, and Groundwater Hydrology of Lakes, Streams, Playas, and Springs: Observations at the Interface
GSA Hydrogeology Division; GSA Limnogeology Division; GSA Geobiology and Geomicrobiology Division

Limnogeology; Geochemistry, Aqueous; Geomicrobiology

Alison J. Smith, Kent State University, Kent, Ohio; Donald Rosenberry, U.S. Geological Survey, Denver, Colo.; Emi Ito

This session will highlight the many ways in which mixing of surface water and groundwater provides a unique ecological niche and generates chemical reactions that modify the hydrochemical budget and sediment record of many surface water bodies. ORAL and POSTER

T11. Dissolution, Precipitation, and Redox Reaction Kinetics in Aquifers
GSA Hydrogeology Division; Geochemical Society; GSA Geobiology and Geomicrobiology Division

Geochemistry, Aqueous; Hydrogeology; Environmental Geoscience

Chen Zhu, Indiana University, Bloomington, Ind.; Mark Person, Indiana University, Bloomington, Ind.; Niel Plummer, U.S. Geological Survey, Reston, Va.

Aquifers are major sites of water-rock interactions, and reaction rates in aquifers are important to many geological and environmental problems. We encourage papers in field, laboratory, and modeling studies of groundwater systems. ORAL

T12. Environmental Issues Related to Oil and Gas Exploration and Production

GSA Hydrogeology Division; International Association of GeoChemistry (IAGC)

Hydrogeology; Environmental Geoscience; Geochemistry, Aqueous

Yousif K. Kharaka, U.S. Geological Survey, Menlo Park, Calif.; James K. Otton, U.S. Geological Survey, Lakewood, Colo.

Papers on past and present impacts to soil, water, and ecosystems caused by exploration and production of petroleum and coal-bed methane. We seek general presentations, case histories, and new methodologies that minimize impacts and improve site remediation. ORAL and POSTER

T13. Fault Zone Controls on Fluid Movement, Earth Resources and Processes: Perspectives from Field, Laboratory, and Modeling Studies

GSA Hydrogeology Division; GSA Structural Geology and Tectonics Division; GSA Geophysics Division

Hydrogeology; Structural Geology; Geophysics/ Tectonophysics/Seismology

Victor F. Bense, Indiana University, Bloomington, Ind.; Jonathan Caine, U.S. Geological Survey, Denver, Colo.

This session is intended to bring together people from diverse disciplines (e.g., groundwater hydrologists, geologists, petroleum engineers, numerical modelers) who face similar challenges in the geological characterization of fault zones and their impacts on fluid flow in the Earth's upper crust. ORAL and POSTER

T14. Flowpaths Integrating Terrestrial and Aquatic Components of Catchment Ecosystems

GSA Hydrogeology Division; GSA Geobiology and Geomicrobiology Division

Hydrogeology; Geochemistry, Aqueous; Geomicrobiology

Madeline E. Schreiber, Virginia Tech, Blacksburg, Va.; H. Maurice Valett, Virginia Tech, Blacksburg, Va.

Hydrologic and biogeochemical flowpaths connect terrestrial and aquatic environments and play important roles on the function of catchment ecosystems. Presentations on the role of these flowpaths in both natural and engineered settings are encouraged. ORAL

T15. Groundwater Quality and Quantity Interconnections: The Effects of Natural and Anthropogenic Contamination on Groundwater Availability

GSA Hydrogeology Division; National Ground Water Association/Association of Ground Water Scientists and Engineers

Hydrogeology; Environmental Geoscience; Geochemistry, Aqueous

Michael J. Moran, U.S. Geological Survey, Rapid City, S.Dak.; Vicki Kretsinger, Luhdorff and Scalmanini, Consulting Engineers, Woodland, Calif.

This session will focus on the interconnections between groundwater quality and quantity including the effect that quality can have on the volume of groundwater that is effectively available for present and future human and ecological needs. ORAL

T16. Hydrogeology and Climate Change: Insights from the Past

GSA Hydrogeology Division

Hydrogeology; Limnogeology; Quaternary Geology

Vicki Remenda, Queens University, Kingston, Ontario; Mark Austin Person, Indiana University, Bloomington, Ind.

Groundwater flow systems can respond to climate change on time scales of decades to millennia. This session focuses on isotopic, sedimentological, and geochemical evidence for Holocene and Pleistocene hydrogeologic change within watersheds and sedimentary basins. ORAL and POSTER

T17. Identification, Quantification, and Simulation of Contaminant Exchange at the Atmosphere and Land Interface

GSA Hydrogeology Division

Geochemistry, Aqueous; Hydrogeology; Limnogeology

William Blanford, Louisiana State University, Baton Rouge, La.; Thomas Boving, University of Rhode Island, Kingston, R.I.

The exchange mechanisms for contaminants between atmosphere and land are poorly understood. This session seeks to showcase research on these processes for a variety of contaminants that occur over a wide range of scales. ORAL

T18. Innovations and New Frontiers in Hydrologic Modeling

GSA Hydrogeology Division; National Ground Water Association; International Association of Hydrogeologists; GSA Engineering Geology Division

Hydrogeology; Limnogeology

Frank W. Schwartz, The Ohio State University, Columbus, Ohio; Motomu Ibaraki, The Ohio State University, Columbus, Ohio

Models have grown from a mathematical curiosity to an indispensable tool for analysis of hydrologic systems. This session examines new developments in groundwater and hydrologic modeling, emphasizing innovations in theory, design, and data handling. ORAL

T19. Innovative Methods of Estimating Recharge in Humid Climates

GSA Hydrogeology Division

Hydrogeology; Environmental Geoscience

Todd W. Rayne, Hamilton College, Clinton, N.Y.; Kenneth R. Bradbury, Wisconsin Geological and Natural History Survey, Madison, Wis.; Randy J. Hunt, U.S. Geological Survey, Middleton, Wis.

We encourage papers that focus on innovative methods of estimating recharge in humid climates and examples of potential problems with current recharge estimation methods. ORAL

T20. Innovative Monitoring and Modeling Techniques for Assessing the Performance of Passive Remediation Projects for Contaminated Water and Soil

GSA Hydrogeology Division

Hydrogeology; Environmental Geoscience; Geochemistry, Aqueous

David Naftz, U.S. Geological Survey, Salt Lake City, Utah; Christopher Fuller, U.S. Geological Survey, Menlo Park, Calif.; Terry Snyder, Bureau of Land Management, Salt Lake City, Utah

Passive remediation methods offer low-cost alternatives to other methods for soil and water clean up. The success of these efforts is dependent on innovative techniques to monitor and assess long-term performance. This session will focus on recently developed laboratory, modeling, and monitoring techniques. ORAL

T21. Innovative Use of Natural and Artificial Tracers in Mountain Catchments Underlain by Fractured Rocks

GSA Hydrogeology Division; International Association of Hydrogeologists

Hydrogeology

Mike Wireman, U.S. Environmental Protection Agency, Region 8, Denver, Colo.; Mark Williams, University of Colorado, Boulder, Colo.

This session focuses on the use of natural and artificial tracers to characterize groundwater sources, flowpaths, residence times, and hydraulic connection to surface water beneath mountain catchments underlain by fractured rocks. ORAL

T22. Interactions of Groundwater and Surface Water at the Land-Sea Margin

GSA Hydrogeology Division

Hydrogeology; Marine/Coastal Science; Geochemistry, Aqueous

René M. Price, Florida International University, Miami, Fla.; Jaye E. Cable, Louisiana State University, Baton Rouge, La.

New research related to seawater intrusion, submarine groundwater discharge, and associated geochemical processes are encouraged. Papers discussing the provenance and quantification of geochemical constituents in groundwater flow at the land-sea margin are welcome. ORAL

T23. Nano- to Field-Scale Processes Governing the Transport of Microbes and Colloids in the Subsurface

GSA Hydrogeology Division

Hydrogeology; Geochemistry, Aqueous; Geomicrobiology

William P. Johnson, University of Utah, Salt Lake City, Utah; Joseph N. Ryan, University of Colorado, Boulder, Colo.

This session highlights advances in understanding of nanoscale to field-scale controls (e.g. physical, geochemical,

biological) on the transport of microbes (viruses, bacteria, and protozoa) and colloids in the subsurface. ORAL and POSTER

T24. Naturally Occurring Perchlorate (and Other Oxyanions) in the Hydrologic Cycle—Origins, Accumulation, Transformations, and Transport

GSA Hydrogeology Division; GSA Geobiology and Geomicrobiology Division

Environmental Geoscience; Hydrogeology; Geomicrobiology

David A. Stonestrom, Menlo Park, Calif.; Scott W. Tyler, University of Nevada, Reno, Nev.; Andrew W. Jackson, Texas Tech University, Lubbock, Tex.

Advancing analytics are revealing the chemical, isotopic, and microbial systematics of naturally occurring oxyanions. All topics are welcome, including atmospheric reactions, deposition, accumulation, transport, microbial and chemical transformations, climatic and biologic shifts, and extraterrestrial occurrences. ORAL and POSTER

T25. Arsenic Occurrence and Fate in Hydrogeologic Systems

GSA Hydrogeology Division; Geochemical Society; GSA Geobiology and Geomicrobiology Division

Hydrogeology; Geochemistry, Aqueous; Geomicrobiology

Alan Fryar, University of Kentucky, Lexington, Ky.; Abhijit Mukherjee, University of Kentucky, Lexington, Ky.; Alan Welch, U.S. Geological Survey, Carson City, Nev.

Because of its toxicity at low concentrations and its presence in a variety of geologic settings, arsenic is a contaminant of concern in groundwater. This session will encompass sources, mobility, and cycling of arsenic. ORAL and POSTER

T26. Quantifying Controls on Microbial Reaction Rates in Subsurface Environments

GSA Hydrogeology Division; National Ground Water Association; GSA Geobiology and Geomicrobiology Division

Hydrogeology; Geomicrobiology; Environmental Geoscience

Barbara Bekins, U.S. Geological Survey, Menlo Park, Calif.; Eric Roden, University of Alabama, Tuscaloosa, Ala.; Gary P. Curtis, U.S. Geological Survey, Menlo Park, Calif.

Accurate subsurface microbial reaction rates are central to modeling the fate of groundwater contaminants and quantifying global chemical cycles. We encourage studies investigating controls on subsurface microbial reaction rates by direct and proxy methods. ORAL and POSTER

T27. Seafloor Hydrogeology: Investigating Fluid Flow through the Oceanic Crust and Seafloor Sediments

GSA Hydrogeology Division

Hydrogeology; Geochemistry, Aqueous; Marine/Coastal Science

Jennifer D. Shosa, Colby College, Waterville, Maine; Lindsay B. Masters, Colby College, Waterville, Maine

This session will bring together hydrogeologists investigating fluid flow through the seafloor and will provide a forum for discussion about the nature of these systems and the effects of fluid flow on oceanic crust, seafloor sediments, and seawater chemistry. ORAL

T28. Stream-Hyporheic Interactions: Hydrology, Geochemistry, and Biology

GSA Hydrogeology Division

Hydrogeology; Geochemistry, Aqueous; Quaternary Geology/Geomorphology

Eric W. Peterson, Illinois State University, Normal, Ill.; Robert A. Payne, Utah State University, Logan, Utah

An interdisciplinary session designed to synthesize and expose concepts of hyporheic zone, focusing on the "exchange flows" that link the hydrology, geochemistry, and biology of the stream with the substrate the forms the hyporheic zone. ORAL

T29. Surface and Subsurface Geologic Characterization of the Edwards and Trinity Carbonate Aquifer Systems, Central Texas (Posters)

GSA Hydrogeology Division

Hydrogeology; Structural Geology; Geophysics/Tectonophysics/Seismology

Charles D. Blome, Denver, Colo.; Geary M. Schindel, Edwards Aquifer Authority, San Antonio, Tex.

This multidisciplinary session will highlight the recent advances in characterizing the surface and subsurface geology (mapping, 3-D modeling, geophysics, and isotope geology) of the Edwards and Trinity aquifer systems of central Texas. POSTER

T30. The Hydrosystem of the Great Salt Lake Basin: New Frontiers for Observing and Modeling Human-impacted Hydrologic, Climatic, and Geomorphologic Processes

GSA Hydrogeology Division; American Geophysical Union

Hydrogeology; Paleoclimatology/Paleoceanography; Environmental Geoscience

David Tarboton, Utah State University, Logan, Utah; Craig Forster, University of Utah, Salt lake City, Utah; Christopher J. Duffy, Penn State University, University Park, Pa.; Danny Marks, Agricultural Research Service, U.S. Department of Agriculture, Boise, Idaho

Observations and modeling of climatic, hydrologic, and geomorphologic processes impacted by human activity in the rapidly urbanizing Great Salt Lake Basin provides insight, and serves as a microcosm, for understanding hydrosystems of the modern West. ORAL and POSTER

T31. The Role of Colloids and Semicrystalline/Amorphous Materials in Environmental Cycling of Trace Elements

GSA Hydrogeology Division

Geochemistry, Aqueous; Environmental Geoscience; Geochemistry, Other

Katherine Walton-Day, U.S. Geological Survey, Denver, Colo.; Lisa Stillings, U.S. Geological Survey, Reno, Nev.

Amorphous/semicrystalline materials composed of iron, aluminum, and manganese minerals help control trace metal(loid) cycling, transport, and mobility in environmental systems. We welcome presentations describing the nature of these materials and their interactions with trace metal(loid)s. ORAL

T32. Water Resource Management and Planning for Fractured and Karstic Aquifers
GSA Hydrogeology Division

Hydrogeology; Public Policy; Environmental Geoscience

Todd Halihan, Oklahoma State University, Stillwater, Okla.; Maureen Muldoon, University of Wisconsin, Oshkosh, Wis.; Stanley T. Paxton, Oklahoma State University, Stillwater, Okla.

Spatial heterogeneity and high-permeability of karstic and fractured aquifers make them exceedingly susceptible to contamination, challenging to characterize, and difficult to model and manage. This session brings together scientists and managers to discuss these issues. ORAL

T33. Water, Solute, and Sediment Fluxes through Carbonate and Karst Aquifers
GSA Hydrogeology Division; GSA Sedimentary Geology Division; Karst Waters Institute

Hydrogeology; Quaternary Geology/Geomorphology; Sediments, Clastic

Ira D. Sasowsky, University of Akron, Akron, Ohio; Jonathan B. Martin, University of Florida, Gainesville, Fla.

Includes field and theoretical studies of water, solute, and sediment movement through sinkholes, drip water, speleothems, matrix, fractures and conduits. Present and paleohydrology are appropriate. A holistic understanding is sought through varied approaches. ORAL and POSTER

T34. Springs: Keys to Understanding Geochemical Processes in Aquifers
GSA Hydrogeology Division; International Association of Hydrogeologists; Karst Waters Institute

Hydrogeology; Geochemistry, Aqueous; Environmental Geoscience

Brian G. Katz, U.S. Geological Survey, Tallahassee, Fla.; Dorothy J. Vesper, West Virginia University, Morgantown, W.Va.

Springs provide unique opportunities to study geochemical processes in aquifers in natural systems and those impacted by anthropogenic inputs. This session focuses on studies that use biogeochemical, hydrologic, and geophysical methods to characterize processes affecting spring-water chemistry. ORAL and POSTER

T35. Riparian Corridors in Semi-Arid and Arid Environments: Results and Approaches of Integrative Studies in Support of Scientifically Based Management and Restoration, with Emphasis on the Great Basin
Hydrogeology; Quaternary Geology/Geomorphology; Environmental Geoscience

David Jewett, U.S. Environmental Protection Agency, Ada, Okla.; Mark Lord, Western Carolina University, Cullowhee, N.C.; Dru Germanoski, Lafayette College, Easton, Pa.

This session focuses on the results and approaches of integrative geomorphic, hydrologic, geophysical, stratigraphic, and/or ecological studies to characterize, understand, manage and/or restore riparian ecosystems in semiarid and arid environments. ORAL and POSTER

T36. Debris Flows Initiated by Runoff and Erosion: Processes, Recognition, and Hazard Implications
GSA Engineering Geology Division

Engineering Geology; Geomorphology; Quaternary Geology/Geomorphology

Jeffrey A. Coe, U.S. Geological Survey, Denver, Colo.; Susan H. Cannon, U.S. Geological Survey, Denver, Colo.

Runoff-generated debris flows impact many regions, but are poorly understood. Initiation processes and hazards from these debris flows are significantly different from landslide-mobilized debris flows. This session promotes a discussion of runoff-generated debris flows. ORAL

T37. Debris-flow Processes, Stratigraphy, Geomorphology, and Societal Response
GSA Engineering Geology Division; GSA Geology and Society Division

Engineering Geology; Environmental Geoscience; Geomorphology

Jeffrey R. Keaton, AMEC Earth and Environmental, Inc., Anaheim, Calif.; Richard E. Giraud, Utah Geological Survey, Salt Lake City, Utah; John D. Kiefer, University of Kentucky, Lexington, Ky.

Debris-flow processes produce distinctive stratigraphy, geomorphology, and source-area features. Debris-flow velocity and runout depend on slurry and channel characteristics. Societal response depends on hazard recognition and typically involves avoidance and engineered structures. ORAL

T38. Drought Related Geologic Hazards: A Worldwide Perspective
GSA Engineering Geology Division

Engineering Geology; Quaternary Geology; Geomorphology

David C. Noe, Colorado Geological Survey, Denver, Colo.; L. Darlene Batatian, Planning and Development Services Division, Salt Lake City, Utah

The initiation and behavior of geologic hazards during wet periods is well known, but what about during times of drought? This session considers a wide variety of geologic hazards caused or influenced by droughts. ORAL and POSTER

T39. Exploring How Private Projects Affect Public Land
GSA Engineering Geology Division; GSA Geology and Society Division

Engineering Geology; Public Policy

Jerome V. DeGraff, USDA Forest Service, Clovis, Calif.; Thomas J. Evans, Wisconsin Geological and Natural History Survey, Madison, Wis.

The session will examine the policy and technical issues that arise from these pressures and the mandates of Federal agencies administering these lands. ORAL

T40. Genesis, Behavior, Mapping, and Treatment of Collapsible Soils
GSA Engineering Geology Division

Engineering Geology; Quaternary Geology; Geomorphology

Paul M. Santi, Colorado School of Mines, Golden, Colo.; Jonathan L. White, Colorado Geological Survey, Denver, Colo.

Collapsible soils are widespread throughout arid climates and cause significant damage to structures built on them. This session will focus on identification and mapping methods, laboratory characterization, mitigation, and case studies of collapsible soils. ORAL

T41. Geologic Remote Sensing
GSA Engineering Geology Division

Remote Sensing/Geographic Info System

Vern Singhroy, Canada Centre for Remote Sensing, Ottawa, Ontario; Farouk El-Baz, Boston University, Boston, Mass.

This session will focus on the uses of integrated remote sensing (SAR, optical, thermal and hyperspectral sensors) for studies in geological mapping, mineral and hydrocarbon exploration and geohazard assessment. Particular emphasis will be placed on new developments in InSAR, hyperspectral, and data fusion techniques. ORAL

T42. Mine Rock Piles and Pyritically Altered Areas: Their Slope Stability and Effect on Water Quality
GSA Engineering Geology Division; Geochemical Society

Hydrogeology; Engineering Geology; Geomicrobiology

Patrick Walsh, New Mexico Bureau of Geology and Mineral Resources, Socorro, N.Mex.; Kathleen S. Smith, U.S. Geological Survey, Denver, Colo.; Virginia T. McLemore, New Mexico Tech, Socorro, N.Mex.

Presenters describe multidisciplinary characterization studies of mine rock piles, tailings dams, and naturally exposed alteration areas. Workers analyze the effects on nearby water quality and the stability of mine rock piles and hydrothermal alteration areas. ORAL and POSTER

T43. Recognition and Characterization of Neogene Faults
GSA Engineering Geology Division; GSA Structural Geology and Tectonics Division

Engineering Geology; Neotectonics/Paleoseismology; Geophysics/Tectonophysics/Seismology

Vincent S. Cronin, Baylor University, Waco, Tex.; Keith A. Sverdrup, University of Wisconsin, Milwaukee, Wis.

The death toll related to earthquakes since 1999 exceeds that of the previous decade. The importance of active-fault studies is self-evident. This forum includes the broad spectrum of efforts to find and characterize active faults. ORAL and POSTER

Students: Sign Up to Volunteer and Reap the Rewards!

Do you ever feel the only way you can afford to go to a meeting is to panhandle? Now you don't have to! Become a student volunteer and offset your meeting costs.

No upfront meeting registration fee required!

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For more information contact Kevin Ricker, kricker@geosociety.org, or visit www.geosociety.org/meetings/2005/students.htm.

T44. Seismogenic Landslides
GSA Engineering Geology Division

Engineering Geology; Neotectonics/Paleoseismology; Quaternary Geology/Geomorphology

Thomas C. Badger, Washington State Department of Transportation, Olympia, Wash.

Both near- and far-field effects of earthquakes have included dramatic examples of slope instability. This session focuses on the distribution, characterization, and/or causal mechanisms of prehistoric and historic seismogenic landslides. ORAL

T45. What Goes Up Must Come Down: The Science and Policy of Dam Removal
GSA Engineering Geology Division; Geology and Public Policy Committee

Environmental Geoscience; Geomorphology; Public Policy

John F. Bratton, U.S. Geological Survey, Woods Hole, Mass.; Walter Barnhardt, U.S. Geological Survey, Woods Hole, Mass.

About 200 of the 2.5 million dams in the U.S. have been removed since 1999, with more planned. The geoscience and public policy frameworks for this boom of dam busting are trying to keep pace. ORAL

T46. Conservation and Management of Global Geoheritage Resources: Regional and Local Sites
GSA Geology and Society Division; GSA International Division; National Park Service; Geology and Public Policy Committee

Public Policy; Environmental Geoscience; Geoscience Education

John D. Kiefer, University of Kentucky, Lexington, Ky.; Robert D. Higgins, National Park Service, Denver, Colo.; Maurice J. Terman, Falls Church, Va.

A companion to the session "Conservation and Management of Global Geoheritage Resources," with its international perspective, this session will explore outstanding examples of protecting and maintaining geoheritage or geopark sites at local and regional levels. ORAL and POSTER

T47. Forensic Geology: Geographic Sourcing, a Modern Day Provenance Study
Mineralogy/Crystallography; Geochemistry, Other; Environmental Geoscience

Christopher S. Palenik, Stafford, Va.; Samuel J. Palenik, Microtrace, Elgin, Ill.

This session showcases the ways various aspects of geology, including mineralogy, petrology, geochemistry, and palynology, applied to forensic evidence can be used to reconstruct a modern environment to provide investigative leads in forensic casework. ORAL

T48. Geology in the National Forests—Stewardship, Education, and Research
Geoscience Information/Communication; Environmental Geoscience; Geoscience Education

Joseph Gurrieri, U.S. Forest Service, Butte, Mont.; Andrew H. Rorick, USDA Forest Service, Sandy, Ore.

GSA Trivia Night

Come along and test your knowledge of geoscience trivia at this evening of fun! There are over 100 questions waiting for you to rack your brain and test your skills. Winning teams will be awarded fabulous prizes and the prestige of being the second annual GSA Trivia Night winners!

Register a team or come and join a team, meet new people, share your knowledge and have a great evening in Salt Lake City!

Teams and individuals need to register before the event by e-mail to Gary Lewis, glewis@geosociety.org.

Papers are encouraged on geoscience-related studies or activities conducted in the National Forests. Topics include but are not limited to paleontology, cave and karst geology, engineering geology and natural hazard mitigation, hydrogeology, interpretive and recreational geology, and geoscience education. ORAL

T49. Geology in the National Parks: Research, Mapping, and Resource Management
National Park Service

Geoscience Education; Remote Sensing/Geographic Info System; Environmental Geoscience

Bruce A. Heise, National Park Service, Lakewood, Colo.; Jim Wood, National Park Service, Denver, Colo.; Tim Connors, National Park Service, Denver, Colo.

This session will address the role of geoscience in the National Parks. Presentations are encouraged on geologic research, geologic mapping, paleontology, coastal geology, glacier studies, and resource management in National Parks, Monuments, Seashores, and Historic Sites. ORAL and POSTER

T50. Geology of Parks and Public Lands: Effective and Innovative Informal Earth Science Education for the Masses
National Park Service; Bureau of Land Management; Association of Earth Science Editors

Geoscience Information/Communication; Geoscience Education

Marion Malinowski, Bureau of Land Management, Lakewood, Colo.; Monica Gaiswinkler Easton, Ministry of Northern Development and Mines, Sudbury, Ontario; Jim F. Wood, National Park Service, Lakewood, Colo.

This session will explore programs and products (e.g., displays, publications, signs, Web sites, virtual and real field trips) for effective informal earth science education about the geology of parks, monuments, open spaces, and public lands. ORAL and POSTER

T51. Investigation of Sources and Fates of Anthropogenic Inputs to the Environment through Isotopic Systematics

Environmental Geoscience; Geochemistry, Other; Hydrogeology

P. Evan Dresel, Pacific Northwest National Lab, Richland, Wash.; John N. Christensen, Lawrence Berkeley National Laboratory, Berkeley, Calif.

