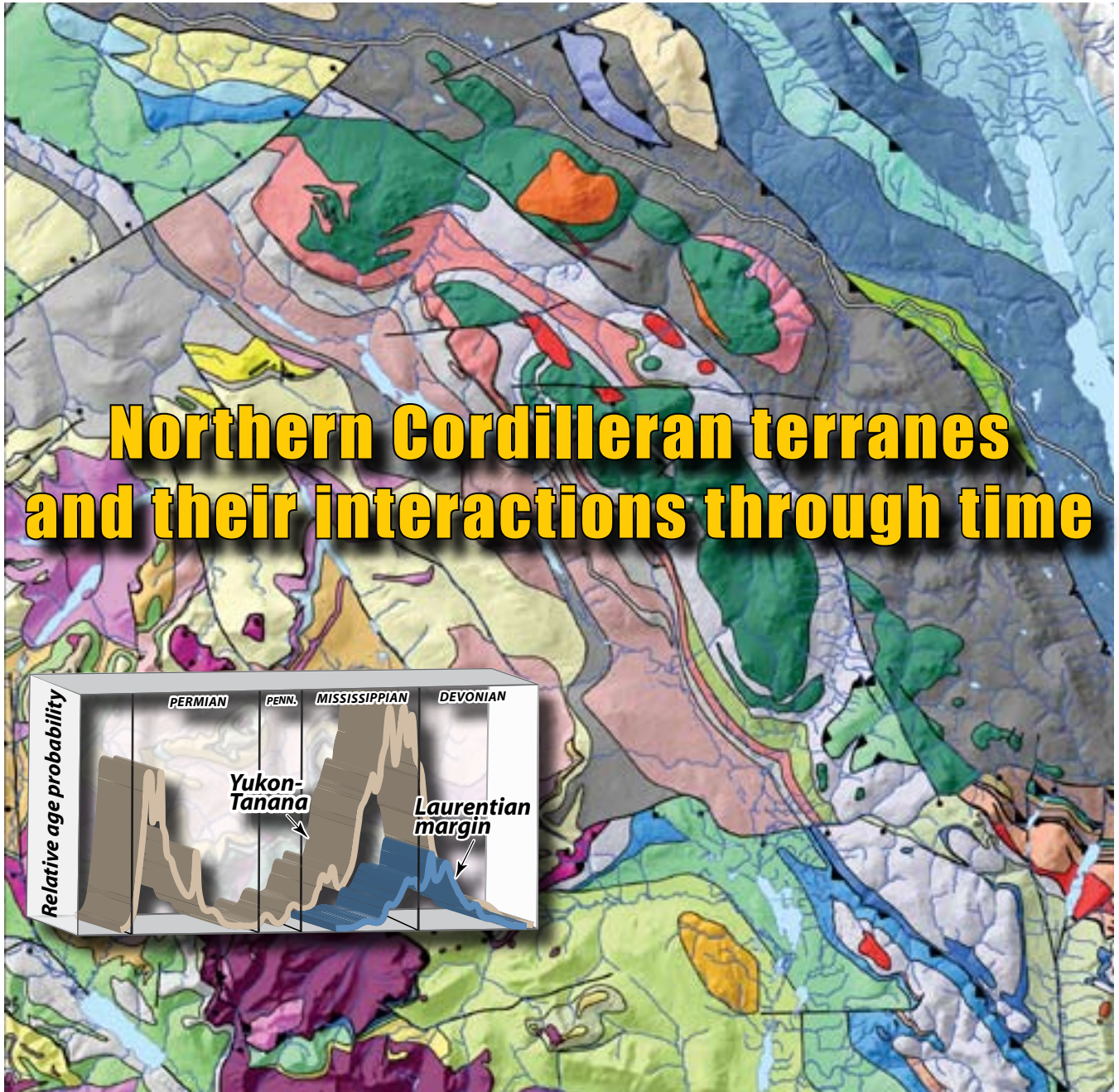


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Northern Cordilleran terranes and their interactions through time