Isotopic studies can provide valuable information on the sources and fate of contaminants and of other anthropogenic compounds. This session will highlight novel application of isotopic geochemistry and biogeochemistry to understanding human impacts on the environment. ORAL and POSTER

T52. Sources, Transport, Fate, and Toxicology of Trace Elements in the Environment

International Association of GeoChemistry

Geochemistry, Aqueous; Environmental Geoscience; Geomicrobiology

LeeAnn Munk, University of Alaska, Anchorage, Alaska; David Long, Michigan State University, East Lansing, Mich.; W. Berry Lyons, Ohio State University, Columbus, Ohio

Papers are welcome on the study of trace elements in the environment related to sources, transport, controls on mobility, toxicological consequences, ecology (e.g., food web dynamics, as limiting nutrients) and accumulation in sediments and soils. ORAL

T53. The Changing Planet: A Special Tribute Session Celebrating the Contributions of Fred T. Mackenzie

Environmental Geoscience; Geochemistry, Aqueous; Marine/Coastal Science

Rolf S. Arvidson, Rice University, Houston, Tex.; Albert S. Colman, Carnegie Institution of Washington, Washington, D.C.; John W. Morse, Texas A&M University, College Station, Tex.

This multidisciplinary session will include past and future biogeochemical cycles, coupled with experimental and field observations of mineral-fluid interaction with implications for ancient and modern systems, and impact of modern activities on atmosphere and ocean chemistry. ORAL

T54. This Changing Planet: Explaining Geologic Hazards to the Media, Policy Makers, and the General Public

GSA Engineering Geology Division; GSA Geology and Society Division; Association of Earth Science Editors; National Park Service; Geology and Public Policy Committee

Geoscience Information/Communication; Public Policy; Environmental Geoscience

Monica Gaiswinkler Easton, Ministry of Northern Development and Mines, Sudbury, Ontario; Diane E. Lane, Association of Earth Science Editors, Pittsburgh, Pa.; Robert D. Higgins, National Park Service, Denver, Colo.

Scientists need to explain volcanoes, earthquakes, tsunamis, landslides, and hydrothermal features, as well as swelling clays, radon, and asbestos, among others. This session will focus on successfully communicating information on geologic hazards to nonscientists. ORAL and POSTER

T55. Advances and Applications of Tephrochronology and Tephrostratigraphy: In Honor of Andrei M. Sarna-Wojcicki

GSA Quaternary Geology and Geomorphology Division

Quaternary Geology/Geomorphology; Paleoclimatology/Paleoceanography; Neotectonics/Paleoseismology

Janet L. Slate, U.S. Geological Survey, Denver, Colo.; Jeffrey R. Knott, California State University, Fullerton, Calif.; Michael E. Perkins, University of Utah, Salt Lake City, Utah

Tephra layers provide time-stratigraphic markers that enable regional correlations for geologic mapping and studies of climate change, geologic hazards, and Neogene stratigraphy. This session honors Andrei Sarna-Wojcicki, a pioneer in the field of tephrochronology. ORAL

T56. Carving the Western Landscape: The Evolution of the Colorado Drainage from Source to Sink

GSA Quaternary Geology and Geomorphology Division

Quaternary Geology/Geomorphology; Sediments, Clastic; Tectonics

Joel L. Pederson, Utah State University, Logan, Utah; Kyle House, University of Nevada, Reno, Nev.

New research is providing answers and raising more questions about the integration and erosion of the Colorado drainage. This session brings together old and new work to revise the history of this famous landscape. ORAL and POSTER

T57. Paleoenvironmental Records in and around the Bonneville Basin: From Glacial/Interglacial Cycles to Anthropogenic Impacts

GSA Limnogeology Division; GSA Quaternary Geology and Geomorphology Division; GSA Archaeological Geology Division

Paleoclimatology/Paleoceanography; Quaternary Geology/Geomorphology; Limnogeology

Joseph G. Rosenbaum, U.S. Geological Survey, Denver, Colo.; Katrina A. Moser, University of Utah, Salt Lake City, Utah

The session focuses on the drivers of environmental change (e.g., climate, tectonics, man) and their impacts on land surface, hydrology, and aquatic systems from all types of deposits (e.g., sediments, shorelines, fluvial and glacial deposits, soils, middens, tree-rings). ORAL and POSTER

T58. Recent Advances in Numerical Dating Techniques for Developing Quantitative Chronostratigraphies in Arid and Semi-Arid Environments

INQUA (International Union for Quaternary Research): Working Group on Dryland Dating

Quaternary Geology/Geomorphology; Stratigraphy; Paleoclimatology/Paleoceanography

Lewis A. Owen, University of Cincinnati, Cincinnati, Ohio; Ashok Singhvi, Physical Research Lab, Ahmedabad, India

Advances in numerical dating techniques, including OSL, ESR, SED and U-series dating, will be presented to provide new results on the chronologies and the nature of Quaternary paleoenvironmental change and landscape evolution for dryland regions. ORAL and POSTER

T59. The 2004–2005 Eruption of Mount St. Helens: New Insights and Hazard Management of an Extraordinary Dacitic Dome-Growth Eruption (Posters)

GSA Quaternary Geology and Geomorphology Division; GSA Geophysics Division; GSA Engineering Geology Division

Volcanology; Geophysics/Tectonophysics/Seismology; Geoscience Information/Communication

Cynthia Gardner, U.S. Geological Survey, Vancouver, Wash.; Jon Major, U.S. Geological Survey, Vancouver, Wash.

The 2004–2005 eruption of Mount St. Helens afforded unprecedented documentation of uncommonly rapid, steady-state growth of a lava dome. This session explores connections among petrology, geodesy, geochemistry, seismicity, mechanics, hydrology, hazard management, and public communication associated with dacitic dome growth. POSTER

T60. Dendrogeology: Geologic Applications of Tree-Ring Studies

GSA Archaeological Geology Division

Environmental Geoscience; Hydrogeology; Geochemistry, Other

Gregg R. Davidson, University of Mississippi, University, Miss.

Tree-ring studies have a wide ranging role in geologic studies. Topics may include tree rings as indicators of past conditions or as evidence of the influence the trees themselves have exerted on their environment. ORAL

T61. Glacial Geology and Lake Sedimentology: In Memory of Geoffrey O. Seltzer

GSA Limnogeology Division

Quaternary Geology; Geomicrobiology; Limnogeology

Donald T. Rodbell, Union College, Schenectady, N.Y.; Jacqueline A. Smith, Syracuse University, Syracuse, N.Y.

This session honors the scientific legacy of Geoff Seltzer. We seek papers that summarize records of environmental change based on glacial geology and lake sediment cores, especially from South America, Central America, and Alaska. ORAL

T62. Ice Free versus Cold-Based Ice: Cosmogenic Nuclides, Trimlines, and Ice Sheet History of Differentially Weathered Landscapes

GSA Quaternary Geology and Geomorphology Division

Quaternary Geology; Geomorphology; Paleoclimatology/Paleoceanography

Jason P. Briner, SUNY Buffalo, Buffalo, N.Y.; Michael R. Kaplan, University of Edinburgh, Edinburgh, UK

The interpretation of weathering zones and trimlines in differentially weathered landscapes has been debated for decades. This session solicits papers that address our current understanding of ice sheet history in these ubiquitous landscapes. ORAL

T63. Timing and Nature of Mountain Glacier Advances throughout the Last Glacial Cycle

Mountain Glacier Working Group, International Quaternary Union

Quaternary Geology; Geomorphology; Paleoclimatology/Paleoceanography

Glenn D. Thackray, Idaho State University, Pocatello, Idaho; Lewis A. Owen, University of Cincinnati, Cincinnati, Ohio

Mountain glacier fluctuations were spatially and temporally variable during the last glacial cycle, ca. 125–10 ka. Talks in this session will explore variability in the extent and chronology of glaciation and the paleoclimatic implications thereof. ORAL and POSTER

T64. Comparative Carbonate Sedimentology: A Tribute to the Career of R.N. Ginsburg

GSA Sedimentary Geology Division

Sediments, Carbonates; Environmental Geoscience; Stratigraphy

Peter Swart, University of Miami, Miami, Fla.; Gregor Eberli, University of Miami, Miami, Fla.

This session is a tribute to the pioneering work of Robert N. Ginsburg in studying the modern environment as an analogue for the ancient. The session will illustrate the impact of comparative sedimentology on our understanding of depositional systems. ORAL and POSTER

T65. Establishment of an Integrated and Calibrated Chronostratigraphic Framework for High Resolution Sequence Stratigraphic Analysis, Stratal Correlation, and Sedimentary Basin Geohistory Reconstruction

GSA Sedimentary Geology Division

Stratigraphy; Sediments, Carbonates; Sediments, Clastic

Ernest A. Mancini, University of Alabama, Tuscaloosa, Ala.

This session will focus on the concepts, disciplines, methods, techniques, and tools required to establish an integrated and calibrated chronostratigraphic framework for high resolution sequence stratigraphic analysis, stratal correlation, and sedimentary basin geohistory reconstruction. ORAL

T66. Petrographic Methods Applied to Sedimentary Rocks

GSA Sedimentary Geology Division; Society for Sedimentary Geology (SEPM)

Sediments, Carbonates; Sediments, Clastic; Mineralogy/Crystallography

Kitty Milliken, University of Texas at Austin, Austin, Tex.; F. Leo Lynch, Mississippi State University, Mississippi State, Miss.

This session, celebrating the 80th birthday of noted sedimentary petrologist and teacher, Bob Folk, is devoted to the technologies available for "looking at rocks." Abstracts are encouraged to showcase any petrographic method applied to sedimentary systems. ORAL and POSTER

T67. Reading the Record of the Rocks: Resolving the Tectonic and Eustatic Signals in Stratigraphic Successions: In Honor of Don Swift on His 70th Birthday

Society for Sedimentary Geology (SEPM)

Stratigraphy; Geophysics/Tectonophysics/Seismology; Marine/Coastal Science

Nora Noffke, Old Dominion University, Norfolk, Va.; Donald J. P. Swift, Old Dominion University, Norfolk, Va.

Resolving the eustatic and tectonic signals of sedimentary successions is a central goal of stratigraphers. Growing concern with global environmental problems has lead to renewed interest in the eustatic-tectonic signals that serve as indicators for biotic and climatic components. ORAL

T68. Recent Advances in the Application of Sedimentology and Stratigraphy to Tectonic Problems

GSA Sedimentary Geology Division; GSA Structural Geology and Tectonics Division

Tectonics; Stratigraphy; Geochemistry, Other

David Barbeau, University of South Carolina, Columbia, S.C.; Andrew Leier, The University of Arizona, Tucson, Ariz.

This session explores recent advances in tectonics and sedimentation research across a wide range of spatial and temporal scales, including studies of basin architecture, growth strata, active tectonics, and the composition of syntectonic sediments. ORAL and POSTER

T69. Refining the Global Neoproterozoic Geologic Record

GSA Sedimentary Geology Division; GSA Geobiology and Geomicrobiology Division

Precambrian Geology; Stratigraphy; Geochemistry, Other

Carol M. Dehler, Utah State University, Logan, Utah; Paul K. Link, Idaho State University, Pocatello, Idaho; Frank A. Corsetti, University of Southern California, Los Angeles, Calif.

Emerging and existing datasets will be explored in the context of bio-, chrono-, litho- and chemostratigraphy, correlation, and basin analysis toward understanding climatic, tectonic, and biogeochemical evolution of the Neoproterozoic Earth System. ORAL and POSTER

T70. Resolving the Late Paleozoic Gondwanan Ice Age in Time and Space: Integration of Southern and Northern Hemisphere Records

GSA Sedimentary Geology Division

Stratigraphy; Sediments, Clastic; Sediments, Carbonates

C.R. Fielding, University of Nebraska, Lincoln, Neb.; T.D. Frank, University of Nebraska, Lincoln, Neb.; J.L. Isbell, University of Wisconsin, Milwaukee, Wis.

This session aims to bring together stratigraphers, sedimentologists, and geochemists who are working on the climate record of the Carboniferous and Permian systems worldwide. Emphasis will be placed on integrating geochemical with lithostratigraphic archives. ORAL

T71. Sedimentary Basins in Transition: Stratigraphic and Structural Records of Plate Tectonic Reconfiguration (Posters)

GSA Sedimentary Geology Division

Tectonics; Stratigraphy; Structural Geology

Cari L. Johnson, University of Utah, Salt Lake City, Utah; Kenneth Ridgway, Purdue University, West Lafayette, Ind.

This session features case studies of sedimentary basins that record fundamental changes in tectonic setting over time, such as shifting plate boundary configurations or multiphase reactivation of structures in intraplate settings. POSTER

T72. Sedimentology Goes to Mars

GSA Planetary Geology Division; GSA Sedimentary Geology Division

Planetary Geology; Sediments, Clastic

R. Aileen Yingst, GSA Planetary Geology Division, Green Bay, Wis.; Kenneth Edgett, Malin Space Science Systems, San Diego, Calif.

Like Earth, Mars has a sedimentary record, one that continues today. This session will review and explore the state of Martian sedimentology revealed by recent missions and the science to be addressed by future missions. ORAL and POSTER

T73. Sedimentology, Stratigraphy, and Paleontology of Southern Utah Public Lands

Sediments, Clastic; Stratigraphy; Paleontology/Paleobotany

Robert L. Eves, Southern Utah University, Cedar City, Utah; Larry E. Davis, College of St. Benedict and St. John's University, Collegeville, Minn.

Public lands in southern Utah have become the focus of geologic research in the past decade. Geologic investigations are due to new land designations and an interest in resource identification and management by federal agencies. ORAL

T74. Waves of Destruction: Historical and Geological Records of Tsunamis and Their Effects (Posters)

GSA Sedimentary Geology Division

Marine/Coastal Science; Neotectonics/Paleoseismology; Public Policy

Joanne Bourgeois, University of Washington, Seattle, Wash.; R. Heather Macdonald, College of William and Mary, Williamsburg, Va.

Geoscientists who have surveyed effects of the 2004 tsunami and older events are encouraged to prepare posters and video presentations illustrating their results—geological, biological and societal impacts. POSTER

T75. Weathering, Sedimentation, and Diagenesis in Major Element Cycles
GSA Sedimentary Geology Division

Geochemistry, Other; Environmental Geoscience; Geochemistry, Aqueous

Robert A. Berner, Yale University, New Haven, Conn.; Miriam Kastner, Scripps Institute of Oceanography 0212, La Jolla, Calif.; Abraham Lerman, Northwestern University, Evanston, Ill.

This session in memory of Raymomd Siever, on weathering, sedimentation, and diagenesis in major element cycles, will highlight the breadth of Ray Siever's significant contributions to this broad field. The origin, evolution, and secular changes in sediments will also be emphasized. ORAL

T76. The Bureau of Land Management's National Landscape Conservation System as Outdoor Laboratories: New Research in Grand Staircase–Escalante National Monument and the Surrounding Area
Stratigraphy; Structural Geology; Sediments, Clastic

Alan L. Titus, Bureau of Land Management, Kanab, Utah; John D. Powell, Bureau of Land Management, Kanab, Utah

The session is to highlight recent geological research within Grand Staircase–Escalante National Monument and surrounding area. Potential topics are limited only by the regional context and all submissions are welcome. ORAL

T77. Advances and Applications with the Fossil Record of Non-Marine Arthropods (Paleogeoarthropods: Insecta, Chelicerata, Myriapoda, some Crustacea) for Geoscientists and Biologists
Paleontological Society; GSA Geobiology and Geomicrobiology Division; GSA Limnogeology Division

Paleontology, Diversity, Extinction, Origination; Paleontology, Paleoecology/Taphonomy; Paleoclimatology/Paleoceanography

Cary R. Easterday, University of Illinois at Chicago, Chicago, Ill.; Sara H. Lubkin, Cornell University, Ithaca, N.Y.

Non-marine arthropods have represented the bulk of animal diversity and abundance for about 300 million years. Research with this vast fossil database has advanced our knowledge of biostratigraphy, paleobiogeography, biomechanics, paleoecology, and other fields. ORAL

T78. Habitat Partitioning above, on, and within the Substrate
Paleontological Society; GSA Geobiology and Geomicrobiology Division

Paleontology, Paleoecology/Taphonomy; Paleontology, Diversity, Extinction, Origination; Paleontology/Paleobotany

A.A. Ekdale, University of Utah, Salt Lake City, Utah; Leif M. Tapanila, University of Utah, Salt Lake City, Utah

Dynamics and complexity of vertical tiering and lateral partitioning of habitat space of benthic communities in hard and soft substrates in modern environments and in the geologic record. ORAL

Welcoming Party and Exhibit Hall Hours

Our Welcoming Party kicks off the GSA Annual Meeting in the Exhibit Hall on Sunday, 16 Oct., 5:30–7:30 p.m. This event provides exposure to 5,000+ attendees with no conflicting events! Exhibits are also open Mon. and Tues., 17–18 Oct., 9 a.m.–5:30 p.m. and Wed., 19 Oct., 9 a.m.–2 p.m.

T79. Jurassic Marine Paleobiology: Tracing the Roots of the Modern Biota
Paleontological Society

Paleontology/Paleobotany; Paleontology, Paleoecology/Taphonomy; Paleontology, Diversity, Extinction, Origination

Carol M. Tang, California Academy of Sciences, San Francisco, Calif.; Paul Taylor, Natural History Museum, London, UK

During the Jurassic, many groups of organisms made their first appearances, establishing the modern fauna. This session will address the key changes that affected the evolution of marine communities and taxonomic groups during the Jurassic. ORAL

T80. Paleoenvironments and Taphonomy of Cambrian Lagerstatten
Paleontological Society

Paleontology, Paleoecology/Taphonomy; Sediments, Clastic; Geochemistry, Other

Wayne Powell, Brooklyn College, New York, N.Y.; Robert Gaines, Pomona College, Claremont, Calif.

This session will focus on aspects of the physical, chemical, and ecological environments associated with Burgess Shale–type deposits, and how these factors contributed to the preservation of fossils of soft-bodied organisms. ORAL

T81. Protists in Extreme Environments: Fossil Evidence to Physiological Adaptations
Cushman Foundation; Paleontological Society

Environmental Geoscience; Geomicrobiology; Paleontology, Paleoecology/Taphonomy

Pamela Hallock, University of South Florida, St. Petersburg, Fla.

Emerging and existing evidence for fossil and extant eucaryotic microorganisms in their environmental extremes, including morphological and physiological adaptations that enable their survival and proliferation. ORAL

T82. Taphonomy: Process and Bias through Time
Paleontological Society

Paleontology, Paleoecology/Taphonomy; Sediments, Carbonates; Paleontology, Diversity, Extinction, Origination

Peter A. Allison, Imperial College London, UK; David J. Bottjer, University of Southern California, Los Angeles, Calif.

This session will focus on the extent to which taphonomic bias has changed through time in different environments. ORAL

T83. The Dawn of Animal Life: Evolutionary and Paleoecological Patterns in the Neoproterozoic-Cambrian Animal Fossil Record
Paleontological Society; GSA Geobiology and Geomicrobiology Division

Paleontology, Paleoecology/Taphonomy; Paleontology, Diversity, Extinction, Origination

Stephen Q. Dornbos, University of Wisconsin, Milwaukee, Wis.

This session will include a broad spectrum of studies on the evolution and paleoecology of early animals, providing a synthesis of the latest ideas and results in this rapidly changing field. ORAL

T84. Thinking about Fossils: The Emergence and Development of Paleontological Thought in North America from Native American Customs to the End of the Great Western Surveys
GSA History of Geology Division; History of Earth Sciences Society (HESS); GSA Archaeological Geology Division; Paleontological Society; Society of Vertebrate Paleontology

History of Geology; Paleontology/Paleobotany; Paleontology, Paleoecology/Taphonomy

Edward Rogers, History of the Earth Sciences Society, Poncha Springs, Colo.; Patrick Wyse Jackson, Trinity College, Dublin, Ireland

This session on the emergence and development of paleontological thought in North America will cover the period from Native American beliefs regarding fossils to ideas developed up to the end of the great government and institutional surveys of the western United States and Canada. ORAL

T85. Traces of Life: Micro- to Macroscopic Evidence of Past and Present Biogenic Activity and their Implications
Paleontological Society; GSA Geobiology and Geomicrobiology Division

Paleontology, Paleoecology/Taphonomy; Geomicrobiology; Paleontology/Paleobotany

Stephen T. Hasiotis, University of Kansas, Lawrence, Kans.; Jennifer A. Roberts, University of Kansas, Lawrence, Kans.

Ichnofossils preserve a range of organism-substratum interactions that provide insights into physicochemical processes and behaviors of microbes to plants and animals. Submissions regarding neoichnologic-taphonomic actualistic studies, ichnodiversity, paleoenvironment, pedology, paleoecology, paleohydrology, and paleoclimate are welcomed. ORAL and POSTER

T86. Collaboration for the Dissemination of Geologic Information among Colleagues
Geoscience Information Society

Geoscience Information/Communication; Public Policy; Geoscience Education

Adonna Fleming, Geoscience Information Society, Lincoln, Neb.

This session focuses on cooperative projects and practices by faculty, students, government agencies, librarians, professional and trade organizations, or others, designed to disseminate information among the geologic community. Includes discussion of Web pages, guides, classes, workshops, digitization projects, or any other forum in which geological information was dispersed to colleagues. ORAL and POSTER

T87. Communicating Geoscience Information through Public Speaking: Problems and Solutions
GSA Geology and Society Division; Association of Earth Science Editors; Geology and Public Policy Committee

Geoscience Information/Communication; Geoscience Education; Public Policy

Sarah Andrews, Sebastopol, Calif.

Science meets the art of communication. ORAL

T88. Does Geology Serve Society? Let's Count the Ways!
Geology and Society Division; Geology and Public Policy Committee; Critical Issues Caucus

Public Policy; Geoscience Information/Communication; Geoscience Education

Paul H. Reitan, SUNY at Buffalo, Buffalo, N.Y.

Examples of geology being put to good use abound: protecting a community water supply, mitigating natural hazards, controlling erosion, finding and managing resources, reducing slope failure, informing legislation/education—you name it. Let's share successes. ORAL

T89. Efficient and Effective Practices in Using Web Sites and Technologies to Support and Manage Information, Student Learning and Recruitment, and Public Education
National Association of Geoscience Teachers

Geoscience Information/Communication; Geoscience Education; Remote Sensing/Geographic Info System

Christopher W. Thomas, Indiana University–Purdue University, Indianapolis, Ind.

Increasingly, student learning and recruitment and public education are supported by organizational or individual Web sites, Web technologies, and online courses. This explores successful implementations that increase student/public learning or make Web technologies usable, simple, and informative. ORAL

T90. From Rocks to Records: Geological Preservation for the Profession and the Public Good
GSA Geology and Society Division

Public Policy; Geoscience Information/Communication; Geoscience Education

Donald G. Mikulic, Illinois State Geological Survey, Champaign, Ill.; Joanne Kluessendorf, Weis Earth Science Museum, Menasha, Wis.

This session highlights the timeliness of preserving geological samples, data, and sites as new developments underscore their importance in meeting the modern needs of the geological profession and the general public. ORAL

T91. Geology and Art—Forever the Twain Shall Meet
Geoscience Education

Mary C. Simmons, University of Southern Indiana, Evansville, Ind.

Our species has engaged in equally endless practices of discovery and the production of art objects. This session will illustrate the specific scientific basis behind the production of the artwork; e.g. pigments, glass, ceramics, metals. ORAL

T92. Keys to Opportunities with the National Park Service
National Park Service; Geological Society of America; American Geological Institute; Association for Women Geoscientists

Public Policy; Geoscience Information/Communication; Geoscience Education

Judy Geniac, National Park Service, Denver, Colo.; Gary Lewis, GSA Education and Outreach, Boulder, Colo.; Ann Benbow, Alexandria, Va.; Marguerite Toscano

Examine lessons learned: accessing parks for research, developing partnerships, aiding or benefiting from projects, and finding volunteer and paid positions. Discover geoscience opportunities in national parks for professors, students, retirees, organizations, universities, companies. ORAL

T93. The National Geologic Map Database (Posters)
U.S. Geological Survey; Association of American State Geologists

Geoscience Information/Communication

David Soller, U.S. Geological Survey, Reston, Va.; Thomas M. Berg, Ohio Geological Survey, Columbus, Ohio

The National Geologic Map Database (http://ngmdb.usgs.gov/) is a congressionally mandated effort. This session focuses on the collaborative USGS and state geological survey advances in digital mapping, standards (map symbolization, data model, science language), and map databases that are conducted under the aegis of, or in collaboration with, this project. POSTER

T94. Conservation and Management of Global Geoheritage Resources: A National Perspective
GSA International Division; GSA Geology and Society Division; National Park Service; Geology and Public Policy Committee

Public Policy

Robert D. Higgins, National Park Service, Denver, Colo.; Maurice J. Terman, Falls Church, Va.; Jim Wood, National Park Service, Denver, Colo.

This session will explore examples of managing geologic heritage resources and sites through national programs whose goals are in accordance with conservation and public enjoyment. ORAL

T95. Conservation and Management of Global Geoheritage Resources: International Perspectives
GSA International Division; GSA Geology and Society Division; National Park Service; U.S. Geological Survey; Geology and Public Policy Committee

Public Policy; Geoscience Education; Geoscience Information/Communication

Maurice J. Terman, Falls Church, Va.; John D. Kiefer, University of Kentucky, Lexington, Ky.; Robert Higgins, National Park Service, Denver, Colo.

This session will introduce many more American geoscientists to the UNESCO Geoparks concept and thus stimulate broader discussion of how best to conserve and manage these

resources increasingly threatened by burgeoning populations and economic constraints. ORAL

T96. Geological Monitoring in National Parks
National Park Service

Marine/Coastal Science; Geomorphology; Remote Sensing/ Geographic Info System

Robert S. Young, Western Carolina University, Cullowhee, N.C.; Lisa Norby, National Park Service, Lakewood, Colo.