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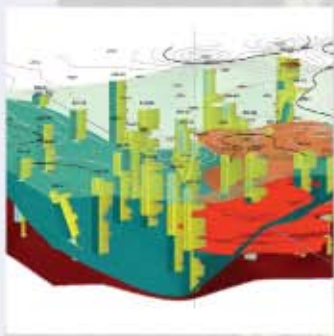
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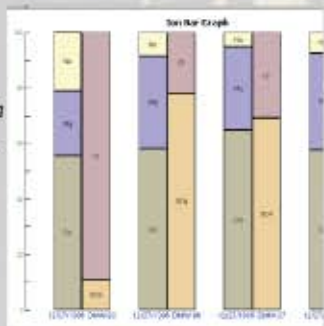
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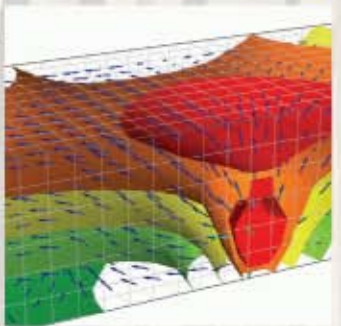
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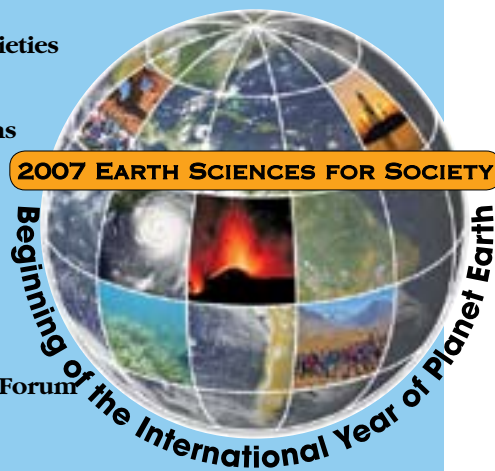


Cover: Map: Bedrock geology of part of the Finlayson Lake area, central Yukon. The Lower Permian Campbell Range formation (dark green) straddles the fault bounding Carboniferous and older units of the Yukon-Tanana and Slide Mountain terranes, thus providing a depositional link between the two terranes. Age graph: Frequency diagram of U-Pb zircon igneous ages from the Yukon-Tanana terrane and the Laurentian margin (stylized after Nelson et al., 2006). See "Northern Cordilleran terranes and their interactions through time" by Colpron et al., p. 4–10.

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Northern Cordilleran terranes and their interactions through time

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ABSTRACT

In the 25 years since the first application of the terrane concept to the North American Cordillera and the introduction of the term “suspect,” a pattern of interterrane stratigraphic and intrusive linkages and shared isotopic and faunal elements has emerged. Far from being restricted to late, post-amalgamation overlaps, these linkages can be as old as the oldest rocks within the terranes. In the Canadian Cordillera, these linkages give a coherent sense to terranes that otherwise might appear to be a collection of isolated and unrelated fragments. Such observed linkages effectively eliminate some of the paleogeographic uncertainties that were previously inferred between adjacent terranes (although not necessarily with respect to the Laurentian continent) and highlight their common history. In light of these relationships, it is now possible to interpret terranes of the Canadian Cordillera in terms of shared geodynamic scenarios, such as repeated arc superposition on older arcs and/or basement and coexisting arc system components. A primary result of this analysis is that the Intermontane terranes represent one interrelated set of arcs, marginal seas, and continental fragments that once formed a Paleozoic to early Mesozoic fringe to North America, the peri-Laurentian realm. By contrast, the Insular terranes, along with the Farewell and Arctic-Alaska terranes, include crustal fragments that originated from separate sites within the Arctic realm in Paleozoic time.

INTRODUCTION

The terrane concept was introduced some 25 years ago to describe the tectonically and stratigraphically composite nature of the North American Cordillera (Coney et al., 1980). Based upon knowledge of Cordilleran geology at that time, terranes were defined as fault-bounded crustal blocks that preserved a geological record distinct from that of adjacent terranes (Jones et al., 1983). Because of this inherent large-scale tectonostratigraphic granularity, the pre-accretionary paleogeographic positions of terranes with respect to each other and to the Laurentian craton were considered uncertain or, in the famous moniker, “suspect.” The fundamental character of the Cordillera was envisaged as a collage (i.e., an assembly of diverse elements; Helwig, 1974; Coney et al., 1980). The terrane concept

provided the underlying framework for much of the subsequent detailed mapping and tectonic analysis of the North American Cordillera. It has served to focus attention on relationships amongst terranes and has fostered the development and application of tools to resolve these relationships (e.g., Nd and Sr isotopes, detrital zircon geochronology, and paleomagnetism). These studies have significantly improved our understanding of the internal framework of the terranes and their external relationships (e.g., Monger and Nokleberg, 1996; Monger and Price, 2002). Extensive geochronological, isotopic, geochemical, fossil, paleomagnetic, and mineral deposit databases now allow for improved resolution of the geological history and geodynamic interpretation of many terranes, including genetic and/or evolutionary linkages between some terranes, and provide an improved framework for paleogeographic analysis.