There has been an increased recognition of the importance of geologic monitoring as national parks focus on science-based management. Presentations may include geologic monitoring protocols, results, or resource management implications. ORAL and POSTER

T97. Innovation, Evaluation, and Best Practices in Informal Geoscience Education
National Association of Geoscience Teachers; GSA Geoscience Education Division; Association of Earth Science Editors

Geoscience Education; Geoscience Information/ Communication

Robert M. Ross, Paleontological Research Institution, Ithaca, N.Y.; Warren D. Allmon, Paleontological Research Institution, Ithaca, N.Y.

Informal education reaches millions every year with potentially life-changing geoscience education. This session will feature best practices in informal geoscience education, for example innovative approaches, techniques for evaluation, and creation of partnerships with formal education. ORAL

T98. Innovations in Geological Mapping (Posters)
GSA Engineering Geology Division; GSA Geology and Society Division; GSA Hydrogeology Division; Geology and Public Policy Committee; Association of American State Geologists; GSA Quaternary Geology and Geomorphology Division

Quaternary Geology/Geomorphology; Stratigraphy; Hydrogeology

Richard C. Berg, Champaign, Ill.; Peter T. Lyttle, U.S. Geological Survey, Reston, Va.; Harvey Thorleifson, University of Minnesota, St. Paul, Minn.

Geological mapping is a key to environmental and water resource protection and management. This session will highlight innovative mapping products that are being used by an increasingly broad range of users. POSTER

T99. Imparting Hands-on Geological Education: Reaching out to Undergraduates and K–12 Students (Posters)
Geoscience Education; Geoscience Information/ Communication; Environmental Geoscience

Nazrul I. Khandaker, York College of City University of New York, Jamaica, N.Y.; Stanley Schleifer, York College of City University of New York, Jamaica, N.Y.

This session is intended to provide an opportunity for motivated and curious undergraduates and K–12 students to present the results of their research to the geoscience community as a part of their early involvement in inquiry-based learning abilities. POSTER

T100. Integrating Research into Undergraduate Geoscience Coursework
National Association of Geoscience Teachers

Geoscience Education

C. Frederick Lohrengel, Southern Utah University, Cedar City, Utah; Robert L. Eves, Southern Utah University, Cedar City, Utah; Mark Colberg, Southern Utah University, Cedar City, Utah

Research as an integral part of undergraduate coursework is a rapidly growing trend. Share your successes, failures, and ideas for future growth directions with others. ORAL

T101. Interdisciplinary Education: Applications of GIS and the Infusion of Spatial Concepts across the Curriculum
National Association of Geoscience Teachers

Geoscience Education; Remote Sensing/Geographic Info System; Geoscience Information/Communication

Richard B. Schultz, Elmhurst College, Elmhurst, Ill.; Mark R. Hafen, University of South Florida, Tampa, Fla.; J. Christopher Haley, Virginia Wesleyan College, Norfolk, Va.

This interdisciplinary session, emphasizing the diverse applications of GIS and educational methodologies of spatial concept instruction, showcases broad and unique applications for GIS and creates an awareness for the infusion of spatial concepts across the educational curriculum. ORAL and POSTER

T102. International Undergraduate Field Trips: Logistics, Challenges, and Successes
Geoscience Education

Timothy P. Flood, St. Norbert College, DePere, Wis.; Nelson R. Ham, St. Norbert College, DePere, Wis.

This session welcomes geoscience educators to share their experiences in leading undergraduate international field trips. The presenters will provide information to those who conduct such trips and those who wish to initiate such trips. ORAL

T103. Is it Science? Strategies for Addressing Creationism in the Classroom and the Community
National Association of Geoscience Teachers; GSA Geology and Society Division; Geology and Public Policy Committee; GSA Geoscience Education Division

Geoscience Education; Public Policy; Geoscience Information/ Communication

Michael A. Phillips, Illinois Valley Community College, Oglesby, Ill.; Robert C. Thomas, University of Montana–Western, Dillon, Mont.; Sheila M. Roberts, University of Montana–Western, Dillon, Mont.

Creationists present their faith-based philosophy as scientifically rigorous and valid. This session will explore techniques for dealing with creationist challenges in the college classroom and present strategies for addressing efforts to add creationist content to K–12 science curricula. ORAL

T104. It's About Time: Teaching the Temporal Aspects of Geoscience (Posters)

National Association of Geoscience Teachers; GSA Geoscience Education Division

Geoscience Education

R. Heather Macdonald, College of William and Mary, Williamsburg, Va.; David W. Mogk, Montana State University, Bozeman, Mont.; Barbara Tewksbury, Hamilton College, Clinton, N.Y.

Posters will demonstrate ways to enhance student understanding of all aspects of geologic time and its measurement (including rates, recurrence intervals, predictions, dating techniques, teaching with a temporal theme, research on learning about time). POSTER

T105. Let's Rock Their World: Integrating Planetary Science Data into Undergraduate Geoscience Courses

GSA Planetary Geology Division; GSA Geoscience Education Division; On the Cutting Edge; National Association of Geoscience Teachers

Planetary Geology; Geoscience Education

Eric B. Grosfils, Pomona College, Claremont, Calif.; Barbara Tewksbury, Hamilton College, Clinton, N.Y.

This session will present examples of innovative ideas for effectively integrating planetary science data into a variety of types of undergraduate geology courses at both the introductory and upper level. ORAL and POSTER

T106. Methods of Assessing Teaching and Learning in the Geosciences

National Association of Geoscience Teachers

Geoscience Education

David N. Steer, The University of Akron, Akron, Ohio; David A. McConnell, The University of Akron, Akron, Ohio; Katherine Owens, The University of Akron, Akron, Ohio

This session will focus on effective assessment of student learning and the impact on faculty teaching in the geosciences. Papers are solicited that discuss development, implementation, and research findings from assessment studies. ORAL and POSTER

T107. Minorities, Women, and Persons with Disabilities in the Geosciences: Avenues to Success

Committee on Minorities and Women in the Geosciences

Geoscience Education; Geoscience Information/ Communication; Public Policy

Marc A. Carrasco, University of California, Berkeley, Calif.; Denise A. Battles, Georgia Southern University, Statesboro, Ga.

This session will highlight what resources (personal and financial) are available to minorities, women, and persons with disabilities in the geosciences and explore new and existing programs to enhance their representation. ORAL and POSTER

T108. Museum-College Connections: Rich Opportunities for Earth Science Education (Posters)

National Association of Geoscience Teachers

Geoscience Education

Eleanor Miele, Brooklyn, N.Y.; Maritza Macdonald, American Museum of Natural History, New York, N.Y.; Wayne Powell, Brooklyn College, New York, N.Y.

This session will profile how partnerships between museums and colleges have improved earth science education and provide blueprints for how other institutions might build similar productive educational teams. POSTER

T109. Providing Future Elementary and Middle School Teachers with Meaningful Geoscience Content Knowledge

GSA Geoscience Education Division; National Association of Geoscience Teachers

Geoscience Education

Heather L. Petcovic, Western Michigan University, Kalamazoo, Mich.; Elizabeth Nagy-Shadman, California State University, Northridge, Calif.

How do we ensure that prospective K–8 teachers have an adequate yet meaningful understanding of geoscience content? This session considers research-based, effective methods, courses or curricula that enhance the geoscience content knowledge of future teachers. ORAL and POSTER

T110. REU at 25: Its Impact on Undergraduate Geoscience Education

National Association of Geoscience Teachers; Council on Undergraduate Research, Geoscience Division

Geoscience Education; Geoscience Information/ Communication

Jeffrey G. Ryan, University of South Florida, Tampa, Fla.; Lori Bettison-Varga, College of Wooster, Wooster, Ohio; Laura Guertin, Penn State University–Delaware County, Media, Pa.

In celebration of 25 years of the National Science Foundation–Research Experiences for Undergraduates (NSF-REU) program, this session will highlight geoscience REU initiatives, examine best practices for research with undergraduates, and assess the role of REU in geoscience Bachelor's degree programs today. ORAL and POSTER

T111. Sigma Gamma Epsilon Student Research (Posters)

Sigma Gamma Epsilon

Environmental Geoscience

Donald W. Neal, East Carolina University, Greenville, N.C.; Charles Mankin, Oklahoma Geological Survey, Norman, Okla.

All students are welcome to present their research in any area of geology. POSTER

T112. Earthcaching—Educational Earth Science Geocaches that Link Public and other Lands with the General Public via a Web-based Adventure Game

Geoscience Education; Geoscience Information/ Communication

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

Earthcaching is the educational earth science–based component of the geocaching game. It takes real sites and provides educational notes via the Web that visitors can use to discover some fascinating aspect of our planet. ORAL

T113. Strategies for Teaching Introductory Geoscience in Large Lecture Classes

National Association of Geoscience Teachers

Geoscience Education

Michelle L. Stoklosa, Boise State University, Boise, Idaho; Karen Viskupic, Boise State University, Boise, Idaho

This session will focus on strategies for teaching introductory geoscience to classes of 100+ students. Papers are solicited that illustrate effective or failed methods for improving any aspects of teaching/learning in large lecture classes. ORAL and POSTER

T114. We Can Continue to Do Better: More Alternatives to the Same Old Lab-Lecture Format in the College Classroom

GSA Geoscience Education Division; National Association of Geoscience Teachers

Geoscience Education

Elizabeth M. King, Illinois State University, Normal, Ill.; Dexter Perkins, University of North Dakota, Grand Forks, N.Dak.

There are many excellent alternative teaching tools rather than the standard lab-lecture format. Building on last year's successful theme session, this session will provide an opportunity to continue sharing innovative teaching styles across the discipline. ORAL and POSTER

T115. Holocene Climate Change in Western North America: Spatial-Temporal Phasing of Climate Modes, Events, and Transitions

GSA Limnogeology Division; GSA Archaeological Geology Division

Limnogeology; Paleoclimatology/Paleoceanography; Quaternary Geology

Matthew E. Kirby, California State University, Fullerton, Calif.; Steve P. Lund, University of Southern California, Los Angeles, Calif.; Larry V. Benson, U.S. Geological Survey, Boulder, Colo.; Rob Negrini, California State University, Bakersfield, Calif.

This session will highlight recent advances in our knowledge of Holocene climate variability in western North America over annual to millennial scales from terrestrial environments, including the spatial and temporal phasing of climate modes, events, and transitions. ORAL and POSTER

T116. Causes and Effects of the Paleocene-Eocene Thermal Maximum and Other Paleogene Hyperthermal Events

GSA Limnogeology Division

Paleoclimatology/Paleoceanography; Paleontology, Diversity, Extinction, Origination; Geochemistry, Other

Scott L. Wing, Smithsonian Institution, Washington, D.C.

The Paleocene-Eocene Thermal Maximum is the best-documented geological example of sudden global warming and its effects on biotas. Authors in this session will report new results on the PETM and other, recently-discovered Paleogene hyperthermal events. ORAL

T117. Terrestrial and Extraterrestrial Environments for Microbial Survival

GSA Geobiology and Geomicrobiology Division

Geomicrobiology

Stephen E. Grasby, Natural Resources Canada, Calgary, Alberta; Penny Morris; Susan Wentworth, Johnson Space Center, Houston, Tex.

The session will be dedicated to understanding the variety of microbial systems that have existed throughout geological time and how this may help us predict environments for survival in extraterrestrial systems. ORAL

T118. The Peña Blanca Uranium District, Chihuahua: A Natural Analogue for the Transport of Radionuclides in a Nuclear Waste Repository in Unsaturated, Welded Tuff

Geology and Public Policy Committee

Geochemistry, Aqueous; Geochemistry, Other; Hydrogeology

Ardyth M. Simmons, Los Alamos National Laboratory, Los Alamos, N.Mex.; Patrick F. Dobson, Lawrence Berkeley National Laboratory, Berkeley, Calif.

Studies conducted at the Peña Blanca uranium district of Chihuahua, Mexico, address features and processes analogous to those anticipated in a Yucca Mountain, Nevada, waste repository and modeling predictions relevant to total system performance assessment. ORAL

T119. Mercury in Coal: Origins to Emissions

GSA Coal Geology Division; GSA Geology and Society Division

Coal Geology; Environmental Geoscience; Public Policy

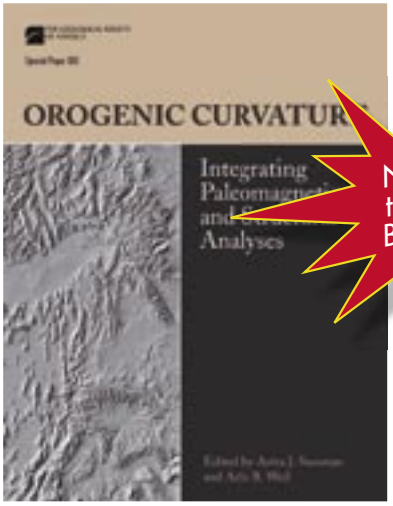
Jeffrey C. Quick, Utah Geological Survey, Salt Lake City, Utah; Allan Kolker, U.S. Geological Survey, Reston, Va.

New rules will limit mercury emissions from coal-fired electric utilities. We encourage presentations on mercury in modern mires, its distribution in fossil coal, behavior during beneficiation and combustion, control strategies, and atmospheric fate. ORAL

continued on page 41

Bookstore Update 2004–2005

GSA Special Papers



NEW to the GSA Bookstore

Orogenic curvature: Integrating paleomagnetic and structural analyses
edited by Aviva J. Sussman and Arlo B. Weil

Most active and ancient orogenic systems display salients and recesses with varying degrees of curvature in map view. Within these arcuate orogens, many observations (e.g., out-of-plane strains, oblique slip, earthquake swarms, vertical-axis rotations) indicate that material is transported (or flows) in three dimensions, such that no single cross section can fully describe the motion. Although our conceptualization of the architecture of curved mountain belts has become increasingly sophisticated; many questions as to the kinematics and mechanics of forming arcuate orogenic systems still need to be answered. To this end, GSA Special Paper 383 brings together several investigations which integrate structural and paleomagnetic techniques. Examples of the multidisciplinary research presented in the volume include: the impact that vertical-axis rotations have on shortening estimates; magnetic anisotropy and strain distribution as a function of basement/cover decoupling; remagnetization and structural growth; mantle-lithosphere delamination caused by plate bending; and the relationship between shear zones and vertical-axis rotations.

SPE383, 258 p. plus index,
ISBN 0-8137-2383-3
$80.00, **member price $64.00**

Large meteorite impacts III
edited by Thomas Kenkmann, Friedrich Hörz, and Alex Deutsch

The third volume of the series "Large Meteorite Impacts" provides an updated and comprehensive overview of modern impact crater research. In 26 chapters, more than 90 authors from Europe, the United States, Russia, Canada, and South Africa give a balanced, firsthand account of the multidisciplinary field of cratering science, with reports on field studies, geophysical analyses, and experimental and numerical simulations. Nine chapters focus on structure, geophysics, and cratering motions of terrestrial craters. Recent advances in impact ejecta studies and shock metamorphism are assembled, each with seven chapters, and three chapters extend the scope from a terrestrial to a planetary perspective.

SPE 384, 457 p. plus index,
ISBN 0-8137-2384-1
$95.00, **member price $76.00**

GSA Special Papers in the works!

Available Soon!

Cenozoic Climatic and Environmental Changes in Russia
edited by A.A. Velichko and V.P. Nechaev (editors of the English-language edition are H.E. Wright Jr., A.A. Velichko, T.A. Blyakharchuk, and Olga Borisova)

SPE382, ISBN 0-8137-2382-5 (in prep.)

Active Tectonics and Seismic Hazards of Puerto Rico, the Virgin Islands, and Offshore Areas
edited by Paul Mann

SPE 385, 287 p., ISBN 0-8137-2385-X (in prep.)

Reconstruction of Pleistocene Ice-Dammed Lake Outburst Floods in the Altai Mountains, Siberia
edited by Jürgen Herget

SPE386, ISBN 0-8137-2386-8 (in prep.)

Coal Systems Analysis
edited by Peter D. Warwick

SPE387, ISBN 0-8137-2387-6 (in prep.)

Fifth Hutton Symposium: The Origin of Granites and Related Rocks
edited by S. Ishihara, W.E. Stephens, S.L. Harley, M Arima, and T. Nakajima

SPE 389, 392 p., ISBN 0-8137-2389-2 (in prep.)

Maps and Charts

Geology of the Scott-Reedy Glaciers Area, Southern Transantarctic Mountains, Antarctica
by M.B. Davis and D.D. Blankenship, 2005

MCH093F, 1 folded sheet
$50.00, **member price $40.00**

MCH093R, 1 rolled sheet
$55.00, **member price $45.00**

Geological Map of the Northern Main Ethiopian Rift
by Tsegaye Abebe, Piero Manetti, Marco Bonini, Giacomo Corti, Fabrizio Innocenti, and Francesco Mazzarini, 2005

MCH094F, 1 folded sheet, 20 p. text
$50.00, **member price $40.00**

MCH094R, 1 rolled sheet, 20 p. text
$55.00, **member price $45.00**

Recently Published Books in 2004

GSA Special Papers

Orogenic Curvature: Integrating Paleomagnetic and Stuctural Analyses
edited by Aviva J. Sussman and Arlo B. Weil, 2004

SPE383, 272 p., plus index, CD-ROM, ISBN 0-8137-2383-3
$80.00, **member price $64.00**

Hydraulic Tests of Miocene Volcanic Rocks at Yucca Mountain and Pahute Mesa and Implications for Groundwater Flow in the Southwest Nevada Volcanic Field, Nevada and California
by Arthur L. Geldon, 2004

SPE381, 104 p., ISBN 0-8137-2381-7
$50.00, **member price $40.00**

Gneiss Domes in Orogeny
edited by Donna L. Whitney, Christian Teyssier, and Christine S. Siddoway, 2004

SPE380, 378 p., plus index, CD-ROM, ISBN 0-8137-2380-9
$85.00, **member price $68.00**

Sulfur Biogeochemistry—Past and Present
edited by Jan P. Amend, Katrina J. Edwards, and Timothy W. Lyons, 2004

SPE379, 205 p., ISBN 0-8137-2379-5
$75.00, **member price $60.00**

Detrital Thermochronology—Provenance Analysis, Exhumation, and Landscape Evolution of Mountain Belts
edited by Matthias Bernet and Cornelia Spiegel, 2004

SPE378, 126 p., ISBN 0-8137-2378-7
$55.00, **member price $44.00**

Precambrian Geology of the Tobacco Root Mountains, Montana
edited by John B. Brady, H. Robert Burger, John T. Cheney, and Tekla A. Harms, 2004

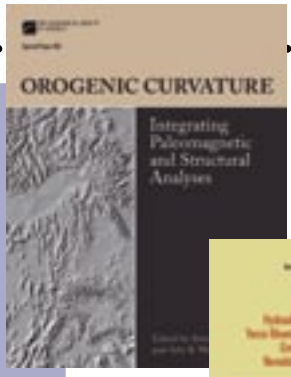
SPE377, 256 p., plate, ISBN 0-8137-2377-9
$100.00, **member price $80.00**

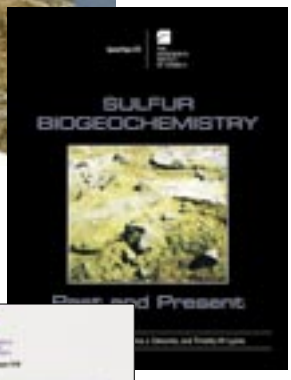
Posture, Locomotion, and Paleoecology of Pterosaurs
by Sankar Chatterjee and R.J.Templin, 2004

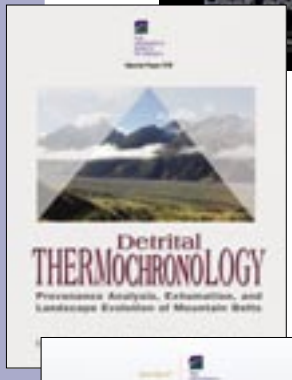
SPE376, 64 p., ISBN 0-8137-2376-0
$50.00, **member price $40.00**

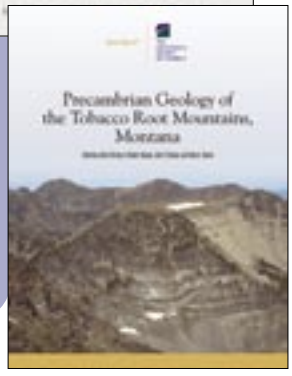
Natural Hazards in El Salvador
edited by William I. Rose, Julian J. Bommer, Dina L. López, Michael J. Carr, and Jon J. Major, 2004

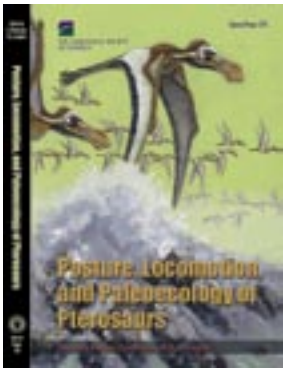
SPE375, 480 p., plus index, ISBN 0-8137-2375-2
$100.00, **member price $80.00**

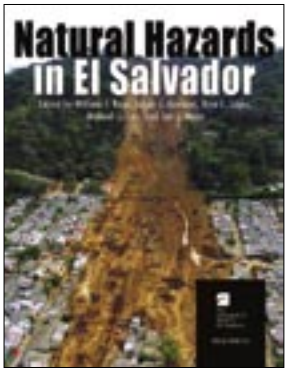












Memoir

Proterozoic Tectonic Evolution of the Grenville Orogen in North America
edited by Richard P. Tollo, Louise Corriveau, James McLelland, and Mervin J. Bartholomew, 2004

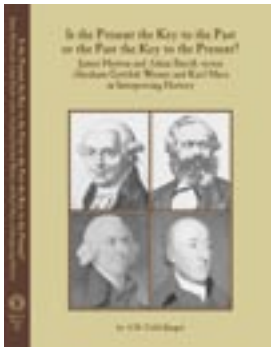
MWR197, 798 p., plus index, ISBN 0-8137-1197-5
$195.00, **member price $156.00**

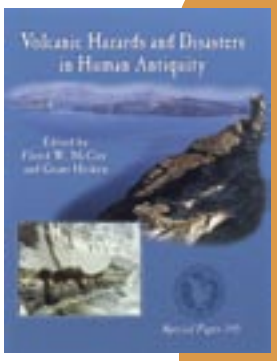
GSA Field Guide

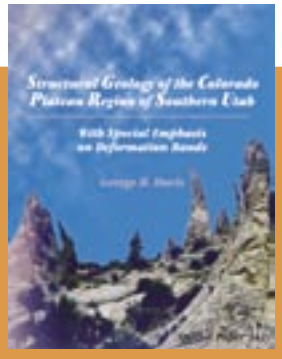
Field Trips in the Southern Rocky Mountains, USA
edited by Eric P. Nelson and Eric A. Erslev, 2004

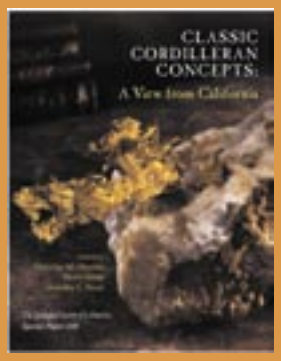
FLD005, 242 p., ISBN 0-8137-0005-1
$45.00, **member price $36.00**

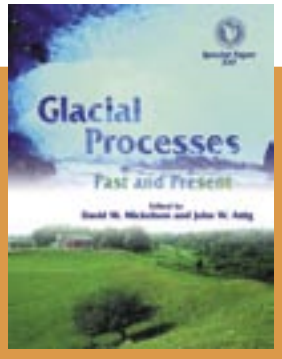
Back in Print











GSA Special Papers

Is the Present the Key to the Past or the Past the Key to the Present?
James Hutton and Adam Smith versus Abraham Gottlob Werner and Karl Marx in Interpreting History
by A.M.C. Şengör, 2001

SPE355, 51 p., ISBN 0-8137-2355-8, endnotes
$36.00, member price $28.80

Volcanic Hazards and Disasters in Human Antiquity
edited by Floyd W. McCoy and Grant Heiken, 2000

SPE345, 99 p., ISBN 0-8137-2345-0
$35.00, **member price $28.00**

Structural Geology of the Colorado Plateau Region of Southern Utah, with Special Emphasis on Deformation Bands
by George H. Davis, 1999

SPE342, 157 p., ISBN 0-8137-2342-6
$35.00, **member price $28.00**

Classic Cordilleran Concepts: A View from California
edited by E.M. Moores, D. Sloan, and D.L. Stout, 1999

SPE338, 481 p., ISBN 0-8137-2338-8
$80.00, **member price $64.00**
(Also available on CD-ROM)

Glacial Processes Past and Present
edited by D.M. Mickelson and J.W. Attig, 1999

SPE337, 203 p., ISBN 0-1837-2337-X
$38.00, **member price $30.40**
(Also available on CD-ROM)

Tectonosomes and Olistostromes in the Argille Scagliose of the Northern Apennines, Italy
by G.A. Pini, 1999

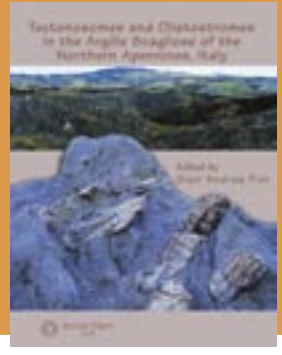
SPE335, 70 p., ISBN 0-8137-2335-3
$25.00, **member price $20.00**

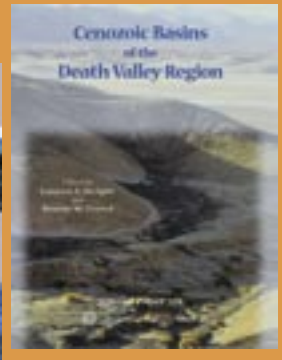
Cenozoic Basins of the Death Valley Region
edited by L.A. Wright and B.W. Troxel, 1999

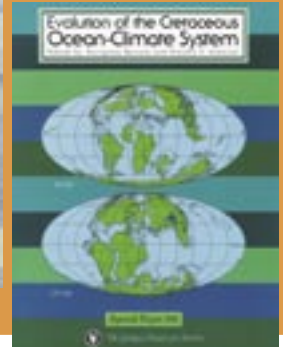
SPE333, 376 p. plus index, ISBN 0-8137-2333-7
$40.00, **member price $32.00**

Evolution of the Cretaceous Ocean-Climate System
edited by E. Barrera and C.C. Johnson, 1999

SPE332, 436 p. plus index, ISBN 0-8137-2332-9
$70.00, **member price $56.00**



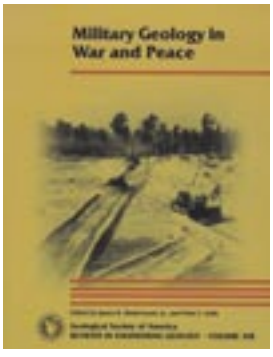




Memoirs

Pre-Mesozoic Ice Ages: Their Bearing on Understanding the Climate System
by J.C. Crowell, 2000

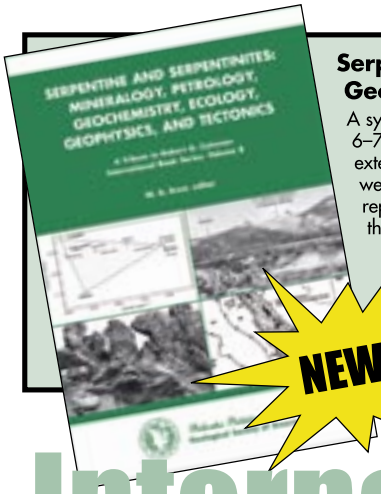
MWR192, 106 p., ISBN 0-8137-1192-4
$40.00, **member price $32.00**



Reviews in Engineering Geology

Reviews in Engineering Geology XIII Military Geology in War and Peace
edited by J.R. Underwood Jr. and P.L. Guth, 1998

REG013, 237 p., ISBN 0-8137-4113-0,
$35.00, **member price $28.00**



NEW!