Herein, we briefly summarize the current scientific understanding of northern Cordilleran terranes, particularly the Intermontane terranes and their interrelationships, and suggest updating the terrane concept in order to more accurately reflect this new understanding of the Cordilleran orogen. More exhaustive discussion of some of the relationships summarized here can be found in Nokleberg et al. (2000), Colpron and Nelson (2006), and Nelson and Colpron (2007).

NORTHERN CORDILLERAN TERRANES

Within the northern Cordillera, Proterozoic to Triassic miogeoclinal, mainly sedimentary, platformal to basinal strata of the western Laurentian continental margin (NA_m and NA_b on Fig. 1) extend into eastern British Columbia, Yukon, and east-central Alaska. Farther west, most of British Columbia, Yukon, and Alaska are made up of Paleozoic to Mesozoic volcanic, plutonic, sedimentary, and metamorphic assemblages that represent magmatic arcs, microcontinents, and ocean basins accreted to western Laurentia in Mesozoic and younger time. These, along with the parautochthonous deformed belt and the undisturbed platform of western Canada, are overlain by syn- and post-accretionary clastic deposits. The western and inner parts of the orogen are pierced by post-accretionary plutons and overlain in places by thick accumulations of relatively young volcanic strata.

Although the northern Cordillera has been subdivided into a multiplicity of terranes (cf. Coney et al., 1980; Wheeler et al., 1991; Fig. 1), it can be viewed more globally as consisting of five first-order tectonic entities (Fig. 1 inset):

1. Ancestral North America (Laurentia), including the Yukon-Tanana upland, Alaska Range, and Kootenay terrane—the autochthon and parautochthon;
2. The allochthonous marginal pericratonic terranes (Intermontane terranes)—the peri-Laurentian realm;

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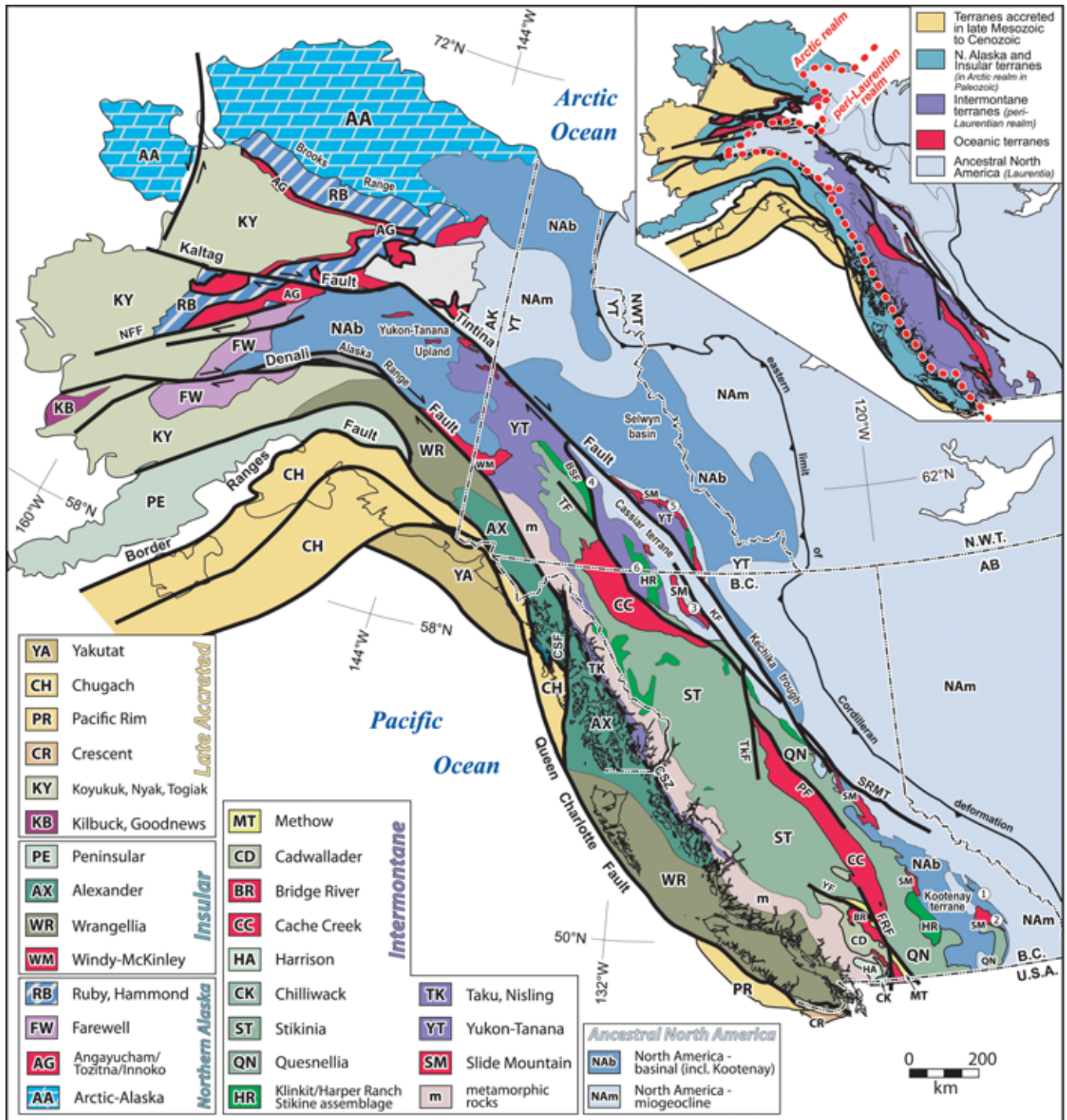