Serpentine and Serpentinites: Mineralogy, Petrology, Geochemistry, Ecology, Geophysics, and Tectonics: A Tribute to Robert G. Coleman *edited by W.G. Ernst, 2005*

A symposium dealing with the plate-tectonic origin, geochemical evolution, and environmental impact of serpentinites was held 6–7 December 2003 at Stanford University, in honor of Professor Emeritus Robert G. Coleman. The technical sessions to some extent reflected his broadly diversified research thrusts. The up-to-date scientific contributions that resulted from the symposium were published in issues of International Geology Review and are collected in this International Book Series volume. The volume represents a unique collection of research subjects spanning an unusually broad spectrum of disciplines that overlap chiefly in their focus on hydrated mantle material. The book is divided into topical areas, mirroring some of Coleman's scientific contributions in mineralogy; petrology, regional geology, and plate tectonics; geochemistry; geophysics; and environmental geobotany. In aggregate, it constitutes a scholarly attempt of the scientific community to recognize some of Coleman's lifetime of extraordinary scientific achievements—especially those concerning a fuller understanding of serpentine and serpentinites.

IBS008, 606 p., ISBN 0-9665869-8-0 **$95.00, member price $76.00**

International Book Series

The George A. Thompson Volume: The Lithosphere of Western North America and Its Geophysical Characterization

edited by Simon L. Klemperer and W.G. Ernst, 2003

The George Thompson Volume presents an up-to-date overview of the geologic architecture of western North America, from the San Andreas fault to the Colorado Plateau, utilizing techniques as diverse as shear-wave splitting, numerical modeling, Re/Os systematics, and synthesis of field mapping. Scientific contributions highlight new developments in some of the many fields to which George Thompson has contributed over a long career, including the strength and stress state of the crust, the formation of basins and temporal evolution of deformation, and crustal roots and the evolution of lithospheric composition and structure. Twenty-five papers with an international authorship, originally presented at a December 2001 symposium, are grouped in six sections: "Continental Deformation"; "Fault Mechanics and the San Andreas Fault"; "Geology of the Western United States"; "Isostasy and Gravity Methods"; "The Mantle: Flow and Seismic Structure"; and "The Mantle: Geochemistry." Earth scientists concerned with the geologic development of the western conterminous United States need to read this book!

IBS007, 544 p., ISBN 0-9665869-6-4
$95.00, member price $76.00

Frontiers in Geochemistry: Konrad Krauskopf Volume 1 (Global Inorganic Geochemistry) *and* Volume 2 (Organic, Solution, and Ore Deposit Geochemistry)

edited by W.G. Ernst, 2002

The technical papers resulting from a symposium entitled "Frontiers in Geochemistry," held at Stanford University in honor of Professor Konrad B. Krauskopf, were published in separate installments in International Geology Review and are collected here in an attempt to recognize Krauskopf's lifetime of extraordinary achievement in both geology and geochemistry. Krauskopf has published a diverse set of international-quality investigations broadly arching across the fields of hard-rock geology, petrology, geochemistry, and mineral deposits. Detailed studies include illuminating the parageneses of granitoids and basement terranes in the Pacific Northwest, the volcanic eruptions of Parícutin in the Transmexican volcanic belt, and the regional petrologic evolution of coastal Norway. He has generated both mineral deposit and general geologic maps for the California Division of Mines and the U.S. Geological Survey, chiefly in the Sierra Nevada and the White-Inyo ranges of eastern California. He pioneered books applying the principles of physics and chemistry to Earth and provided geoscientists with discipline-defining texts in geochemistry and physical geology over five decades. Special emphases have included elucidation of aqueous solution–metal complex equilibria as well as thermodynamic applications to solid-melt-fluid partitioning. Few geochemists have contributed to the earth sciences in such far-ranging ways as geologist, geochemist, and science and technology advisor to the nation. This two-volume set is an insufficient tribute to the legendary scientific accomplishments of Krauskopf, but it's a start!

Volume 1: IBS005, 324 p., ISBN 09665869-4-8
$95.00, member price $76.00

Volume 2: IBS006, 265 p., ISBN 09665869-5-6
$85.00, member price $68.00

Ultra-High Pressure Metamorphism and Geodynamics in Collision-Type Orogenic Belts

co-edited by W.G. Ernst, and J.G. Liou, 2000

Collisional belts that retain the effects of Phanerozoic ultra-high pressure (UHP) metamorphism are increasingly being recognized, especially in Eurasia. Neighboring regions generally lack evidence of coeval arc volcanism or plutonism. Following the consumption of intervening oceanic lithosphere, each UHP orogen marks the site of astonishingly deep subduction of a microcontinental promontory or island-arc fragments. Mafic and ultramafic rocks are volumetrically minor in such belts. Maximum recorded pressures in UHP complexes approach or even exceed 2.8 GPa at temperatures of 600–900 °C. Subduction zones involve low-T prograde trajectories, and constitute the only plate-tectonic environment where such conditions exist. Internal portions of descending lithospheric plates may be characterized by yet lower geothermal gradients, but the crustal upper margins are typified by less extreme high-P, low-T paths of 5–10 °C/km. Mineral parageneses, physical conditions of recrystallization, and the tectonics of subduction and exhumation are thoroughly documented in this volume. Extensional collapse and erosion of rising sialic masses evidently aid in the continued ascent of deeply subducted but buoyant material. Surviving UHP terranes consist of relatively thin slabs of continental crust. Slices evidently rose to mid-crustal levels rapidly at remarkably high exhumation rates—approaching or exceeding 10 mm/yr. Back reaction attending decompression in all cases was nearly complete; where UHP relics have persisted, retrogression evidently was limited by declining temperatures, coarse grain size of host minerals, and relative impermeability of the rocks to catalytic aqueous fluids. Clearly, UHP terranes provide important new constraints on the origin and tectonic evolution of collisional mountain belts.

IBS004, 293 p., ISBN 0-9665869-3-X
$50.00, member price $40.00 *REDUCED PRICE!*

Tectonic Studies of Asia and the Pacific Rim: A Tribute to Benjamin M. Page (1911–1997)

co-edited by W.G. Ernst and R.G. Coleman, 2000

The late Benjamin M. Page, professor of geology of Stanford University, was a geologic mapper, regional geologist, and plate tectonician par excellence. His many research areas included western Nevada, the Apennines, southern Taiwan, and southwestern Japan, but Page's most notable and extensive works involve elucidation of the geology of the California coast ranges. Page devoted a lifetime to unraveling the geologic architecture and plate-tectonic evolution of this continental-margin mountain belt. Indeed, nearly half of the papers in this volume, including a posthumous contribution by Page, involve the tectonic history of the central California coast ranges. Topics of special concentration include the origin, evolution, and geologic occurrence of ophiolites, accretionary mélanges, continental-margin structural and/or geophysical transects, transform faults, and convergent-margin mountain belts. In 1993, the Geological Society of America recognized Page's numerous seminal scientific papers with the Career Award in Structural Geology and Tectonics.

IBS003, 328 p., ISBN 0-9665869-2-1
$50.00, member price $40.00 *REDUCED PRICE!*

Planetary Petrology and Geochemistry

The Lawrence A. Taylor 60th Birthday Volume

co-edited by G.A. Snyder, C.R. Neal, and W.G. Ernst, 1999

IBS002, 277 p., ISBN 0-9665869-1-3
$50.00, member price $40.00 *REDUCED PRICE!*

Integrated Earth and Environmental Evolution of the Southwestern U.S.

co-edited by W.G. Ernst and C.A. Nelson, 1998

IBS001, 502 p., ISBN 0-9665869-0-5
$50.00, member price $40.00 *REDUCED PRICE!*

New Treatise Volumes

Protoctista 1, Vol. 1, Charophyta
edited by Roger L. Kaesler; coordinating author, Monique Feist, leading a team of international specialists

This is the first volume of Part B, Protoctista 1 to be published. Part B deals generally with plantlike autotrophic protoctists. Future volumes of Part B will cover the dinoflagellates, silicoflagellates, ebredians, benthic calcareous algae, coccolithophorids, and diatoms. Included in the charophyte volume are introductory chapters covering morphology, mineralization, techniques for preparation and study, ecology and paleoecology, biogeography, stratigraphic distribution and paleobiogeography, stratigraphic range chart, biozonation, evolutionary history, molecular phylogeny, classification, and glossary. Systematic descriptions of class Charophyceae include the orders Moellerinales, Sycidiales, and Charales, followed by a comprehensive reference list and index.

TREBV1, ISBN 0-8137-3002-3, indexed, in prep.

Porifera (Revised), Vol. 2
edited by Roger L. Kaesler; coordinating author, J. Keith Rigby, with authors R.E.H. Reid, R.M. Finks, and *J. Keith Rigby*

Second volume in the revision of the Porifera. Entirely devoted to introductory material, with chapters on general features of the Porifera; morphology, phylogeny, and classificaton of the Demospongea, Lyssacinosa, and Hexactinellida; glossary; reproduction and development; physiology; functional morphology and adaptation; variability and variation; ecology and paleoecology; evolution and ecological history; geographic and stratigraphic distribution; and techniques of study. Also included are a comprehensive reference list and an index.

TREEV2R, ISBN 0-8137-3130-5,
hardbound, indexed, in prep.

Porifera (Revised), Vol. 3
edited by Roger L. Kaesler; coordinating author, J. Keith Rigby, with authors R.M. Finks, R.E.H. Reid, and *J. Keith Rigby, 2004*

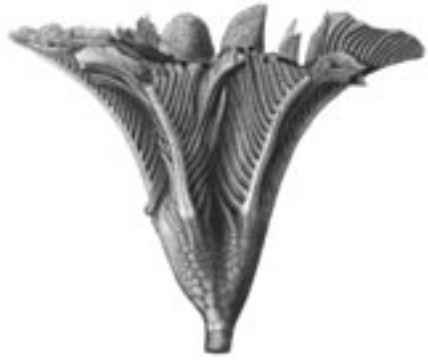
Third volume in the revision of the Porifera. Included in the volume are systematic descriptions for the classes Demospongea, Hexactinellida, Heteractinida, and Calcarea, followed by a stratigraphic range chart to the subgenus level, comprehensive reference list, and index.

TREEV3R, xxxi + 872 p., ISBN 0-8137-3131-3
$175.00, **member price $140.00**

Brachiopoda (Revised), Vol. 5
edited by Roger L. Kaesler; coordinating author, Sir Alwyn Williams, leading a team of international specialists

Fifth volume to be published in this extensive six-volume revision of the phylum Brachiopoda. Included in this volume is the subphylum Rhynchonelliformea (part), including orders Spiriferida, Spiriferinida, Thecideida, and Terebratulida, followed by a comprehensive reference list and index.

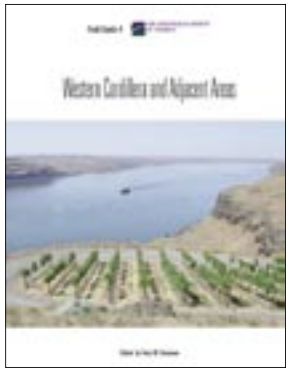
TREHV5R, ISBN 0-8137-3135-6,
hardbound, indexed, in prep.



GSA Field Guides

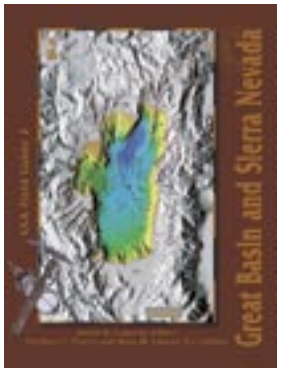
Field Trips in the Southern Rocky Mountains, USA
edited by Eric P. Nelson and *Eric A. Erslev, 2004*

FLD005, 242 p., ISBN 0-8137-0005-1, softcover
$45.00, **member price $36.00**



Western Cordillera and Adjacent Areas
edited by Terry W. Swanson, 2003

FLD004, 284 p. ISBN 0-8137-0004-3, softcover
$45.00, **(Sorry, no additional discounts)**



BACK IN PRINT!

Great Basin and Sierra Nevada
edited by David R. Lageson, co-editors
Stephen G. Peters and *Mary M. Lahren, 2000*

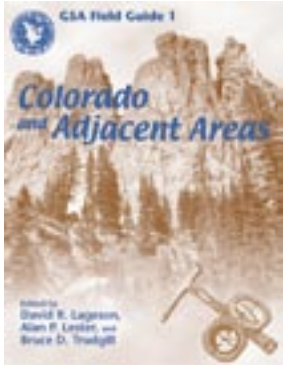
FLD002, 430 p., ISBN 0-8137-0002-4, softcover,
$55.00, **member price $44.00**

IGC Field Trip Guide CD-ROM

This CD contains 27 papers from field excursions held in conjunction with the 31st International Geological Congress (IGC), Rio de Janeiro, August 6–17, 2000. Covering mainly the two tectonic domains of the South American continent, the Andean Cordillera and the South American Platform, articles are divided into pre, during, and post-Congress field trips. Pre-Congress trips embody studies in the Parana Basin (southern Brazil); trips during the Congress relate to geological sites located not too far from the city of Rio de Janeiro; post-Congress trips focus on several economic geology themes.

High-quality material and the scientific level of these guidebooks, offered together in one complete CD-ROM, make this a valuable and economical addition to any geoscience collection.

IGC Field Trip Guide, CD-ROM,
Rio de Janeiro, Brazil
FLDIGC01, 27 Trips
$20.00, **member price: $16.00**



BACK IN PRINT!

Colorado and Adjacent Areas
edited by David R. Lageson, Alan P. Lester,
and *Bruce D. Trudgill, 1999*

FLD001, 201 p., ISBN 0-8137-0001-9, softcover
$35.00, **member price $28.00**

Geological Field Trips in Southern Idaho, Eastern Oregon, and Northern Nevada
edited by Kathleen M. Haller
and *Spencer H. Wood, 2004*

Detailed guides to localities for the nine field trips of the 2004 Geological Society of America Cordilleran and Rocky Mountain Sections joint meeting in Boise, Idaho. Topics covered include: the Antler orogeny and Late Paleozoic history of the Basin and Range from sites in Coal Mine, Carlin, and Ferdelford Canyons; localities of Miocene silicic volcanism and widespread ash-flow tuffs between Vale, Unity, and Burns, Oregon; outcrop features of Miocene rhyolite volcanism along the Owyhee Mountain front; the Quaternary basalt field at Craters of the Moon; late Pleistocene glaciation in the Sawtooth Mountains and Valley of central Idaho; stratigraphic records of forest-fire history, debris flows, sedimentation events, and geomorphic change recorded in alluvial fans and river terraces of the South Fork of the Payette River Canyon; hydrovolcanic tuffs in the canyon of the Snake River near Swan Falls, Idaho; and more.

FLDSEC02, 173 p., ISBN 0-9753738-0-3
$20.00 **(Sorry, no additional discount.)**

Other Field Guides

INQUA 2003 Field Guide Volume: Quaternary Geology of the United States
edited by Don J. Easterbrook, 2003

Much of the landscape in the United States was shaped by climatic events during the Quaternary, especially the erosion and deposition in the Pleistocene. The wealth of Quaternary features found in the U.S. includes continental ice sheet glaciation, alpine glaciation, marine shorelines, marine deposits, faulting, tectonic uplift, effects of isostatic rebound, pluvial lakes, large-scale eolian deposits, the world's largest geothermal area, and much more. This volume contains 17 guides with contributions from 97 authors across the country, from Alaska and the west coast to New England, including much new, previously unpublished information. Each guide includes specific sites with interpretations of the features to be seen and discussions of critical issues.

FLDINQ01, 438 p., ISBN 0-945920-50-4, softcover
$45.00 **(Sorry, no additional discount.)**

Geologic Field Trips, Western Montana and Adjacent Areas
edited by Sheila Roberts and *Don Winston, 2000*

This volume reflects the great geological diversity of the U.S. Northwest. For Quaternary and hazards geologists, there is a guide by Dave Alt on the Glacial Lake Missoula floods. Other trips describe the geology and hydrology of the upper Flathead valley, 100 years of mining and smelting contamination of the Clark Fork River drainage, and recent landslides in the Blackfoot River drainage. Igneous and metamorphic petrologists can take a tour of the Bitterroot metamorphic core complex or look at contemporaneous Sevier-style fold and thrust tectonics and granite emplacement in Southwest Montana. Belt Supergroup enthusiasts can inspect the Proterozoic to recent geology of the Coeur d'Alene mining district and Lewis and Clark line on two trips with Don Winston, Ian Lange, and Brian White. Sedimentologists might want to check out a paper on Mississippian Madison Group carbonate rocks. History of geology fans will enjoy a tour of the geology of the Lewis and Clark Trail in southwest Montana.

FLDSEC01, 233 p., softcover
$25.00, **member price $20.00**

Reviews in Engineering Geology

Reviews in Engineering Geology XV
Catastrophic Landslides: Effects, Occurrence, and Mechanisms
edited by Stephen G. Evans and Jerome V. DeGraff, 2002
REG015, 400 p. plus index, ISBN 0-8137-4115-7
$140.00, **member price $112.00**

Reviews in Engineering Geology XIV
The Environmental Legacy of Military Operations
edited by Judy Ehlen and Russell S. Harmon, 2001
REG014, 219 p. plus index, ISBN 0-8137-4114-9
$125.00, **member price $100.00**

BACK IN PRINT!
Reviews in Engineering Geology XIII
Military Geology in War and Peace
edited by J.R. Underwood Jr., and P.L. Guth, 1998
REG013, 237 p. plus index,
ISBN 0-8137-4113-0, softcover
$35.00, **member price $28.00**

Reviews in Engineering Geology XII
A Paradox of Power: Voices of Warning and Reason in the Geosciences
edited by C.W. Welby and M.E. Gowan, 1998
REG012, 185 p., ISBN 0-8137-4112-2
$50.00, **member price $40.00**

Reviews in Engineering Geology XI
Storm-Induced Geologic Hazards: Case Histories from the 1992–1993 Winter in Southern California and Arizona
edited by R.A. Larson and J.E. Slosson, 1997
REG011, 117 p. plus index, ISBN 0-8137-4111-4
$20.00, **member price $16.00** REDUCED PRICE!

Reviews in Engineering Geology X
Clay and Shale Slope Instability
edited by W.C. Haneberg and S.A. Anderson, 1994
REG010, 150 p. plus index, ISBN 0-8137-4110-6
$20.00, **member price $16.00** REDUCED PRICE!

International Stratigraphic Guide:

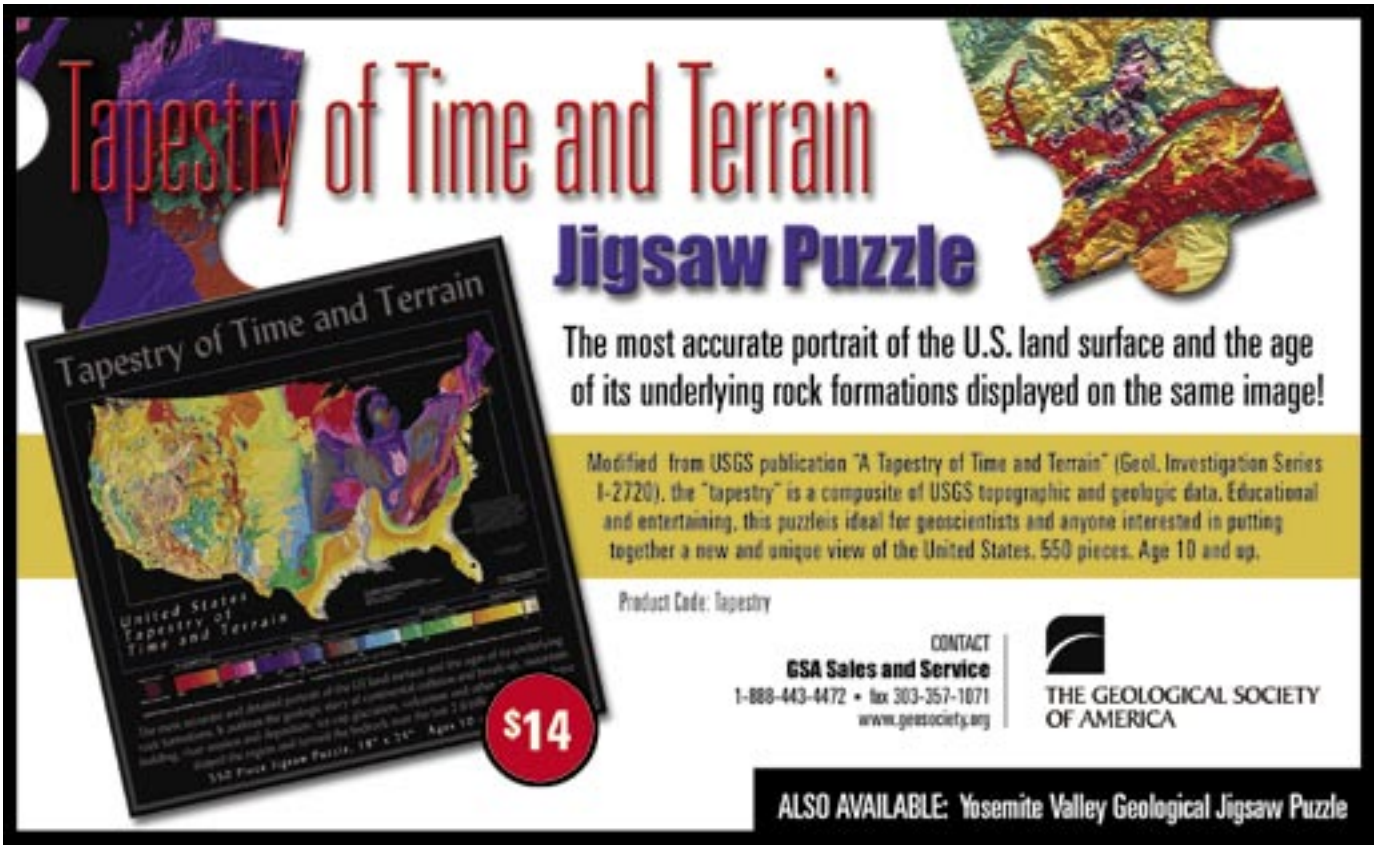
A Guide to Stratigraphic Classification, Terminology, and Procedure
edited by Amos Salvador, 1994

Copublished by GSA and the International Union of Geological Sciences (IUGS)

The purposes of this guide are to promote international agreement on principles of stratigraphic classification and to develop internationally acceptable stratigraphic terminology and roles of stratigraphic procedure—all in the interest of improved international communication, coordination, and understanding and thus of improved effectiveness in stratigraphic work throughout the world.

Here is the most up-to-date statement of international agreement on concepts and principles of stratigraphic classification, and a guide to international stratigraphic terminology. The first edition, published in 1976, was a significant contribution toward international agreement and improvement in communication and understanding among earth scientists worldwide. This revised, second edition updates and expands the discussions, suggestions, and recommendations of the first edition, expansions necessitated by the growth and progress of stratigraphic ideas and the development of new stratigraphic procedures since release of the first edition. A valuable tool for every earth scientist writing for an international audience.

IUG001, 206 p. plus index, ISBN 0-8137-7401-2,
hardcover, 6" x 9" format
$24.00, **member price $19.20**



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T120. Experimental, Theoretical, Stable Isotope, and Predictive Studies of Sulfide Oxidation Processes in the Field and Laboratory

Environmental Geoscience; Geochemistry, Aqueous; Geomicrobiology

W.C. Pat Shanks, U.S. Geological Survey, Denver, Colo.; Robert R. Seal, U.S. Geological Survey, Reston, Va.

Papers are welcome on experimental and modeling studies of inorganic and microbial oxidation of sulfides in mine waste and other settings, partitioning of metals among primary phases, secondary phases, aqueous environment, and use and calibration of light element and transition element stable isotopes to understand these processes. ORAL

T121. Thermochronology: Techniques, Applications, and Interpretations

Tectonics; Geomorphology; Geochemistry, Other

Todd A. Ehlers, University of Michigan, Ann Arbor, Mich.; Peter W. Reiners, Yale University, New Haven, Conn.

Time-temperature histories of rocks from thermochronologic approaches provide unique constraints on a wide range of tectonic, geomorphic, magmatic, and other processes. This session will explore recent developments in analytical and interpretation techniques, and new applications using both high and low-temperature thermochronology. ORAL and POSTER

T122. Dynamics of Metamorphic and Hydrothermal Processes: From Grain-Scale to Mountain Belt

Petrology, Metamorphic; Mineralogy/Crystallography; Geochemistry, Aqueous

John R. Bowman, University of Utah, Salt Lake City, Utah; C. Tom Foster, University of Iowa, Iowa City, Iowa

This session solicits field, analytical, and modeling studies that focus on the mechanisms, rates and timescales of crystal growth, mineral reaction, heat/mass transfer, and fluid fluxes in metamorphic and hydrothermal systems. ORAL and POSTER

T123. Mars Analogue Research and Instrument Field Testing

GSA Planetary Geology Division

Planetary Geology; Remote Sensing/Geographic Info System

John C. Armstrong, Weber State University, Ogden, Utah; Luther Beegle, Jet Propulsion Laboratory, Pasadena, Calif.; R. Glenn Sellar, Jet Propulsion Laboratory, Pasadena, Calif.

This session will bring together those working with Mars analogue environments and remote sensing of terrestrial environments related to Mars with researchers performing new pre-flight instrument field tests. ORAL

T124. The Lunar Exploration Initiative: Current Science Knowledge and Future Exploration

GSA Planetary Geology Division

Planetary Geology

Ben Bussey, Applied Physics Lab, Laurel, Md.; R. Aileen Yingst, GSA Planetary Geology Division, Green Bay, Wis.

This session will discuss opportunities afforded by the President's Lunar Exploration Initiative, the current state of lunar science, types of data to be acquired and how these will add to our understanding of the Moon. ORAL

T125. 4-D Evolution of the Continents: Integrated Solutions through Cyberinfrastructure

GSA Geophysics Division; GSA Structure and Tectonic Division

Tectonics; Geophysics/Tectonophysics/Seismology; Structural Geology

A.K. Sinha, Virginia Tech, Blacksburg, Va.; Robert D. Hatcher, University of Tennessee, Knoxville, Tenn.; G. Randy Keller, University of Texas, El Paso, Tex.

Several recent initiatives and programs are focused on studies of the 4-D evolution of continents. Answering key questions about continental tectonics requires highly integrated studies. Data and model integration through cyberinfrastructure facilitates scientific discovery. ORAL and POSTER

T126. Accretionary Orogens in Space and Time
GSA Geophysics Division

Geophysics/Tectonophysics/Seismology; Precambrian Geology; Tectonics

Kent C. Condie, New Mexico Institute of Mining and Technology, Socorro, N.Mex.; Peter A. Cawood, University of Western Australia, Crawley, Australia; Alfred Kroner, Johannes Gutenberg–Universität Mainz, Mainz

This multidisciplinary session focuses on the origin and evolution of accretionary orogens through time. We encourage papers on tectonics, terrane accretion, juvenile crust production, seismology, changes in tectonic settings through time, and relationship to the supercontinent cycle. ORAL and POSTER

T127. Geometry and Evolution of Extensional Basins and their Influence on Fluid Flow, Sedimentation, Seismicity, and Magmatism
GSA Geophysics Division; GSA Structural Geology and Tectonics Division

Tectonics; Geophysics/Tectonophysics/Seismology; Structural Geology

Victoria E. Langenheim, U.S. Geological Survey, Menlo Park, Calif.; V.J.S. Grauch, U.S. Geological Survey, Denver, Colo.

We solicit papers that discuss how the geometry and evolution of extensional basins influence seismicity, fluid flow, magmatism, and sedimentation, particularly but not exclusively in the Basin and Range and Rio Grande Rift. ORAL

T128. Processes of Basin and Range Extension: An EarthScope Primer
GSA Geophysics Division; GSA Structural Geology and Tectonics Division

Geophysics/Tectonophysics/Seismology; Tectonics; Neotectonics/Paleoseismology

Dennis Harry, Colorado State University, Fort Collins, Colo.; Craig H. Jones, University of Colorado, Boulder, Colo.

Presentations on the geology, geophysics, geochemistry, and geodesy of the Basin and Range and its margins. Focus is on identifying and elucidating processes and problems that should be addressed by the EarthScope Program. ORAL and POSTER

T129. The Yellowstone Hotspot: Its Influence on the Magmatic and Tectonic Evolution of the Western U.S.
GSA Geophysics Division; GSA Structural Geology and Tectonics Division

Geophysics/Tectonophysics/Seismology; Volcanology; Tectonics

Robert B. Smith, University of Utah, Salt Lake City, Utah; Richard Carlson, Carnegie Institution of Washington, Washington, D.C.; John Shervais, Utah State University, Logan, Utah

This session seeks to integrate the volcanic and tectonic history with geochemical, geophysical, and field data to understand the evolution of this and other intracontinental hotspot systems. In conjunction with session T130. ORAL

T130. The Yellowstone Hotspot: Integrated Field, Geochemical, and Geophysical Studies
GSA Geophysics Division; Geochemical Society

Petrology, Igneous; Geophysics/Tectonophysics/Seismology; Volcanology

John Shervais, Utah State University, Logan, Utah; Victor Camp, San Diego State University, San Diego, Calif.; Dennis J. Geist, University of Idaho, Moscow, Idaho; Jonathan M.G. Glen, U.S. Geological Survey, Menlo Park, Calif.

This session seeks to integrate the volcanic and tectonic history with geochemical, geophysical, and field data to understand the evolution of this and other intracontinental hotspot systems. In conjunction with session T129. ORAL and POSTER

T131. Geophysical Studies for Improving Management of Land, Water, Environment, and Hazards (Posters)
GSA Geophysics Division; GSA Hydrogeology Division; GSA Engineering Geology Division

Geophysics/Tectonophysics/Seismology; Hydrogeology; Engineering Geology

V.J.S. Grauch, U.S. Geological Survey, Denver, Colo.; Dennis Harry, Colorado State University, Fort Collins, Colo.

This session encourages geophysical and integrated studies that are likely to have short- or long-range impact on decisions regarding management of land use, water resources, water quality, environmental cleanup, or natural hazards. POSTER

T132. High-Pressure Mineral Physics: To Honor Ho-Kwang Mao, Roebling Medalist
Mineralogical Society of America; Geophysical Laboratory of the Carnegie Institution of Washington and COMPRES: COnsortium for Materials Properties Research in Earth Sciences

Mineralogy/Crystallography; Petrology, Experimental; Geophysics/Tectonophysics/Seismology

William A. Bassett, Cornell University, Ithaca, N.Y.; Russell J. Hemley, Carnegie Institution of Washington, Washington, D.C.; Anne Hofmeister, Washington University, St. Louis, Mo.

This session to celebrate Ho-Kwang Mao's receipt of the Roebling Medal covers a broad spectrum of research in mineral physics. Areas that Dr. Mao pioneered will be highlighted along with their importance to all geology. ORAL

T133. Insights into the Raising of the Colorado Plateau
GSA Geophysics Division

Geophysics/Tectonophysics/Seismology; Tectonics; Quaternary Geology/Geomorphology

Shari Kelley, New Mexico Institute of Mining and Technology, Socorro, N.Mex.; Mousumi Roy, University of New Mexico, Albuquerque, N.Mex.

The latest ideas about the origin of the dramatic, incised landscape of the Colorado Plateau, particularly when and how this broad region came to stand at a modern elevation of ~1.9 km, will be presented. ORAL

T134. Mesozoic and Cenozoic Crustal Evolution of Alaska and Western Canada (Posters)
Neotectonics/Paleoseismology; Tectonics; Geophysics/Tectonophysics/Seismology

Jeff Trop, Bucknell University, Lewisburg, Pa.; Kenneth Ridgway, Purdue University, West Lafayette, Ind.; Peter Haeussler, U.S. Geological Survey, Anchorage, Alaska

This multidisciplinary session integrates new studies focused on processes responsible for crustal growth in Alaska and western Canada, including collisional deformation, terrane accretion, mountain building, magmatism, accretionary wedge development, and sedimentary basin formation. POSTER

T135. Orogenic Plateaus from Top to Bottom
GSA Structural Geology and Tectonics Division; GSA Geophysics Division; GSA Sedimentary Geology Division

Tectonics; Geophysics/Tectonophysics/Seismology; Stratigraphy

Bradley D. Ritts, Indiana University, Bloomington, Ind.; Brian K. Horton, University of California, Los Angeles, Calif.

Resolving the evolution of orogenic plateaus is fundamental to understanding continental mountain building and its effects on the global environment. This cross-disciplinary session will explore the growth and decay of modern and ancient plateaus using geophysics, numerical modeling, petrology, stratigraphy, structural geology, and geodesy. ORAL and POSTER

T136. Out of the Tethys: The Making of Asia
Tectonics; Stratigraphy; Geophysics/Tectonophysics/Seismology

Rasoul Sorkhabi, University of Utah, Salt Lake City, Utah; Ezat Heydari, Jackson State University, Jackson, Miss.

This multidisciplinary session examines how recent geoscientific studies have contributed to our understanding of Asian mountains, plateaus, and basins resulting from the birth and demise of Tethyan oceans and the collision of the Indian and Arabian plates with Asia. ORAL and POSTER

T137. The Backbone of America from Patagonia to Alaska: Plateau Uplift, Shallow Subduction, and Ridge Collision
GSA International Division

Tectonics; Petrology, Igneous; Geophysics/Tectonophysics/Seismology

Mark Cloos, University of Texas at Austin, Austin, Tex.; Suzanne Kay, Cornell University, Ithaca, N.Y.

This session is a precursor to the Backbone of the Americas Meeting in 2006. We seek presentations concerning tectonic and magmatic processes related to plateau uplift, shallow subduction, and ridge collision in either North or South America. ORAL

T138. Tectonic Hazards of the SE Asian Region
GSA Structural Geology and Tectonics Division; GSA Geophysics Division

Tectonics; Geophysics/Tectonophysics/Seismology; Structural Geology

Ron Harris, Brigham Young University, Provo, Utah

The Sumatra megathrust earthquake of 2004 is one of the epic disasters of recorded history. This session will present the latest geological and geophysical research of the earthquake's source region and other potentially hazardous and densely populated seismic source regions in SE Asia. ORAL and POSTER

T139. Tectonics in the Information Age: Large Datasets and Numerical Models in Solid Earth Science
GSA Geophysics Division

Tectonics; Geophysics/Tectonophysics/Seismology; Geoscience Information/Communication

Christopher L. Andronicos, University of Texas at El Paso, El Paso, Tex.; Aaron A. Velasco, University of Texas at El Paso, El Paso, Tex.

We will bring together geologists and geophysicists to discuss the use and design of large high quality databases and numerical models focused on solving large-scale tectonic problems. ORAL

T140. EarthScope: Challenges in Understanding the Heterogeneity of the Lithosphere
GSA Structural Geology and Tectonics Division; EarthScope National Office; GSA Geophysics Division

Tectonics; Geophysics/Tectonophysics/Seismology; Petrology, Metamorphic

Rick Aster, New Mexico Institute of Mining and Technology, Socorro, N.Mex.; Karl Karlstrom, University of New Mexico, Albuquerque, N.Mex.; Mike Williams, University of Massachusetts, Amherst, Mass.

This session will discuss geologic and geophysical perspectives on vertical and lateral heterogeneity of the lithosphere and provide a forum for presentation of EarthScope results on the physical properties that control tectonic processes. ORAL and POSTER

T141. Geology and EarthScope
GSA Structural Geology and Tectonics Division; Integrated Solid Earth Sciences (ISES); Mineralogical Society of America

Geophysics/Tectonophysics/Seismology; Tectonics; Structural Geology

David W. Mogk, Montana State University, Bozeman, Mont.; Basil Tikoff, University of Wisconsin, Madison, Wis.; Michael Brown, University of Maryland, College Park, Md.

EarthScope provides an unprecedented opportunity for integrated research from the Earth's surface to the lower mantle. This session provides numerous examples of how geoscientists can engage EarthScope for research and education and outreach. ORAL

T142. Controversies, Conundrums, and Innovative Approaches in Extensional Tectonics: A Tribute to Ernie Anderson
GSA Structural Geology and Tectonics Division

Tectonics; Structural Geology; Petrology, Igneous

James E. Faulds, University of Nevada, Reno, Nev.; Robert G. Bohannon, U.S. Geological Survey, Denver, Colo.; Keith A. Howard, U.S. Geological Survey, Menlo Park, Calif.; L. Sue Beard, U.S. Geological Survey, Flagstaff, Ariz.

This session honors Ernie Anderson, whose pioneering work on the highly extended Colorado River region 30 years ago and subsequent contributions inspired many to study extensional terranes. Contributions emphasizing existing conundrums and innovative approaches are encouraged. ORAL and POSTER

T143. Great Basin Tectonics and Metallogeny
U.S. Geological Survey

Tectonics; Economic Geology

Albert H. Hofstra, U.S. Geological Survey, Denver, Colo.; David A. Ponce, U.S. Geological Survey, Menlo Park, Calif.; Alan Wallace, U.S. Geological Survey, Reno, Nev.; Jonathan M.G. Glen, U.S. Geological Survey, Menlo Park, Calif.

Relationships between tectonics and metallogeny in the Great Basin will be elucidated via a series of synoptic presentations on geophysics, crustal structure, basement, sedimentation, deformation, magmatism, paleogeography, ore deposit types, geochemistry, fluid flow and mass transport. ORAL and POSTER

T144. The Edges of Extension: Boundaries of the Basin and Range Province as Natural Laboratories for Studying Tectonic and Structural Processes
GSA Structural Geology and Tectonics Division; GSA Geophysics Division

Structural Geology; Tectonics; Geophysics/Tectonophysics/Seismology

Phillip Resor, Wesleyan University, Middletown, Conn.; Joseph Colgan, Stanford University, Stanford, Calif.; Eric Flodin, Indiana University–Purdue University Fort Wayne, Ind.

The goal of this session is to bring together an interdisciplinary group of scientists focused on understanding problems and processes of continental extension as expressed at the margins of the Basin and Range Province. ORAL and POSTER

T145. The Nature, Significance, and Evolution of Transtensional Tectonic Regimes
GSA Structural Geology and Tectonics Division

Structural Geology; Tectonics; Neotectonics/Paleoseismology

Robert E. Holdsworth, University of Durham, Durham, UK; Basil Tikoff, University of Wisconsin, Madison, Wis.; John Waldron, University of Alberta, Edmonton, Alberta

A session bringing together structural geologists, geophysicists, and geodeticists who have worked in obliquely divergent regimes worldwide allowing discussion of the key variables that control transtensional deformation patterns in the crust. ORAL and POSTER

T146. Young and Active Transtensional Deformation along the Western Margin of North America: Walker Lane Belt/Eastern California Shear Zone to the Gulf of California
GSA Structural Geology and Tectonics Division; GSA Geophysics Division; GSA Quaternary Geology and Geomorphology Division

Neotectonics/Paleoseismology; Tectonics; Structural Geology

Paul Umhoefer, Northern Arizona University, Box 4099, Flagstaff, Ariz.; Jeffrey Lee, Central Washington University, Ellensburg, Wash.

This session will explore and compare strain distribution and localization and geodynamic controls on faulting patterns along the length of a linked transtensional zone extending from the Walker Lane Belt to the Gulf of California. ORAL and POSTER

T147. Ductile Flow and Folding in Geo-Materials: A Multidisciplinary Perspective
GSA Structural Geology and Tectonics Division

Structural Geology; Tectonics; Volcanology

Graham D.M. Andrews, University of Leicester, Leicester, UK; Steve Temperley, University of Leicester, Leicester, UK; Michael J. Branney, University of Leicester, Leicester, UK

A multidisciplinary session bringing together workers studying flow and folding in geo-materials, including ice, lava, and rock. This will allow the cross-fertilization and development of paradigms allowing a better understanding of viscous flow. ORAL and POSTER

T148. What is a Magma Chamber? The Role of Sheets in the Assembly of Intrusions
GSA Structural Geology and Tectonics Division

Structural Geology; Geophysics/Tectonophysics/Seismology; Petrology, Igneous

Sven Morgan, Central Michigan University, Mount Pleasant, Mich.; Basil Tikoff, University of Wisconsin, Madison, Wis.; Drew Coleman, University of North Carolina, Chapel Hill, N.C.

A variety of data indicate the final shape of intrusions does not represent the shape of a single magma chamber. We solicit presentations on the structural, geochronological, petrological, and geophysical evidence concerned with understanding the dynamics of "magma sheeting." ORAL and POSTER

T149. Rheological Information from Naturally Deformed Materials: New Approaches to Understanding Bulk Ductile Behavior
GSA Structural Geology and Tectonics Division

Structural Geology; Tectonics; Geophysics/Tectonophysics/Seismology

Dyanna Czeck, University of Wisconsin, Milwaukee, Wis.; Cheryl Waters-Tormey, Western Carolina University, Cullowhee, N.C.

This session highlights challenges in and new approaches for inferring "bulk" rheology from natural heterogeneous ductile deformation zones. We seek studies that test predictions from experimental work and consider the multiscalar factors affecting bulk mechanical behavior. ORAL and POSTER

T150. Fracturing and Faulting of the Clastic Rocks of the Colorado Plateau
Structural Geology; Hydrogeology; Sediments, Clastic

Atilla Aydin, Stanford University, Stanford, Calif.; James P. Evans, Utah State University, Logan, Utah

This session encourages discussion into the diverse processes of fracturing and faulting in clastic rocks of the Colorado Plateau. Contributions combining structure with diagenesis, fluid flow, and depositional environment are welcome. ORAL and POSTER

HOW TO SUBMIT YOUR ABSTRACT

Please use the online abstract form found on the GSA Web site, www.geosociety.org. An abstract submission fee of $18 for all students and $30 for all others will be charged. If you cannot submit your abstract electronically, contact Nancy Carlson, (303) 357-1061, ncarlson@geosociety.org.

From the home page of www.geosociety.org, click on the "Submit an Abstract" button and follow the steps given. If you lose your Internet connection before you are finished, you can resume making a submission when you log back on.

You and your coauthors will be provided (by e-mail) with a record of the abstract identification number and password, and you can access your abstract and revise it as necessary from any Internet connection until the published abstract submission deadline date.

The system supports the submission of complex abstracts that contain subscripts, superscripts, italic and boldface type, tables, Greek letters, and equations.

SCIENTIFIC CATEGORIES

Determine if your paper would fit neatly under one of the topical sessions. If it doesn't, please submit your abstract for inclusion in the general discipline sessions. The available choices are:

- Archaeological Geology
- Coal Geology
- Economic Geology
- Engineering Geology
- Environmental Geoscience
- Geochemistry, Aqueous
- Geochemistry, Organic
- Geochemistry, Other
- Geomicrobiology
- Geomorphology
- Geophysics/Tectonophysics/Seismology
- Geoscience Education
- Geoscience Information/Communication
- History of Geology
- Hydrogeology
- Limnogeology
- Marine/Coastal Science
- Mineralogy/Crystallography
- Neotectonics/Paleoseismology
- Paleoclimatology/Paleoceanography
- Paleontology, Biogeography/Biostratigraphy
- Paleontology, Diversity, Extinction, Origination
- Paleontology, Paleoecology/Taphonomy
- Paleontology, Phylogenetic/Morphological Patterns
- Petrology, Experimental

- Petrology, Igneous
- Petrology, Metamorphic
- Planetary Geology
- Precambrian Geology
- Public Policy
- Quaternary Geology
- Remote Sensing/Geographic Info System
- Sediments, Clastic
- Stratigraphy
- Structural Geology
- Tectonics
- Volcanology

Presentation Modes

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

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

Poster Mode. Each poster session presenter is provided with one horizontal, freestanding display board approximately 8' wide and 4' high. Precise measurements will appear in the speaker guide, which will be posted on the GSA Web site in September. Speakers must be at their poster booths for at least two of the four presentation hours.

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

Speaker Equipment. GSA provides the following equipment in each Technical Session Room at no charge to speaker:

- 1 Desktop Computer (with Windows 2000 Operating System and MS Office XP. All Macintosh or MS PowerPoint XP presentations will work, but must be saved in a PC format).
- 1 LCD Projector
- 1 Screen
- 1 Laser Pointer
- 1 Lectern/Podium with light and microphone
- 1 Wired Lavaliere microphone

Slide projectors, overhead projectors, and multiple screens are no longer part of the standard set-up, but are available for an additional fee. More information on this is included in the speaker guide, which will be posted on the GSA Web site in September.

Abstract Body

Please keep the abstract's body to 2,000 characters or fewer. The online abstract system will reject it if it exceeds this limit.

You can include a table with your abstract, but understand that the table might reduce the number of words allowed in your abstract. Taken together, the body of the abstract should take up no more space than would be occupied by roughly 2,000 characters alone.

Check the spelling of the abstract's body and title using your own word processor. Then read it again and make sure that it is something the whole world should see. (We won't check or edit it for you.)

For typing and pasting, add an extra line between paragraphs or they will run together when displayed (you can do this before copying, after pasting, or while typing).

Abstracts Fee

Once the abstract is in place, a window to submit payment will appear. The nonrefundable submission fee is $18 for all students; $30 for all others.

You May Present Only ONE Volunteered Abstract

- Please submit only one *volunteered* abstract as speaker or poster presenter in topical and/or discipline sessions. This helps avoid speaker scheduling conflicts and gives everyone an equal opportunity to be heard. ***Multiple submissions as speaker-presenter will result in rejection of all abstracts.***
- This limitation does not apply to, nor does it include, *invited* contributions to keynote symposia or topical sessions.

JTPC to Finalize Program in Early August

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

Future GSA Annual Meetings

2006	Philadelphia (October 22–25)
2007	Denver (October 28–31)
2008*	Chicago (October 26–29)
2009	Portland, Ore. (tentative; October 18–21)
2010	Denver (October 31–November 3)
2011	Minneapolis (tentative; October 9–12)

* Joint meeting with American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America.

Salt Lake City 2005 Field Trips

The Annual Meeting in Salt Lake City is the ideal opportunity for a great field trip experience. Classic features and ground-breaking research can be explored at the doorstep of the meeting venue—and what a doorstep! It includes the red-rock country of the Colorado Plateau as well as the Basin-and-Range, Rocky Mountains, and Snake River Plain. There are 28 trips distributed across a range of topics and interests, from the Neoproterozoic to the neotectonic, from living brine shrimp to new dinosaur digs, and from glacial cirques to desert canyons. About one-third of the trips are single or half-day excursions to locations around the Salt Lake region, but note that a few of the longer trips start and end in Las Vegas or Reno, Nevada. Remember that air travel plans that include a Saturday night stay can be less expensive. This savings on airfare can substantially offset field trip costs. The following list is tentative and subject to change. Detailed descriptions of these trips will be available when registration for the meeting begins in June.

The field trip co-chairs for the Salt Lake City 2005 meeting are Joel L. Pederson, Department of Geology, Utah State University, 4505 Old Main Hill, Logan, UT 84322-4505, (435) 797-7097, fax 435-797-1588, bolo@cc.usu.edu, and Carol M. Dehler, Department of Geology, Utah State University, 4505 Old Main Hill, Logan, UT 84322-4505, (435) 797-0764, fax 435-797-1588, chuaria@cc.usu.edu. For more information about the current list of field trips, please contact the field trip leaders.

PREMEETING

Basaltic Volcanism of the Central and Western Snake River Plain and its Relation to the Yellowstone Plume
Thurs.–Sat., Oct. 13–15. John Shervais, Department of Geology, Utah State University, Logan, Utah 84322, (435) 797-1274, fax 435-797-1588, shervais@cc.usu.edu; John Kauffman; Kurt Othberg; Virginia Gillerman. Max.: 22. Cost: $325.

From Cirques to Canyon Cutting: New Quaternary Research in the Uinta Mountains
Thurs.–Sat., Oct. 13–15. Jeffrey Munroe, Geology Department, Middlebury College, Middlebury, VT 05753, (802) 443-3446, fax 802-443-2072, jmunroe@middlebury.edu; Joel Pederson; Benjamin Laabs; Eric Carson. Max.: 30. Cost: $255.

Geomorphology and Rates of Landscape Change in the Fremont River Drainage, Northwestern Colorado Plateau
Thurs.–Sat., Oct. 13–15. David Marchetti, Department of Geology and Geophysics, University of Utah, Salt Lake City, UT 84112, (801) 581-7062, fax 801-581-8219, dwmarche@mines.utah.edu; John Dohrenwend; Thure Cerling. Max.: 25. Cost: $315.