Figure 1. Terranes of the Canadian-Alaskan Cordillera. Inset shows terrane groupings and tectonic realms. Paleozoic basal strata of Ancestral North America (NAB; e.g., Selwyn basin) were not previously included on terrane maps of the Cordillera (e.g., Wheeler et al., 1991). We include them here because they represent a first-order lithotectonic belt equivalent to many terranes and correlate with some of the displaced terranes (e.g., Kootenay terrane, Yukon-Tanana upland, and Northern Alaska Range). Numbers refer to locations where linkages exist amongst adjacent terranes (see text). Abbreviations for major post-accretionary faults: BSF—Big Salmon fault; CSF—Chatham Strait fault; CSZ—Coast shear zone; FRF—Fraser River fault; KF—Kechika fault; NFF—Nixon Fork–Iditarod fault; PF—Pinchi fault; SRMT—southern Rocky Mountain trench; TkF—Takla-Finlay-Ingenika fault system; YK—Yalakom fault. Other abbreviations: AB—Alberta; AK—Alaska; B.C.—British Columbia; N.W.T.—Northwest Territories; YT—Yukon. Sources: Wheeler et al. (1991); Silberling et al. (1992); Colpron (2006).

3. The Insular and Northern Alaska terranes, which evolved in the Arctic realm in Paleozoic time;
4. Oceanic and accretionary complex terranes, which evolved alongside the Intermontane and Northern Alaska–Insular terranes (shown in red on Fig. 1);
5. Mesozoic and younger arc and accretionary terranes that form a western and southern fringe to the older elements—the Late Accreted terranes in Figure 1.

Ancestral North America (Laurentia) includes the western craton margin, the miogeocline with its platforms and basins, and its fringing, parautochthonous terranes (Cassiar and Kootenay, Fig. 1). Until recently, metamorphic rocks of the Yukon-Tanana upland and Alaska Range in east-central Alaska were considered a part of the allochthonous Yukon-Tanana terrane (see below); they are now interpreted as part of the parautochthonous Laurentian continental margin (see Dusel-Bacon et al., 2006; Nelson et al., 2006, for details). The western, outboard boundary of this autochthonous to parautochthonous belt is marked by discontinuous slivers and slices of the Slide Mountain oceanic terrane, which were formed in a marginal rift basin of Late Devonian to Permian age that once lay between the continent and a belt of rifted pericratonic fragments upon which successive Devonian through Jurassic arcs were formed (Yukon-Tanana, Quesnellia, Stikinia; Colpron et al., 2006; Nelson et al., 2006). The belt of pericratonic terranes was originally bounded on its outer, oceanward margin by an accretionary complex, the Cache Creek terrane, which includes slivers of high-pressure–low-temperature metamorphic assemblages, as well as blocks of limestone with exotic Permian fusulinid and coral faunas of Tethyan (Asian) affinity (Ross and Ross, 1983). Monger et al. (1982) defined the Intermontane superterrane as an amalgamation of many of the Intermontane terranes during Triassic–Jurassic accretion. In this discussion, we describe initial and ongoing relationships that span the entire period of the existence of these terranes. The position of the exotically derived Cache Creek terrane, enclosed within the pericratonic belt, is a constructional anomaly that may be best explained by oroclinal enclosure that developed as the Intermontane terranes amalgamated and accreted to the continent (Mihalynuk et al., 1994).