Ice in Equatorial Pangea: The Unaweep-Cutler System
Thurs.–Sat., Oct. 13–15. Cosponsored by *GSA Sedimentary Geology Division*. G.S. (Lynn) Soreghan, School of Geology and Geophysics, University of Oklahoma, Norman, OK 73019, (405) 325-4482, fax 405-325-3140, lsoreg@ou.edu. Max.: 24. Cost: $270.

Lacustrine Records of Laramide Landscape Evolution, Green River Formation
Thurs.–Sat., Oct. 13–15. Cosponsored by *GSA Limnogeology Division*. Alan Carroll, Department of Geology and Geophysics, University of Wisconsin, Madison WI 53706, (608) 262-2368, fax 608-262-0693, carroll@geology.wisc.edu; Paul Buchheim; Arvid Aase. Max.: 33. Cost: $340.

Late Cretaceous Stratigraphy, Depositional Environments, and Macrovertebrate Paleontology in Grand Staircase–Escalante National Monument, Utah
Thurs.–Sat., Oct. 13–15. Alan L. Titus, Grand Staircase–Escalante National Monument, 190 E. Center St., Kanab, UT 84741, (435) 644-4332, fax 435-644-4350, Alan_Titus@blm.gov; John D. Powell; Eric Roberts; Stonnie Pollock; Jim Kirkland; L. Barry Albright. Max.: 36. Cost: $220.

Neoproterozoic Uinta Mountain Group of Northeastern Utah: Pre-Sturtian Geographic, Tectonic, and Biologic Evolution
Thurs.–Fri., Oct. 13–14. Cosponsored by *GSA Sedimentary Geology Division*. Carol M. Dehler, Department of Geology, Utah State University, Logan, UT 84321, (435) 797-0764, fax 435-797-1588, chuaria@cc.usu.edu; Susannah Porter; Doug Sprinkel. Max.: 27. Cost: $185. *This field trip is in conjunction with the Pocatello Formation and Overlying Strata, Southeastern Idaho: Snowball Earth Diamictites, Cap Carbonates, and Neoproterozoic Isotopic Profiles field trip held on Sat., Oct. 15.*

Sheet-like Emplacement of Satellite Laccoliths, Sills and Bysmaliths of the Henry Mountains, Southern Utah
Thurs.–Sat., Oct. 13–15. Sven Morgan, Department of Geology, Central Michigan University, Mount Pleasant, MI 48859, (989) 774-1082, fax 989-774-2142, sven.morgan@cmich.edu; Eric Horsman; Basil Tikoff; Michel de Saint Blanquat. Max.: 36. Cost: $195.

Transect across the Northern Walker Lane, Northwest Nevada and Northeast California: An Incipient Transform Fault along the Pacific–North American Plate Boundary
Thurs.–Sat., Oct. 13–15. James E. Faulds, Nevada Bureau of Mines and Geology, MS178, University of Nevada, Reno, NV 89557, (775) 784-6691 ext. 159, fax 775-784-1709, jfaulds@unr.edu; Christopher D. Henry; Nicholas H. Hinz. Max.: 29. Cost: $285. *Begins and ends in Reno.*

Brittle Deformation, Fluid Flow, and Diagenesis in Sandstone at Valley of Fire State Park, Nevada
Fri.–Sat., Oct. 14–15. Peter Eichhubl, Physical and Life Sciences Department, Texas A&M University–Corpus Christi, Corpus Christi, TX 78412, (361) 825-2309, fax 361-825-3345, peichhubl@falcon.tamucc.edu; Eric Flodin. Max.: 20. Cost: $170. *Begins and ends in Las Vegas.*

Evolution of a Miocene-Pliocene Supradetachment Basin, Northeastern Great Basin
Sat., Oct. 15. Alexander Steely, Department of Geology, Utah State University, Logan, UT 84321, (435) 797-1273, fax 435-797-1588, asteely@cc.usu.edu; Susanne Janecke; Stephanie Carney; Sean Long; Robert Oaks Jr. Max.: 25. Cost: $95.

Geology and Natural Burning Coal Fires of the Ferron Sandstone Member of the Mancos Shale, Emery Coal Field, Utah
Sat., Oct. 15. Cosponsored by *GSA Coal Geology Division.* Glenn B. Stracher, East Georgia College, Swainsboro, GA 30401, (478-289-2073, fax 478-289-2080, stracher@ega.edu; Paul B. Anderson; David E. Tabet; Janet L. Stracher. Max.: 36. Cost: $90.

Latest Pleistocene/Early Holocene Human Occupation in the Bonneville Basin
Sat., Oct. 15. Cosponsored by *GSA Archaeological Geology Division.* David Rhode, Desert Research Institute, Reno, NV 89512, (775) 673-7310, fax 775-673-7397, dave.rhode@dri.edu; Ted Goebel; Bryan Hockett; Kevin Jones; David Madsen. Max.: 48. Cost: $75.

Neotectonics and Paleoseismology of the Wasatch Fault, Utah
Sat., Oct. 15. Ronald L. Bruhn, Department of Geology and Geophysics, University of Utah, Salt Lake City, UT 84112, (801) 581-6619, fax 801-581-8219, rlbruhn@mines.utah.edu; Ronald Harris; William R. Lund; Christopher DuRoss. Max.: 40. Cost: $70.

Pocatello Formation and Overlying Strata, Southeastern Idaho: Snowball Earth Diamictites, Cap Carbonates, and Neoproterozoic Isotopic Profiles
Sat., Oct. 15. Cosponsored by *GSA Sedimentary Geology Division.* Paul Link, Department of Geosciences, Idaho State University, Pocatello, ID 83209, (208) 282-3346, fax 208-282-4414, linkpaul@isu.edu; Frank Corsetti; Nathaniel Lorentz. Max.: 30. Cost: $80. *This field trip is in conjunction with the Neoproterozoic Uinta Mountain Group of Northeastern Utah: Pre-Sturtian Geographic, Tectonic, and Biologic Evolution field trip held Thurs.–Fri., Oct. 13–14.*

DURING THE MEETING

Geology of the Wasatch: A Two Billion Year Tour through the Upper Third of the Crust—A One-Day Trip
Mon., Oct. 17. Cosponsored by *National Association of Geoscience Teachers.* Michael Bunds, Department of Earth Science, Utah Valley State College, Orem, UT 84058, (801) 863-6306, fax 801-863-8064, bundsmi@uvsc.edu; William Dinklage; Daniel Horns. Max.: 36. Cost: $60.

Unique Geologic Features of Timpanogos Cave National Monument—A Half-Day Trip
Tues., Oct. 18. Cosponsored by *National Park Service.* Jon Jasper, Timpanogos Cave National Monument, American Fork, UT 84003, (801) 492-3647, fax 801-756-5661, jon_jasper@nps.gov; Dave Herron. Max.: 20. Cost: $95.

Biogeochemistry, Limnology, and Ecology of Great Salt Lake—A Half-Day Trip
Wed., Oct. 19. David Naftz, U.S. Geological Survey, 2329 Orton Cir., Salt Lake City, UT 84119, (801) 908-5053, fax 801-908-5001, dlnaftz@usgs.gov; Wayne Wurtsbaugh; Don Paul. Max.: 45. Cost: $75.

POSTMEETING

Anatomy of Reservoir-Scale Normal Faults in Central Utah: Stratigraphic Controls and Implications for Fault Zone Evolution and Fluid Flow
Wed.–Fri., Oct. 19–21. Peter Vrolijk, ExxonMobil Upstream Research Company, Houston, TX 77252, (713) 431-4151, fax 713-431-4114, peter.vrolijk@exxonmobil.com; Zoe K. Shipton; Rod Myers; James P. Evans; Mike Sweet. Max.: 24. Cost: $220.

Folds, Fabrics, and Kinematic Criteria in Rheomorphic Ignimbrites of the Snake River Plain, Idaho: Insights into Emplacement and Flow
Weds.–Sat., Oct. 19–22. Graham D.M. Andrews, Department of Geology, University of Leicester, Leicester, UK, (+44)1162523930, gdma1@le.ac.uk; Steve Temperley; Mike J. Branney. Max.: 24. Cost: $225.

Mesozoic Lakes of the Colorado Plateau
Wed.–Sat., Oct. 19–22. Cosponsored by *GSA Limnogeology Division.* Tim Demko, Department of Geological Sciences, University of Minnesota, Duluth, MN 55812, (218) 726-8340, fax 218-726-8275, tdemko@umn.edu; Kathleen Nicoll; Steve Hasiotis; Lisa Park. Max.: 30. Cost: $300.

Birth of the Lower Colorado River—Stratigraphic and Geomorphic Evidence for its Inception and Evolution near the Conjunction of Nevada, Arizona, and California
Thurs.–Sat., Oct. 20–22. P. Kyle House, Nevada Bureau of Mines and Geology, University of Nevada, Reno, NV 89557, (775) 784-6691 ext. 176, fax 775-784-1709, khouse@unr.edu; Philip A. Pearthree; Keith A. Howard; John W. Bell. Max.: 30. Cost: $245. *Begins and ends in Las Vegas, Nevada.*

Classic Geology of Zion and Bryce Canyon National Parks and Cedar Breaks National Monument
Thurs–Sat., Oct. 20–22. Grant C. Willis, Utah Geological Survey, P.O. Box 146100, Salt Lake City, UT 84114, (801) 537-3300, fax 801-537-3400, grantwillis@utah.gov; Robert F. Biek. Max.: 45. Cost: $290.

Development of Miocene Faults and Basins in the Lake Mead Region: A Tribute to Ernie Anderson and a Review of New Research on Basins
Thurs.–Sat., Oct. 20–22. Paul Umhoefer, Department of Geology, Northern Arizona University, Flagstaff, AZ 86011, (928) 523-6464, fax 928-523-9220, paul.umhoefer@nau.edu;

Thomas Hickson; Ernie Anderson; L. Sue Beard; Melissa Lamb. Max.: 33. Cost: $320. *Begins and ends in Las Vegas, Nevada.*

Don R. Currey Memorial Field Trip to the Shores of Pleistocene Lake Bonneville: Stratigraphy, Geomorphology, and Climate Change
Thurs.–Sat., Oct. 20–22. Holly Godsey, Department of Geology and Geophysics, University of Utah, Salt Lake City, UT 84112, (801) 474-0179, fax 801-581-8219, hgodsey@mines.utah.edu; Elliott Lips; David Miller; Mark Milligan; Jack Oviatt; Dorothy Sack. Max.: 40. Cost: $185.

Paleoseismology and Geomorphology of the Hurricane Fault/Escarpment
Thurs.–Sat., Oct. 20–22. Lee Amoroso, U.S. Geological Survey, 2255 N. Gemini Dr., Flagstaff, AZ 86001, (928) 556-7186, fax 928-556-7196, lamoroso@usgs.gov; Cassie Fenton; Jason Raucci. Max.: 20. Cost: $175. *Begins and ends in Las Vegas.*

Sedimentology and Sequence Stratigraphy of Isolated Shelf Turbidite Bodies, Book Cliffs, Utah
Thurs.–Sat., Oct. 20–22. Simon A.J. Pattison, Department of Geology, Brandon University, Brandon, Manitoba R7A 6A9, Canada, (204) 727-7468, fax 204-728-7346, pattison@brandonu.ca; Huw Williams; Trevor A. Hoffman. Max.: 30. Cost: $240.

Geologic Hazards of the Wasatch Front, Utah
Thurs., Oct. 20. Barry J. Solomon, Utah Geological Survey, P.O. Box 146100, Salt Lake City, UT 84114, (801) 537-3388, fax 801-537-3400, barrysolomon@utah.gov. Max.: 42. Cost: $80.

SEG Field Trips

Bingham Canyon Porphyry Cu-Au-Mo Deposit
Fri., Oct. 14. Sponsored by *Society of Economic Geologists.* Organizer: Ricardo D. Presnell, Kennecott Exploration Co., 224 N 2200 W, Salt Lake City, UT 64116, (801) 238-2414, fax 801-238-2430, ricardo.presnell@kennecott.com.

Lisbon Valley Sediment-Hosted Cu Deposit
Sat.–Sun., Oct. 20–21. Sponsored by *Society of Economic Geologists.* Organizers: Jon Thorson, 5515 Nuthatch Road, Parker, CO 80134, (303) 805-2502, fax 303-805-2503, jonthorson@rmi.net; Ricardo D. Presnell, Kennecott Exploration Co., 224 N 2200 W, Salt Lake City, UT 64116, (801) 238-2414, fax 801-238-2430, ricardo.presnell@kennecott.com.

SALT LAKE CITY 2005 SHORT COURSES

GSA-SPONSORED SHORT COURSES

Standard Registration Deadline: September 12

Registration information and course descriptions will be published in the June issue of *GSA Today.* For additional information, contact Edna Collis at GSA Headquarters, ecollis@geosociety.org, or see GSA's Web site, www.geosociety.org.

Introduction to Geographic Information Systems (GIS), Using ArcGIS9 for Geological Applications
Fri. and Sat., Oct. 14–15. Cosponsored by *GSA Geoscience Education Division* and *Environmental Systems Research Institute.* Ann B. Johnson and Willy Lynch, ESRI, Denver, Colo. Fee: US$330. CEU: 1.6.

Measurement of Indoor Radon in Geologically Diverse Terrains
Fri. and Sat., Oct. 14–15. Cosponsored by *GSA Engineering Geology Division.* Douglas Mose and George Mushrush, George Mason University, Fairfax, Va. Fee: US$360. CEU: 1.6.

A Tracer Runs through It: Applications of the Tracer-Injection Methods
Sat., Oct. 15. Cosponsored by *GSA Hydrogeology Division.* Briant A. Kimball, U.S. Geological Survey, Denver, Colo.; Robert L. Runkel, U.S. Geological Survey, Salt Lake City, Utah. Fee: US$310. CEU: 0.8.

Science in Environmental Policymaking
Sat., Oct. 15. Cosponsored by *GSA Geology and Society Division.* Herman Karl, Judith Layzer, Massachusetts Institute of Technology, Cambridge, Mass.; Christine Turner, U.S. Geological Survey, Denver, Colo. Fee: US$340. CEU: 0.8.

Springs Inventory and Classification
Sat., Oct. 15. Cosponsored by *GSA Hydrogeology Division.* Abe Springer, Northern Arizona University, Flagstaff, Ariz.; Larry Stevens, Stevens Ecological Consulting, Flagstaff, Ariz.; Heidi Kloeppel, Grand Canyon Wildlands Council, Flagstaff, Ariz. Fee: US$295. CEU: 0.8.

Three-Dimensional Geologic Mapping for Groundwater Applications Workshop
Sat., Oct. 15. Cosponsored by *GSA Geology and Society Division* and *GSA Hydrogeology Division.* Richard C. Berg, Illinois State Geological Survey, Champaign, Ill.; Hazen Russell, Geological Survey of Canada, Ottawa, Ontario; Harvey Thorleifson, University of Minnesota, St. Paul, Minn. Fee: US$195. CEU: 0.8.

Other Courses

Registration and information can be obtained from the contact person listed.

Sequence Stratigraphy for Graduate Students
Fri. and Sat., Oct. 14–15. Free short course for graduate students. Cosponsored by *ExxonMobil* and *British Petroleum*. Instructors: Kirt Campion (ExxonMobil) and Art Donovan (BP). Information and registration: Kirt Campion, kirt.m.campion@exxonmobil.com, or Art Donovan, art.donovan@bp.com.

Thermochronology
Fri. and Sat., Oct. 14–15. Snowbird Resort, Snowbird, Utah. Sponsored by *Mineralogical Society of America*. Organizers: Peter W. Reiners, Department of Geology and Geophysics, Yale University, New Haven, Conn., (203) 432-3761, peter.reiners@yale.edu; Todd A. Ehlers, Department of Geological Sciences, University of Michigan, Ann Arbor, Mich., (734) 763-5112, tehlers@umich.edu. Information: MSA Business Office, 1015 18th St., NW, Ste 601, Washington, D.C. 20036-5212, USA, (202) 775-4344, fax (202) 775-0018, business@minsocam.org, or visit the MSA Web site, www.minsocam.org.

Paleobiogeography: Generating New Insights into the Coevolution of Earth and Its Biota
Sat., Oct. 15. Sponsored by *Paleontological Society*. Organizer: Bruce Lieberman, Department of Geology, University of Kansas, 323 Lindley Hall, 1475 Jayhawk Boulevard, Lawrence, KS 66045-7613, (785) 864-2741, fax 785-864-5276, blieber@ku.edu.

EARTHCACHING

GSA puts an earth science education spin on geocaching: *Earthcaches*. Earthcaches are "virtual" caches—Earthcache visitors learn about each site they visit (using Global Positioning System [GPS] technology) through online cache notes.

Earthcaches work well in both rural and urban settings. One Earthcache now being set up will provide a guided tour of the building stones used in Denver, with notes on each stone type. Active Earthcaching sites in Australia, Canada, and the United States feature cache notes about local faults, folds, fossils, minerals, glacial features, and waterfalls.

Learn more at **www.earthcache.org** or contact Gary Lewis, glewis@geosociety.org, or Wesley Massey, wmassey@geosociety.org.

GSA is developing these Earthcaches in association with the U.S. Park Service and U.S. Forest Service and in partnership with Groundspeak Inc. and Subaru America.

STUDENTS:

APPLY FOR TRAVEL GRANTS TODAY!

The GSA Foundation has made available $4,500 in grants to each of the six GSA sections. The money, when combined with equal funds from the sections, is used to help GSA undergraduate Student Associates and graduate Student Members travel to GSA meetings. For information and deadlines, please visit the Web sites from each section listed below or contact the section secretary directly.

Cordilleran	www.geosociety.org/sectdiv/cord/ The Cordilleran Section will not be offering Student Travel Grants to the Annual Meeting this year.
Rocky Mountain	www.geosociety.org/sectdiv/rockymtn/ Kenneth E. Kolm +1-303-273-3932 kkolm@bbl-inc.com
North-Central	www.geosociety.org/sectdiv/northc/ Robert F. Diffendal Jr. +1-402-472-7546 rfd@unl.edu
Northeastern	www.geosociety.org/sectdiv/northe/ Stephen G. Pollock +1-207-780-5353 Pollock@usm.maine.edu
South-Central	www.geosociety.org/sectdiv/southc/ Elizabeth Y. Anthony +1-915-747-5483 eanthony@geo.utep.edu
Southeastern	www.geosociety.org/sectdiv/southe/ Donald W. Neal +1-252-328-4392 neald@mail.ecu.edu

Mentor Programs at the 2005 GSA Annual Meeting

Looking for a job—now or in the future?

Plan to attend the Careers Roundtable Discussions Mentor Program

Join this group of mentors for one-on-one career advice, networking opportunities, and job-market perspectives. They represent a broad range of geoscience-related professions including academics, industry, and government agencies. This FREE come-and-go event is open to everyone. **Registration not required**. Date and location TBA. For more information, contact Karlon Blythe, kblythe@geosociety.org.

Attention Students Pursuing a Hydrogeology Career Path—This Mann Mentor Program is for You!

The Mann Mentors in Applied Hydrogeology Program underwrites the cost for up to 25 students to attend the distinguished Hydrogeology Division Luncheon and Awards Presentation. That's right—no cost to students. **Eligible students are those who have: (1) ticked the box on their membership application indicating their professional interest in hydrology/hydrogeology, AND (2) registered for the Annual Meeting by September 13, 2005.** The lucky recipients of these tickets will have the chance to meet with some of the nation's most distinguished hydrogeologists. FREE tickets will be awarded to the first 25 students who respond to an **e-mail invitation**, based on the eligibility criteria above. **Registration required**. Date and location TBA. For more information, contact Karlon Blythe, kblythe@geosociety.org.

Students: check out the GEOLOGY IN GOVERNMENT MENTOR PROGRAM!

A **FREE lunch** for undergraduate and graduate students will be held at GSA's Salt Lake City meeting. This popular annual event will feature a select panel of mentors representing various government agencies. Mentors will invite questions from the students, offer advice about preparing for a career, and comment on the prospects for current and future job opportunities within their agencies. Mon., Oct. 17, 2005, 11:30 a.m.–1:00 p.m., location TBA. **Registration not required.** Every student registered for the Annual Meeting will receive a ticket to this event along with their badge; however, attendance is limited, so arrive early! For more information, contact Karlon Blythe, kblythe@geosociety.org.

K–16 PROGRAM

Attention College Faculty, K–12 Teachers, Teacher Trainers, and Pre-Service Teachers:

Look for the K–16 Education Workshops listing in the June issue of *GSA Today*.
Questions? Contact Edna Collis, ecollis@geosociety.org or (303) 357-1034, for more information.

Graduate School Information Forum

Don't delay—*Reserve your space now!*

Meet face-to-face with prospective students in a relaxed, informal setting by participating in the Graduate School Information Forum (GSIF) during the 2005 GSA Annual Meeting. Take advantage of this excellent opportunity to promote your school to over 1,500 students.

The GSIF will be open Sun.–Weds., Oct. 16–19. You may choose from one day to all four days. Space is limited, and Sunday and Monday will be the first to sell out. Those schools reserving multiple days will be assigned first and to the most visible booths.

Participating schools will be promoted in the September issue of *GSA Today* (pending submittal date of reservation form), the 2005 Annual Meeting Program, and by e-mail links on the GSA Web site so that prospective students may schedule appointments prior to the Annual Meeting.

Go online to reserve your space at https://rock.geosociety.org/forms/xGSIF_form.asp. For more information, contact Kevin Ricker at +1-303-357-1090, kricker@geosociety.org.

SALT LAKE CITY 2005 Registration Information

Standard Registration Deadline: 12 September 2005
Cancellation Deadline: 19 September 2005

Registration information will be available in the June issue of *GSA Today* and on the GSA Web site, www.geosociety.org, in early June. Online registration and information regarding Subaru-sponsored grants for Utah-based graduate students and two-year college faculty also will be available in early June.

REGISTRATION FEES

	Standard Reg. June–12 Sept.	Onsite/Late Reg. after 12 Sept.
Professional Member—Full Meeting	US$299	US$380
Professional Member—1 Day	US$194	US$205
Professional Member >70—Full Meeting	US$244	US$320
Professional Member >70—1 Day	US$139	US$150
Professional Nonmember—Full Meeting	US$379	US$470
Professional Nonmember—1 Day	US$219	US$230
Student Member—Full Meeting	US$94	US$125
Student Member—1 Day	US$64	US$65
Student Nonmember—Full Meeting	US$124	US$155
Student Nonmember—1 Day	US$79	US$80
K–12 Professional—Full Meeting	US$44	US$45
Field Trip or Short Course Only	US$40	US$40
Guest or Spouse	US$80	US$80

This year GSA will provide each meeting registrant* with a copy of the *Abstracts with Programs* on CD-ROM. The 2005 Section Meeting abstracts are also included on the CD.

**Field Trip or Short Course only and guest or spouse registrants are excluded.*

Are You Taking Advantage of the Member Rate?

Not a GSA member or a member of one of the GSA Associated or Allied Societies? Join GSA and pay significantly less for your meeting registration while gaining access to all that GSA has to offer. For information on member benefits and to join securely online, please visit www.geosociety.org/members or call +1.888.443.4472.

LODGING

Salt Lake City offers high-quality, affordable hotel rooms for meeting attendees. GSA has booked rooms at seven hotels, offering special convention rates as low as $89 a night. The co-headquarter hotels are the Hilton Salt Lake City Center Hotel and the Salt Lake City Marriott Downtown. Most activities will take place at the Salt Palace Convention Center and the two headquarter hotels. Additional housing information will be included in the June issue of *GSA Today* as well as on the GSA Meeting Web site beginning in June.

STUDENT TRAVEL FUND

You can make a difference!

Help make it more affordable for students to attend the annual meeting by contributing to the Student Travel Fund via your Annual Meeting Registration Form. Your donation can make it possible for students to attend the 2005 Annual Meeting in Salt Lake City. 100% of the contributions received will go to help fund student travel. To get the fund started off on the right foot, GSA and the GSA Foundation are happy to contribute US$1,000 each.

Guests Invited!

Make plans now to participate in the GSA Guest Program at the Annual Meeting in Salt Lake City, and get ready to be pampered! GSA extends a warm welcome to all spouses, family members, and friends to register for the Guest Program.

The guest or spouse registration fee of $80 per person is for non-geologist spouses or family members and friends of professional and/or student registrants to the GSA Annual Meeting. The guest registration fee is required to attend guest activities, gain entrance to the Exhibit Hall, attend seminars and workshops (to be listed in the June issue of *GSA Today*), and take advantage of refreshments in the Guest Hospitality Suite. Formal tours (also to be listed in the June issue of *GSA Today*) will be offered at an additional cost. Fees cover the cost of professional tour guides, round-trip transportation, admission fees, and gratuities. Reservations for all tours will be accepted on a first-come, first-served basis. Since the tour operator requires a final guarantee weeks in advance, most tours have attendance minimums and maximums. Please register early to guarantee your spot. Tours may be canceled if minimum attendance is not met.

The guest registration fee will NOT provide access to all Technical Sessions. However, guests can sign in with the hostess in the Guest Hospitality Suite and get a Visitor Badge allowing them to attend a specific presentation.

Guest Hospitality Suite Hours

Sun.–Wed., Oct. 16–19

8 a.m.–5:30 p.m.

Registration for the Guest Program begins in June.

Look for the June *GSA Today* or register online at www.geosociety.org.

STUDENTS—Mark Your Calendars!

Students: Plan now to attend a Shlemon Mentor Program and/or a Mann Mentor Program in Applied Hydrogeology at your 2005 Section Meeting to chat one-on-one with practicing geoscientists. These volunteers will answer your questions and share insights on how to get a job after graduation. When programs are scheduled for multiple days, each day's program will offer a different set of mentors.

FREE LUNCHES will be served (students only) at the Shlemon Mentor Programs. Students will receive a **FREE LUNCH** ticket, along with their registration badge, to attend each Shlemon Program. However, space is limited. First come, first served.

And, it gets better: **FREE light suppers** will be served (students only) at the Mann Mentor Programs. The **Mann Programs** are specific to careers in hydrogeology; if you're interested in receiving an invitation to attend the Mann Program for a **FREE light supper** after the tech sessions end, contact Karlon Blythe, kblythe@geosociety.org. Be sure to indicate which Section Meeting you plan to attend.

Mentor Programs for the 2005 Section Meetings

FOR LOCATIONS OF PROGRAMS, ASK AT THE ON-SITE GSA REGISTRATION DESK.

CORDILLERAN SECTION MEETING

San José, California
SHLEMON MENTOR LUNCHEON PROGRAMS:
Fri. and Sat., April 29–30, 11:30 a.m.–1 p.m.

MANN MENTORS IN APPLIED HYDROGEOLOGY PROGRAM:
(by invitation; contact kblythe@geosociety.org)
Fri., April 29, 5–6:30 p.m.

NORTH-CENTRAL SECTION MEETING

Minneapolis, Minnesota
SHLEMON MENTOR LUNCHEON PROGRAMS:
Thurs. and Fri., May 19–20, 11:30 a.m.–1 p.m.

MANN MENTORS IN APPLIED HYDROGEOLOGY PROGRAM:
(by invitation; contact kblythe@geosociety.org)
Thurs., May 19, 5–6:30 p.m.

ROCKY MOUNTAIN SECTION MEETING

Grand Junction, Colorado
SHLEMON MENTOR LUNCHEON PROGRAMS:
Mon. and Tues., May 23–24, 11:30 a.m.–1 p.m.

MANN MENTORS IN APPLIED HYDROGEOLOGY PROGRAM:
(by invitation; contact kblythe@geosociety.org)
Mon., May 23, 5–6:30 p.m.

For more information contact kblythe@geosociety.org

Call for Nominations: Fourteenth Annual Biggs Award

for Excellence in Earth Science Teaching for Beginning Professors

The Biggs Award was established by GSA to reward and encourage teaching excellence in beginning professors of earth science at the college level.

Eligibility

Earth science instructors and faculty from all academic institutions engaged in undergraduate education who have been teaching full-time for 10 years or fewer. (Part-time teaching is not counted in the 10 years.)

Award Amount

An award of $750 is made possible as a result of support from the Donald and Carolyn Biggs Fund (maintained by the GSA Foundation), the GSA Geoscience Education Division, and GSA's Education and Outreach Programs. In addition, this award also includes up to $500 in travel funds to attend the award presentation at the GSA annual meeting.

Deadline and Nomination Information

Nomination forms for the 2005 Biggs Earth Science Teaching Award are posted at www.geosociety.org/aboutus/awards/biggs.htm. Or, contact Diane Lorenz, (303) 357-1028, awards@geosociety.org. Nominations must be received by **May 1, 2005.**

Mail nomination packets to:
Diane Lorenz
Program Officer, Grants, Awards, and Recognition
Geological Society of America
3300 Penrose Place, P.O. Box 9140
Boulder, CO 80301-9140, USA

Greetings from Capitol Hill!

Final Report: 2003–2004 Congressional Science Fellow

Michèle Koppes

Threading Science through the Needle of Politics: Lessons Learned from the Hill

My congressional science fellowship ended this past December with the conclusion of the 108th Congress. Although I am no longer a first-person observer of the political process, the lessons I learned from my time in "the belly of the beast," so to speak, were invaluable. I took this fellowship because I was interested in how science was being used in federal policymaking and to understand how researchers might better communicate their work to lawmakers. These issues had been on my mind for many years owing to my research focus on glacial dynamics and its contribution to understanding global climate change. Thanks to GSA and the U.S. Geological Survey, I am gratified to have seen firsthand the application of science in the policy process, and on several occasions, witnessed scientists effectively communicate the relevance of their work to the political debate.

I spent my fellowship year in the office of Rep. Jay Inslee, who represents the 1st District of Washington State. Congressman Inslee, newly reelected to his fifth term in Congress, is considered on the far left of the political spectrum today. Though his office had never taken on a congressional fellow before, I was drawn to his office by his interest in science and in divorcing data from politics. More importantly, I would have the opportunity to work with him closely on environmental and energy issues pertaining to the House Resources Committee on which he sits. The Resources Committee has oversight over all agencies in the Department of the Interior, including most of the agencies interested in the geosciences such as the U.S. Geological Survey, Bureau of Land Management, U.S. Forest Service, and National Park Service. I looked forward to the opportunity to see the earth sciences applied to debate and decision-making in the committee hearings, as well as the opportunity to question representatives from the various agencies directly about policy proposals and budgets.

Contrary to my expectations, however, many of the issues that came up in relationship to the environment and natural resources during the 108th Congress came through proposed actions and executive orders from the administration rather than through legislation debated by the House Resources Committee. Some examples of these actions include a repeal of the Roadless Rule to require state governors to petition the Forest Service to protect federal forests in their states from new road building, the grounding of long-range tanker planes used by the Forest Service for fighting wildfire from the air, revised National Oceanic and Atmospheric Administration policies for the designation of several species of hatchery salmon as identical to their wild counterparts, revised mitigation strategies for fish passage around federal hydropower dams on the Columbia and Snake Rivers, and plans to open the National Petroleum Reserve in Alaska for development. These quite substantive actions were not debated by Congress or the Resources Committee; rather, they were published with provision for public comment in the Federal Register. In several cases, the proposed actions were opposed by many of the scientists working within the federal agencies that would be subjected to the rule change. In response to these executive orders, members of Congress have the recourse to draft legislation or, like every other citizen, write letters to the administration in support of or opposition to the proposed action. I spent a good part of my time on Capitol Hill composing letters to the White House to express the sentiment of Congressman Inslee regarding these proposed policies.

With the exception of policy driven by executive order, I had the opportunity to sit in on all Resource Committee hearings, briefings, and behind-closed-door negotiations, seeing first-hand both the making of policy and the politics that drive most legislative agendas. One of the most interesting political debates I participated in was the closed-door deliberations over the Wild Sky Wilderness Act, which came up for a hearing in the Resources Committee. Wild Sky is a proposed wilderness area in western Washington whose unique attributes include swaths of low-level temperate forest in the valley floors (i.e., prime timber harvest areas) and proximity to the two million people who reside in Puget Sound. Though the bill had passed the Senate twice in the previous two years and had a groundswell of support in Washington State, it became caught in the political crossfire between the bill's sponsors and the chairman of the Resources Committee over personal interpretations of the 1964 Wilderness Act, in particular over the definition of what constitutes land "untrammeled by man" that could be proposed for wilderness designation (Wild Sky includes many low-lying areas that had been logged at the turn of the century). Congressman Inslee was particularly concerned with including the low-level valley floors in the wilderness area for the protection of aquatic habitat (particularly salmon spawning grounds, the great emblem of the Pacific Northwest), protection of water sources from soil influx due to erosion of logging roads, and protection of old growth forest for wildlife habitat. Arguments for the ecological merits of the region, however, took a back seat to the debate over what constitutes a human legacy in the landscape. Unfortunately, the legislation suffered the additional crossfire of being used as a campaigning tool by both Rep. George Nethercutt and Sen. Patty Murray in the race for the state senate seat and was ultimately not brought to a vote due to its political ramifications in the upcoming election.

In his first term in Congress in 1992, Congressman Inslee represented the 4th district of Washington east of the

Cascades, which encompasses the Hanford Nuclear Reservation, the Department of Energy (DOE) site where the original plutonium atomic bombs were manufactured. As the resident congressional representative, he became heavily involved in issues of nuclear safety, worker safety, and waste clean-up at Hanford, as well as other DOE sites, and has continued to be vocal on nuclear waste issues since. One of my first tasks was to draft amendments and colloquies in opposition to DOE efforts to reclassify high-level nuclear waste as lower level waste for the purposes of expediting required clean-up efforts at federal nuclear sites (and thereby reducing the amount of waste slated to be vitrified and sent to Yucca Mountain). I was also tasked with drafting amendments to prevent the DOE from continuing its practice of dumping low-level and mixed low-level nuclear waste in unlined soil trenches at the Hanford site. Hanford continues to be one of the most contaminated Superfund sites in the country, with the very real danger of a contaminated groundwater plume of high toxicity migrating toward the Columbia River. The clean-up process is so complex, in part due to lack of record-keeping at the dawn of the nuclear era, and due to the numerous parties involved in the clean-up (primarily the DOE, the EPA, and the state of Washington), that continuous and solid oversight remains elusive.

One other reason I was eager to work for Congressman Inslee was his interest in climate change and the potential ramifications of global warming on biodiversity and geopolitics. During my tenure on the Hill, Congressman Inslee helped introduce the Climate Stewardship Act in the House (originally introduced by Senators McCain and Lieberman in the Senate), a bill to cap greenhouse gas emissions at 2000 levels by 2010 through a market-based system of tradable allowances. In working on this issue for the congressman, I was party to strategy sessions among the cosponsors in the House and Senate as well as environmental lobbyists working on emissions issues to promote the legislation in both houses of Congress. The goal was to get a sufficient number of sponsors to sign on to the legislation in order to pique the interest of the appropriate committee chairmen and party leaders to get the bill a hearing in committee and a vote on the floor. While the findings of the Intergovernmental Panel on Climate Change (IPCC) had previously been introduced to the Hill on several occasions, and the administration had developed the Climate Change Science Program (CCSP), whose findings of contemporary change and potential impacts continued to be disseminated in Congress, many members of Congress were reticent to consider any legislation to curb greenhouse gases given the political outcry over the Kyoto Protocol. New strategies to start the discussion included tailoring studies of the regional and local impacts of climate change, the economic impacts and the benefits of early adoption of technologies for the industrial sector, and the impacts of climate change on particularly vulnerable social groups to share with individual members of Congress and their staff.

The one take-home message from my time in Congress is the extent to which science is being politicized on Capitol Hill. Nowhere was this more evident than in the climate change debate, where efforts by scientists to communicate to Congress advances in the understanding of climate change have been obscured by policymakers, lobbyists, and some scientists themselves into two polarized camps: those who claim that current climate change

is insignificant or of non-anthropogenic origin and those who predict a high potential for irreversible, abrupt climate change in the near future and advocate a precautionary approach to anthropogenic contributions. Unfortunately, these perspectives are becoming increasingly entrenched on Capitol Hill, with new research only being disseminated on the Hill to support the argument of one camp or the other. The polarization manifests itself as a battle of competing hearings and briefings for congressional staff, organized on one hand by the Energy & Environment Institute (lobbying for advocates of climate change policy, in particular adopting the Climate Stewardship Act in the House and Senate) and sponsored by Senator McCain and the Congressional Climate Caucus, and on the other hand by the George Marshall Institute and the Cooler Heads Coalition, lobbying for additional research for and a less fatalistic view toward regulated anthropogenic contributions to global warming, supported by Senator Inhofe. The briefings are highly distilled showdowns of the debate occurring in the scientific literature, packaged to promote the personal agenda of the "camp" that sponsored the briefing.

Such polarization reflects the importance of the need for scientific representation in the debate, and more importantly, the policymakers' understanding of the semantics of scientific uncertainty. It is my belief that scientists are one of the most underrepresented groups in Congress. Without a messenger, the scientific data are often lost to those who would be able to use it most in decision-making. Scientists are professionally trained to analyze, not advocate, and are often wary of the fine line to be crossed between the two. Unfortunately, the lack of advocacy for the importance of science in general and for particular findings of social importance manifests itself as decreased federal funds being allocated to the National Science Foundation, the U.S. Geological Survey, and the National Institutes of Health. To prevent such funding shortfalls, there is a need to sell the value of science to both the public and directly to those who set federal budget and scientific priorities. For earth scientists, sometimes this means marketing our assets in the face of large natural and humanitarian disasters, such as the recent tsunami in the Indian Ocean, the earthquake in Iran in 2003, the recent landslides in California, or the floods in the Midwest. These, unfortunately, are the best times to lobby for funding the geosciences at all levels, while the consequences of geologic hazards are in the news and on the radar screen of lawmakers who are poised to take preventive action.

There are many in the federal government who, like Congressman Inslee, see the value in promoting and using science in formulating sound economic and social policies. They need the scientists' help, however, in understanding the data outside of the political lens through which much of the information is transmitted to the Hill. They also need our backing in raising their voices in support of science amidst the constant clamor of the federal government. Although there are a number of professional societies that support congressional science fellows and congressional visits each year, there are yet many more congressional offices whose only link to the scientific community is through the voices of their constituencies.

This manuscript is submitted for publication by Michèle Koppes, 2003–2004 GSA–U.S. Geological Survey Congressional Science Fellow, with the understanding that the U.S. government is authorized to reproduce and distribute reprints for governmental use. The one-year fellowship is supported by GSA and by the U.S. Geological Survey, Department of the Interior, under Assistance Award No. 02HQGR0141. 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. Koppes can be reached at koppes@u.washington.edu.

2005 GSA Section Meetings

CORDILLERAN SECTION
(*Joint meeting with American Association of Petroleum Geologists*)
April 29–May 1, 2005
Fairmont Hotel, San José, California
Information: Jonathan Miller, San José State University, Department of Geology, 1 Washington Square, San José, CA 95192-0102, (408) 924-5015, jsmiller@email.sjsu.edu

NORTH-CENTRAL SECTION
May 19–20, 2005
University of Minnesota, Minneapolis, Minnesota
Information: Carrie Jennings Patterson, University of Minnesota, Minnesota Geological Survey, 2642 University Ave. W., St. Paul, MN 55114-1032, (612) 627-4780, ext. 220, carrie@umn.edu, or Barbara Lusardi, University of Minnesota, Minnesota Geological Survey, 2642 University Ave. W., St. Paul, MN 55114-1032, (612) 627-4780, ext. 212, lusar001@umn.edu

ROCKY MOUNTAIN SECTION
May 23–25, 2005
Mesa State College, Grand Junction, Colorado
Information: Rex Cole, Mesa State College, Department of Physical & Environmental Science, 1100 North Ave., Grand Junction, CO 81501-3122, (970) 248-1599, rcole@mesastate.edu

www.geosociety.org/sectdiv/sections.htm

Coming in May!

The American Geological Institute's
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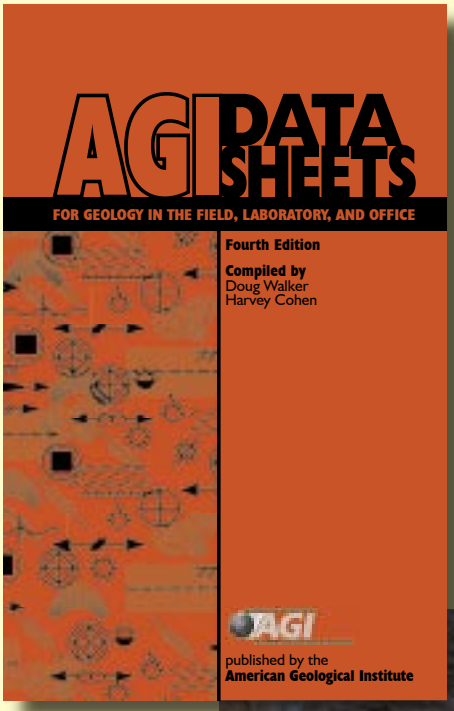

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Doug Walker, Harvey Cohen

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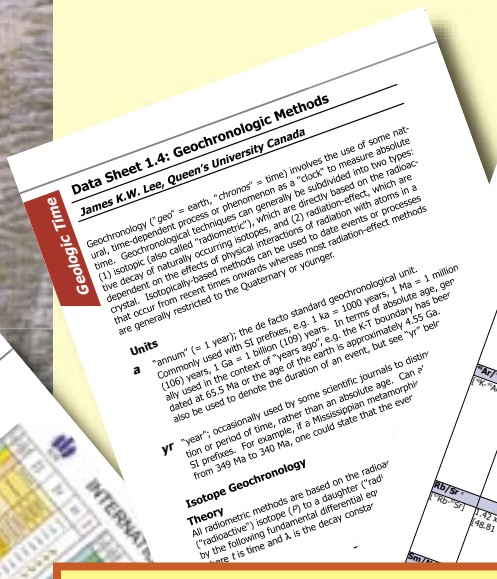

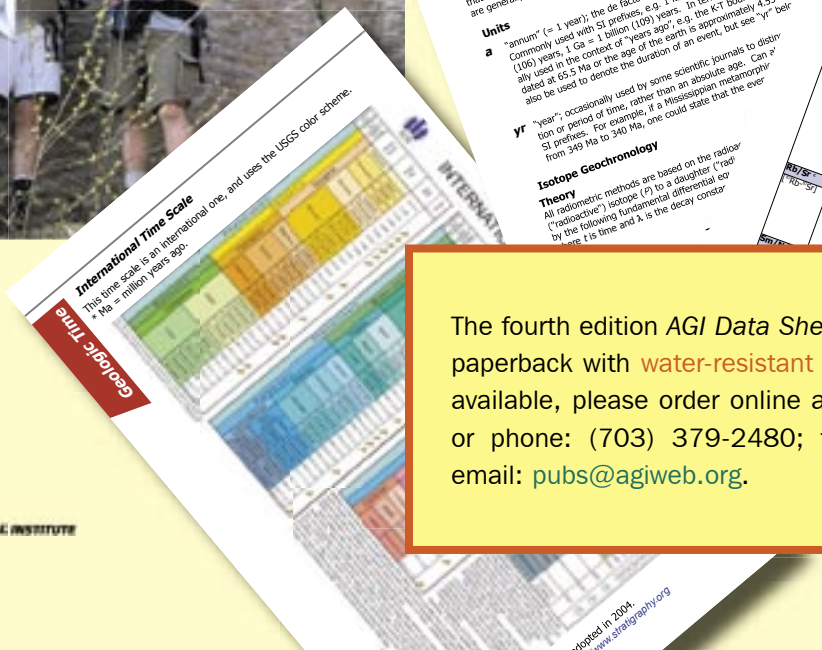

The fourth edition *AGI Data Sheets* will be spiral bound paperback with water-resistant pages, 5" x 8." When available, please order online at www.agiweb.org/pubs or phone: (703) 379-2480; fax: (703) 379-7563; email: pubs@agiweb.org.

SERVING THE GEOSCIENCES
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Field Forum Scheduled

Rethinking the Assembly and Evolution of Plutons: Field Tests and Perspectives

7–13 October 2005

A field excursion across the Mesozoic Cordilleran batholith from Yosemite to the White Mountains, California

Conveners:

John M. Bartley, *Department of Geology and Geophysics, University of Utah, Salt Lake City, Utah 84112-0111, USA, +1-801-585-1670, jbartley@mines.utah.edu*

Drew S. Coleman, *Department of Geological Sciences, University of North Carolina, Chapel Hill, North Carolina 27599-3315, USA, +1-919-962-0705, dcoleman@unc.edu*

Allen F. Glazner, *Department of Geological Sciences, University of North Carolina, Chapel Hill, North Carolina 27599-3315, USA, +1-919-962-0689, afg@unc.edu*

Aaron Yoshinobu, *Department of Geosciences, Texas Tech University, Lubbock, Texas, 79409-1053, USA, aaron.yoshinobu@ttu.edu*

Richard D. Law, *Department of Geosciences, Virginia Tech., Blacksburg, Virginia 24061, USA, rdlaw@vt.edu*

Description and Objectives. The field forum will examine the geologic record of assembly of large Mesozoic granitic plutons in California, focusing on portions of the Sierra Nevada batholith in Yosemite National Park and in the John Muir Wilderness, and more scattered plutons outside of the main batholith in the White Mountains. Particular emphasis will be placed on evaluating the hypothesis that large, superficially homogenous plutons were emplaced in small increments over millions of years rather than as large molten magma bodies. Field examples will be studied in the light of complementary analytical and geophysical data and theoretical considerations, as well as for their broader implications for igneous petrogenesis, the longevity of magmatic systems, and linkage between plutonism and volcanism; for processes by which continental crust is constructed; and for interaction between tectonic and magmatic processes in orogens. The conveners invite participants concerned with all aspects of crustal magmatic processes and their spatial and temporal scales, including but not limited to petrologists, structural geologists, geochronologists, volcanologists, geodesists, seismologists, and geodynamic modelers. Our goal is to consider how better understanding of the growth of plutons can advance general understanding of igneous and tectonic processes and crustal evolution.

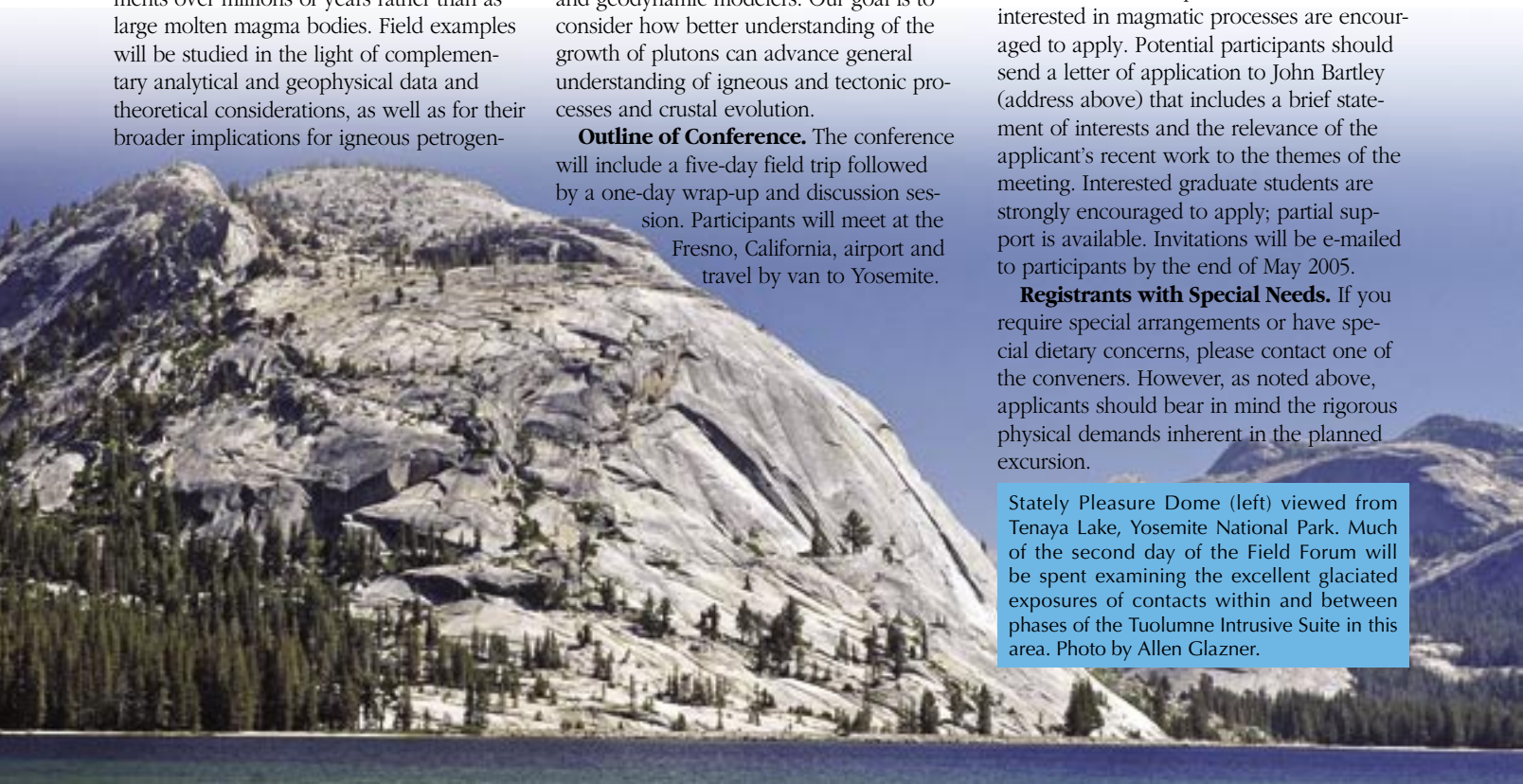
Outline of Conference. The conference will include a five-day field trip followed by a one-day wrap-up and discussion session. Participants will meet at the Fresno, California, airport and travel by van to Yosemite. In the first two days, we will examine the Yosemite Valley and Tuolumne intrusive suites. The next two days will be spent on full-day hiking trips to intrusions exposed on the eastern flank of the Sierra Nevada (Bishop and Big Pine creeks), and the last day in the field will be spent on intrusions in the White and Inyo Mountains east of the Sierra Nevada. The wrap-up session will be held at the Crooked Creek Laboratory of the White Mountain Research Station, which is located astride the contact of the Sage Hen Flat pluton at 10,000 ft (3000 m) elevation in the White Mountains.

Please Note: Days 3 and 4 of the field forum will involve strenuous trail and off-trail hiking at altitudes ranging above 10,000 ft (3000 m). The first two days will be less vigorous and at somewhat lower elevations (4000–9000 ft; 1200–2750 m), and therefore will aid in the acclimatization of participants who reside at sea level. However, excellent physical fitness that permits participants to travel safely through rugged backcountry areas at high altitude is a prerequisite for participation.

Venue. The first two days will be based at Curry Village in Yosemite Valley, and the remainder of the forum will be based at the Owens Valley (Bishop) and Crooked Creek facilities of the White Mountain Research Station of the University of California. The estimated registration fee of US$850 will cover transportation (including to and from the Fresno airport), lodging, meals, and guidebook.

Application Deadline: May 6, 2005. Geoscientists of all specializations who are interested in magmatic processes are encouraged to apply. Potential participants should send a letter of application to John Bartley (address above) that includes a brief statement of interests and the relevance of the applicant's recent work to the themes of the meeting. Interested graduate students are strongly encouraged to apply; partial support is available. Invitations will be e-mailed to participants by the end of May 2005.

Registrants with Special Needs. If you require special arrangements or have special dietary concerns, please contact one of the conveners. However, as noted above, applicants should bear in mind the rigorous physical demands inherent in the planned excursion.



Stately Pleasure Dome (left) viewed from Tenaya Lake, Yosemite National Park. Much of the second day of the Field Forum will be spent examining the excellent glaciated exposures of contacts within and between phases of the Tuolumne Intrusive Suite in this area. Photo by Allen Glazner.

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The GSA Foundation will celebrate its 25th anniversary in December 2005.

The Foundation mission is to solicit support from individuals and institutions for programs and activities of GSA that advance the geosciences, enhance the professional growth of its members, and promote the geosciences in the service of humankind. The Foundation ensures that all gifts are used in ways consistent with donor wishes and wisely manages its resources and assets to maximize their value.

The Foundation can be successful when YOU, the members of the Society, support your professional home base with donations and pledges to the Foundation. The most important resource of the Foundation is our GSA members. Please consider donating to the level you can in this special 25th Anniversary Campaign. Honor your affiliation with this society by supporting the mechanism that helps sustain the growth and successful of GSA—the GSA Foundation.

Please show your support to your professional GSA home and become a major contributor to the Foundation's 25th Anniversary Campaign.

Our goal in this 25th Anniversary Campaign is $1,000,000 each year for the next five years through donations and pledges. These funds will be used to support GSA's greatest needs. The current GSA greatest needs list includes:

- Support of the GSA e-journal, *Geosphere*
- GeoCorps™ America
- Education and Outreach Programs
- Student Research Grants
- Congressional Science Fellowship
- Field Forums
- Headquarters building maintenance and remodeling
- International and domestic travel support

Most memorable early geologic experience:

Introduction to Arizona geology included rattlesnakes, scorpions, sullen bobcats, curious bears, and ornery mules. Ensuing stories entertained and amused the neighboring crusty but tolerant ranchers.

—Donald Peterson

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ANNOUNCEMENTS

MEETINGS CALENDAR

2005

April 17–20	2005 Ground Water Summit, San Antonio, Texas, USA. **Information:** National Ground Water Association, 601 Dempsey Road, Westerville, Ohio 43081-8978, USA. Phone: +1.800.551.7379 or +1.614.898.7791, fax: +1.614.898.7786, customerservice@ngwa.org.
April 18–20	2005 Digital Library for Earth System Education (DLESE) Data Services Workshop, Breckenridge, Colorado, USA. **Information:** www.dlese.org/people/dataservices/dataservices_2005_workshop.html.
April 24–29	World Geothermal Congress, Antalya, Turkey. Held every fifth year. International Geothermal Association. **Information:** www.WGC2005.org.
May 24–28	51st Annual Meeting of the Institute on Lake Superior Geology (ILSG), Nipigon, Ontario, Canada. **Information:** www.lakesuperiorgeology.org/nipigon2005; contact e-mail: Nipigon2005@Lakeheadu.ca.
May 26–27	Workshop: "Late Paleozoic of Western Pangea." Grand Junction, Colorado, USA. **Information:** Lynn Soreghan, University of Oklahoma, lsoreg@ou.edu, or Chuck Kluth, Colorado School of Mines, ckluth@mines.edu, +1.303.273.3889.
June 11–15	42nd Annual Meeting of the Clay Minerals Society, Burlington, Vermont, USA. **Information:** www.middlebury.edu/cms; Chair: Peter Ryan, pryan@middlebury.edu.
June 12–16	National Minerals Education Conference, Tucson, Arizona, USA. **Information:** www.seeuthere.com/MEC2005. Registration deadline: 13 May 2005.
July 31–August 5	Gordon Research Conference on Inorganic Geochemistry: Metals in ore-forming systems: Sources, transport, deposition, Andover, New Hampshire. **Information:** www.grc.uri.edu/programs/2005/inorgeo.htm.
August 8–11	Earth System Processes 2 (ESP2). Cosponsored by GSA and the Geological Society of Canada. Westin Hotel, Calgary, Alberta, Canada. **Information:** www.geosociety.org/meetings/esp2/, or Deborah Nelson, dnelson@geosociety.org, +1.303.357.1014.
August 9–12	9th International Conference on Diffuse Pollution, Johannesburg, South Africa. **Information:** www.iwa-wisa-2005.com or contact Ralph Heath at ralphh@phd.co.za.
September 12–13	Micro-organisms and Earth Systems: Advances in Geomicrobiology, University of Keele, UK. **Information:** Meetings Office, Society for General Microbiology, Marlborough House, Basingstoke Road, Spencers Wood, Reading RG8 9BE, UK, +44 (0)118.988.1805, fax +44 (0)118.988.5656, www.sgm.ac.uk/meetings. Abstracts deadline: 13 May 2005.
September 19–23	14th Meeting of the Association of the European Geological Societies, Torino, Italy. **Information:** www.maegs14.com.

2006

April 3–7	Backbone of the Americas—Patagonia to Alaska, Mendoza, Argentina. Co-convened by Asociación Geológica Argentina and GSA. **Information:** www.geosociety.org/meetings/06boa/index.htm or contact Deborah Nelson, dnelson@geosociety.org, +1.303.357.1014.

Visit www.geosociety.org/calendar/ for a complete list of upcoming geoscience meetings.

About People

GSA Member **Patricia Bobeck** received the inaugural S. Edmund Berger Prize for Excellence in Scientific and Technical Translation from the American Foundation for Translation and Interpretation at the 2004 meeting of the American Translators Association. She received the prize for her English translation of Henry Darcy's 1856 *The Public Fountains of the City of Dijon*. Darcy's account of the planning and construction of Dijon's water distribution system in 1840 includes a detailed description of the experiments that led to the formulation of Darcy's Law.

The Kerry Kelts Research Awards of the Limnogeology Division

The application process for the Kerry Kelts Research Awards of the Limnogeology Division is now open. These awards are named in honor of Kerry Kelts, a visionary limnogeologist and inspiring teacher. Up to three awards of $300 each for use in research related to limnogeology, limnology, and paleolimnology are available. Application for this award is simple and consists of a summary of the proposed research, its significance, and how the award will be used (five-page maximum). Please send your summary in PDF format along with your name and associated information to the chair of the Limnogeology Division, Thomas C. Johnson, tcj@d.umn.edu. **Application Deadline: August 10, 2005.** Awards will be announced at the Limnogeology Division Business Meeting and Reception at the 2005 GSA Annual Meeting in Salt Lake City in October.

We hope to increase the amount of the awards in succeeding years. If you are interested in supporting this awards program, please send your donations, designated for the Kerry Kelts Research Awards of the Limnogeology Division, to GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA.

PENROSE CONFERENCE SCHEDULED

Lessons in Tectonics, Climate, and Eustasy from the Stratigraphic Record in Arc Collision Zones

October 10–14, 2005

Price, Utah

Conveners:

Peter D. Clift, *Department of Geology and Petroleum Geology, University of Aberdeen, Aberdeen AB24 3UE, UK, +44.1224.273456; p.clift@abdn.ac.uk*

Amy E. Draut, *University of California–Santa Cruz and U.S. Geological Survey, 400 Natural Bridges Dr., Santa Cruz, California 95060-5755, USA; +1.831.427.4733; adraut@usgs.gov*

Cosponsored by *International Association of Sedimentologists (IAS)* and *British Sedimentological Research Group (BSRG)*

Description and Objectives. Sediments and sedimentary rocks are essential to understanding and quantifying tectonic, oceanographic, and climatic processes in subduction zones, especially during arc collision events. The stratigraphic and tectonic record of convergent plate margins is typically dominated not by long periods of steady-state subduction but by collisions between arcs and oceanic topography, as well as with passive continental margins. Arc-continent collisional settings are some of the most dynamic sedimentary settings on Earth, where rapid vertical tectonic motion within sedimentary basins can interact with major exhumation of terranes that form sediment sources, and with local climate that may be highly erosive, to generate complicated, sometimes thick, stratigraphic packages. The collision of seamounts and ridges with active margins can cause major readjustments in the geometry, tectonics, and magmatic character of a subduction zone and appears to be central to governing the flux of material back into the upper mantle. Forearc sedimentary sequences are often the only record of paleo-collision events. In this meeting, we aim to quantify the rates of sedimentation and vertical tectonic motions associated with these events.

Despite the complexities inherent in the stratigraphy of arc collisional settings, recent work on modern examples and ancient accreted arc terranes has advanced our understanding of the processes that control the formation of the sedimentary sequences in such environments. As a result, study of the sedimentary record can now provide a more complete understanding of the tectonic and associated climatic processes that have operated in modern and ancient arc collision zones.

Presentations are requested that describe the processes that form the sedimentary record in arc settings and use that record to document environmental changes, which may include but are not limited to tectonic events, global sea-level variation, and climatic changes. The research and ideas discussed at the meeting are intended to synthesize recent advances in our understanding of these arc environments and stimulate further research in both active modern settings and in their ancient analogues.

Planning Future Research. In addition to summarizing what the scientific community knows about sedimentation in arc collisional settings, we will discuss the potential for future research efforts. A GSA Special Paper is planned as an outlet for the meeting results. Future research will be debated with specific recommendations for how it can be advanced within the context of existing, funded programs both in the United States and internationally (e.g., Integrated Ocean Drilling Program [IODP]).

Proposed Sessions. The meeting will be arranged as a series of presentations, interspersed with discussion and poster sessions. Key themes to be addressed will include the stratigraphic record and its importance in arc collision environments; tectonic implications to be learned from modern and ancient records; sedimentary studies, including provenance, sediment budgets, and stratigraphic architecture; and development of stratigraphic concepts in modern collision zones.

Location and Dates. The meeting will be convened in Price, Utah, immediately before the GSA Annual Meeting in Salt Lake City so that participants can attend both meetings easily and in order to take advantage of the dramatic local geology. Registration costs, estimated at $850, will cover lodging, all meals, and the field trip, but will not cover transportation to and from Price, Utah.

Field Trip. A one-day field trip on Thurs., Oct. 13, will highlight some of the classic exposures of sedimentary geology in central Utah. This trip will also provide opportunities for informal discussion in preparation for the final day of presentations and in planning for future research.

Application Deadline: 15 June 2005

To Apply: Geoscientists interested in the stratigraphic record of arc collision zones and associated processes are encouraged to attend. Potential participants should send a letter of intent to Peter Clift or Amy Draut that includes a brief statement of interests, the relevance of the applicant's recent work to the themes of the meeting, the subject of proposed presentation, and contact information. Interested graduate students are strongly encouraged to apply; partial support is available to student attendees from GSA and the IAS.

Registrants with Special Needs. GSA is committed to making Penrose Meetings accessible to all. If you require special arrangements or have special dietary concerns, please contact the meeting coordinator, Edna Collis, at ecollis@geosociety.org.

To learn more about this Penrose Conference, go to www.abdn.ac.uk/~wpg008/ArcPenroseMeeting.html.

GeoVentures™ 2005 Deadlines

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June 17–20, 2005.
Registration deadline: May 1, 2005.

GeoHostel: Geologic Excursions in South-Central Montana

FULL

July 9–14, 2005. Registration deadline: June 1, 2005.

To learn more about these trips and how to sign up, see the February issue of *GSA Today*. For complete details on GeoVentures™ or for full itineraries, contact Edna Collis, program officer, 1-800-472-1988, ext. 1034, fax 303-357-1072, ecollis@geosociety.org, or go to geoventures@geosociety.org.

3–7 April 2006 • Mendoza, Argentina

Backbone of the Americas: From Patagonia to Alaska is a GSA special meeting cosponsored with the Asociación Geológica Argentina. The principal themes are ridge collision, shallow subduction, and plateau uplift along the Americas. Field trips are planned to Patagonia before and the Chilean flat-slab or Central Andean Puna plateau after the meeting. Suzanne Kay and Victor Ramos are serving as meeting co-chairs.

Co-convened by:

Asociación Geológica Argentina

THE GEOLOGICAL SOCIETY OF AMERICA

See www.geosociety.org/meetings/06boa/index.htm for details and to sign up for e-news.

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Positions Open

FACULTY POSITION IN ENERGY EXPLORATION
WEST VIRGINIA UNIVERSITY

The Department of Geology and Geography at West Virginia University invites applications for the Marshall S. Miller Energy Professorship in Geology. Appointment will be at the rank of Associate or Full Professor based on qualifications and experience. A Ph.D. degree is required. The successful candidate will focus on energy exploration and development of fossil fuels (oil, gas, coal, coal-bed methane) in both research and teaching. We seek an individual with substantial energy industry experience. Responsibilities will include the recruitment of qualified graduate students, and outreach to energy producers in the Appalachian Basin and beyond in the form of research projects and student placement. The successful applicant will contribute to current Departmental strengths and teaching at both the undergraduate and graduate levels, and will develop a vigorous externally-funded research program. Department strengths include geophysics, structure/tectonics, remote sensing, GIS, sedimentation, stratigraphy, paleontology, petrology, hydrogeology, surficial processes, and environmental geology. The Department is scheduled to move into a renovated building in 2007. Collaborations are encouraged with the National Energy Technology Lab (DOE-NETL), the National Research Center for Coal and Energy (NRCCE), and the West Virginia Geological and Economic Survey, all in Morgantown.

Candidates should send: (1) letter of application detailing teaching area interests, industry and research experience, and research program; (2) curriculum vitae; and (3) names, phone numbers, e-mail and mail addresses of three references to: Energy Professor Search Committee, Department of Geology and Geography, West Virginia University, Morgantown, WV 26506-6300. Questions may be directed to energy@geo.wvu.edu or 304-293-5603. Review of applications will begin August 15, 2005 and continue until the position is filled. The preferred start date is January 1, 2006. Please see www.geo.wvu.edu, www.wvu.edu, and www.morgantown.com. West Virginia University is an Equal Opportunity/Affirmative Action employer. Women and minority candidates are encouraged to apply.

THE UNIVERSITY OF TEXAS AT AUSTIN
DEPARTMENT OF GEOLOGICAL SCIENCES
JACKSON SCHOOL OF GEOSCIENCES
FACULTY POSITION
WATER SCIENCES AND HYDROGEOLOGY

The Department of Geological Sciences, Jackson School of Geosciences, at The University of Texas at Austin seeks to fill a faculty position in water sciences and hydrogeology. The specific area of research is open, and might include studies in one or more of the following areas: modeling of flow, contaminant transport, and reactions on a variety of scales; groundwater/surface water interactions; theory and applications of geophysical and remote sensing methods; analysis of water resources and related policy; land-atmosphere interactions; and hydrologic impacts of climate variability and climate change. The rank is open, and candidates at all levels, including Chair level, will be considered. The successful candidate will join the Jackson School of Geosciences, which includes the Department of Geological Sciences, the Bureau of Economic Geology, and the Institute for Geophysics. The School has a large and diverse community of geoscientists, with excellent research facilities and support. Through other campus departments in science and engineering and research units, such as the Environmental Science Institute, Center for Space Research, Institute for Computational Engineering and Sciences, and Center for Research in Water Resources, there are opportunities to interact with faculty and scientists from many disciplines. The selected candidate will have demonstrated strong potential for conducting a vigorous externally funded research program, should be an enthusiastic teacher at the undergraduate and graduate levels and well qualified to direct the research of M.S. and Ph.D. students. The anticipated starting date for this position is August 31, 2005, but the position remains open until filled. A PhD in an Earth science or related discipline is required at the time of appointment. Please refer to http://www.geo.utexas.edu for additional information. To apply: please send a curriculum vitae, statement of research and teaching interests, and names and contact information for four references to: Hydrogeology Search, Department of Geological Sciences, The University of Texas at Austin, Austin, Texas 78712-1101. Review of applications will begin March 1, 2005, and will continue until the position is filled. The University of Texas is an Equal Opportunity/Affirmative Action employer.

SURFACE WATER HYDROLOGIST
DESERT RESEARCH INSTITUTE

Desert Research Institute (DRI), Division of Hydrologic Sciences, Las Vegas, NV, seeks a Surface Water Hydrologist at the Assistant or Associate Research Professor rank. The incumbent will have a Ph.D. with emphasis in hydrology, water resources engineering, or hydraulic engineering; arid land hydrology experience, an engineering background, a strong background in the areas of surface water hydrology and will complement DRI's existing strengths in hydrology, hydraulics, soil science, and sediment engineering. Applicant reviews begin April 15, 2005. For full details visit http://jobs.dri.edu or call 775-673-7332. DRI is an AA/EEO employer.

GEOLOGY ASSISTANT/ASSOCIATE PROFESSOR
MIDWESTERN STATE UNIVERSITY

Geology Assistant/Associate Professor—tenure track, Fall 2005. Ph.D. in geoscience with a broad professional background, and strong interpersonal skills. Teach Introductory Geology, Sedimentology, Structural Geology, and appropriate upper-level courses along with advising responsibilities. Preference will be given to individuals with research background, field experience, and resultant publication in refereed journals. MSU is a comprehensive public university serving approximately 6,500 students. Send application letter, vita, and names and addresses of three references to Dr. M. Kocurko, Chair, Department of Geology, Midwestern State University, 3410 Taft Blvd., Wichita Falls, Texas 76308, e-mail: john.kocurko@mwsu.edu. Screening starts April 1. Applications will be accepted until position is filled. EOE/EDA.

GEOLOGIST, RCF MANAGEMENT, DENVER, CO

RCF Management in Denver, CO, seeks a degreed geologist to serve as Vice President w/exp. in Canadian securities analysis & investments incl. exp. as a mining analyst in a brokerage firm. Must have North American mineral exploration industry exp. focused on a range of commodities (incl. gold, base metals & diamonds), a variety of deposit types & w/exposure to all stages of exploration; extensive overseas travel. Send resume & salary requirements to: Brian T. Dolan, Partner, RCF Management, LLC, 1400 16th St., Ste. 200, Denver, CO 80202 or fax: 720.946.1450.

SEDIMENTARY GEOLOGY
TWO FACULTY POSITIONS
JACKSON SCHOOL OF GEOSCIENCES
UNIVERSITY OF TEXAS AT AUSTIN

The Department of Geological Sciences at The University of Texas at Austin seeks two Sedimentary Geologists. The positions are open at all levels, including Chair level. Applicants with a wide range of specialties within clastic Sedimentary Geology will be considered. There has long been strong Sedimentary Geology at UT Austin, but we wish to further develop our vision as the Jackson School is chartered. The new positions will strengthen our range of approaches in Sedimentary Geology (field, subsurface and experimental observation; laboratory analysis and modeling), and will help use the sedimentary record at all time scales in new Earth-Science initiatives. Opportunities exist for interaction with faculty and students in the Department's programs in sedimentary geology, petroleum geology, mineral resources geology, paleontology, geochemistry, hydrogeology, exploration geophysics and tectonics, and with research staff of the Bureau of Economic Geology and Institute for Geophysics which, together with the Department, comprise the John A. and Katherine G. Jackson School of Geosciences (visit our web site at www.geo.utexas.edu). The successful candidate will be expected to establish a vigorous research program and teach at both the undergraduate and graduate levels. A Ph.D. is required. Please send statements of research and teaching interests, resume, reprints, names and addresses of at least four references, plus any supplemental information to: Chair, Sedimentary Geology Search Committee, Department of Geological Sciences C1100, The University of Texas at Austin, Austin, TX 78712-1101. Review of applications will begin April 15, 2005, and the positions will remain open until filled. The University of Texas at Austin is an equal opportunity/affirmative action employer.

Opportunities for Students

Graduate Student Research Grants, The Society for Organic Petrology (TSOP). TSOP invites applications for one or two graduate student research grants of up to $1000 each. The purpose of the grants is to foster research in organic petrology (which includes coal petrology, kerogen petrology organic geochemistry and related disciplines) by providing support to graduate students who demonstrate the utility and significance of organic petrology in solving the thesis problem.

The Grant Program supports qualified graduate students from around the world who are actively seeking advanced degrees. Preference is given to full-time students in master's (or equivalent) degree programs but applications are also encouraged from Ph.D. candidates and part-time graduate students. Grant are to be applied to expenses directly related to the student's thesis work such as summer fieldwork, laboratory expenses, etc.

Grant application deadline is May 1, 2005. Grants will be awarded in September 2005. Detailed information and an application form on the TSOP web site (http://www.tsop.org/grants.htm) or applications may be obtained from S. J. Russell, Shell UK Exploration & Production, 1 Altens Farm Rd., Nigg, Aberdeen AB12 3FY, United Kingdom; fax: +44(0) 1224 88 3689; e-mail: suzanne.j.russell@shell.com.

Call for Papers: GSA's *Geosphere*

Submit a paper to *Geosphere*, GSA's new online journal. *Geosphere* is using an online manuscript submission and tracking system accessible through www.geosociety.org (click on "Publications Services," then "Submit a Manuscript") or http://gsa-geosphere.allentrack.net. (If you have submitted papers to *Geology* or to *GSA Bulletin*, you'll find the process familiar.)

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- aims to evolve with technological advances.

Geosphere science editor: G. Randy Keller, University of Texas at El Paso.

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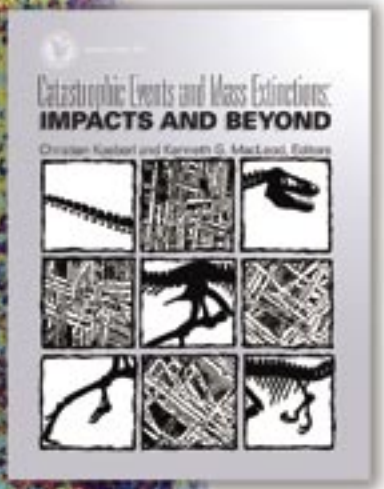

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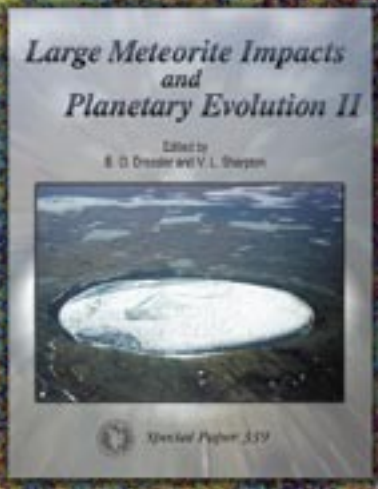

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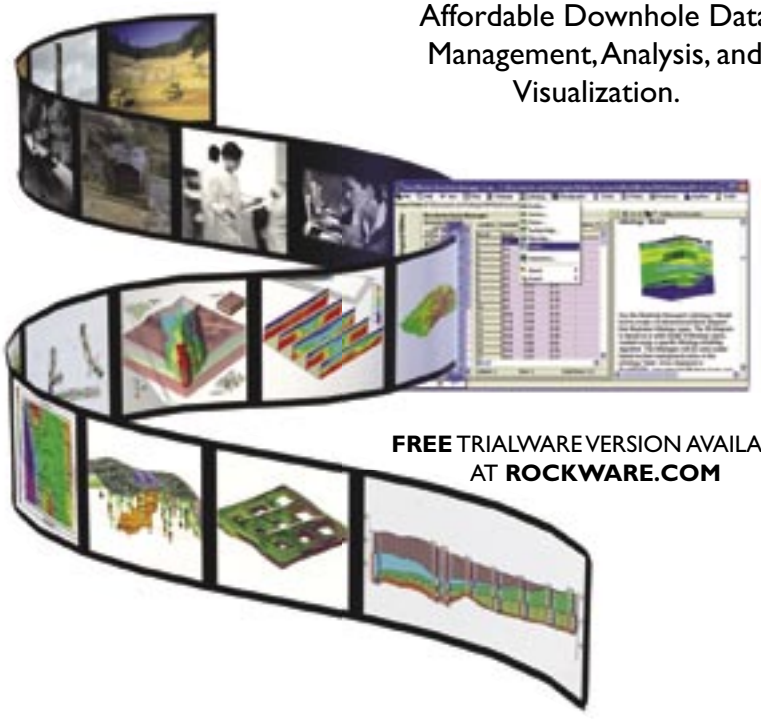

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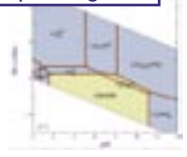

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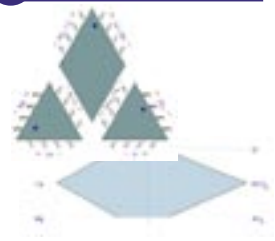

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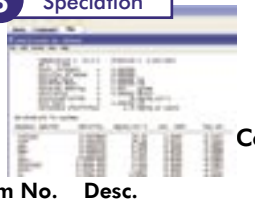

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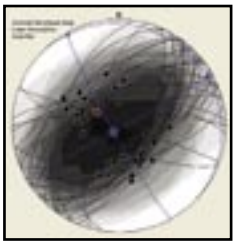

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