In fundamental contrast to the Intermontane terranes, the Insular terranes (Wrangellia and Alexander, Insular superterrane of Monger et al., 1982; and the Peninsular terrane of southwestern Alaska; Plafker et al., 1989) and the Farewell terrane of central Alaska (Bradley et al., 2003), although in part long-lived (Precambrian to Triassic) and in part pericratonic origin, show no evidence of early relationships to the western margin of Laurentia. Instead, their early faunal and isotopic affinities are consistent with Siberia and Barentia (Bazard et al., 1995; Bradley et al., 2003; Nokleberg et al., 2000). The Arctic-Alaska terrane, although continental to pericratonic and thought to show continuity with the northernmost miogeocline (Lane, 1997), is anomalous with respect to western Laurentia (Patrick and McClelland, 1995). It bears stratigraphic similarities to the Chukotka peninsula of the Russian Far East; it has been proposed that Arctic-Alaska and Chukotka were contiguous throughout most of their histories and displaced and/or rotated into their current position in Cretaceous time (Miller et al., 2006). Together, the Insular, Farewell, and Arctic-Alaska

terranes constitute an original set of mobile to detached crustal fragments, along with subsequent Paleozoic and Mesozoic arcs and basins, which developed mainly within the Arctic realm: They are collectively referred to here as the Northern Alaska–Insular terranes (Fig. 1, inset). Early in the history of Wrangellia, a Pennsylvanian pluton linked it to the Alexander terrane (Gardner et al., 1988). By Late Triassic to Early Jurassic time and prior to mid-Jurassic accretion with the Intermontane terranes, at least Wrangellia seems to have been transported to a more southerly paleolatitude west of the Laurentian margin (Aberhan, 1999; Smith et al., 2001). This set of terranes bounds the combined Laurentian margin and Intermontane (peri-Laurentian) terranes to the west (Fig. 1).

The outermost belt of terranes contains relatively young Mesozoic to Paleogene assemblages, including the accreted Yukon-Koyukuk arc, the Paleocene–Eocene seamounts of the Crescent terrane, and the Chugach, Pacific Rim, and Yakutat terranes, which are accretionary complexes dominated by trench sediments. These arc and accretionary assemblages developed within the eastern Pacific realm on or near the developing Cordilleran margin. Monger and Nokleberg (1996) interpreted them as paired accretionary prism-arc belts (see their work for a clear and useful synthesis).

LINKING THE INTERMONTANE TERRANES

In the southern Canadian Cordillera, the Kootenay and Slide Mountain terranes are stratigraphically linked to the Laurentian miogeocline. Lower Paleozoic, deep-water metasedimentary and metavolcanic rocks of the Lardeau Group (Kootenay terrane) are positionally tied to Lower Cambrian carbonate and quartzite characteristic of the Laurentian miogeocline (1 on Figs. 1–2; Colpron and Price, 1995; Logan and Colpron, 2006). The Kootenay terrane is in turn stratigraphically and positionally tied to the eastern side of the oceanic Slide Mountain terrane via strata of the Mississippian Milford Group, which unconformably overlies the Lardeau Group and, in an adjacent thrust panel, occurs stratigraphically below the Permian Kaslo Group (Slide Mountain; 2 on Figs. 1–2; Klepacki, 1985). Detrital zircon ages from sandstone of the Milford Group resemble those of the Lardeau Group and Neoproterozoic–Lower Cambrian miogeoclinal strata (Roback et al., 1994), suggesting a common source region and/or recycling of older units into younger ones. In northern British Columbia, clean quartz-chert sandstone beds interbedded with argillite and ribbon chert, and mafic volcanic strata in the Sylvester allochthon (Slide Mountain terrane; 3 on Fig. 1) have been correlated with coeval autochthonous siliciclastic units. These relationships suggest deposition near the Laurentian continental margin (Fig. 2). They mark the eastern margin of the Slide Mountain ocean, a marginal ocean basin that began to open in latest Devonian time and reached its maximum breadth in the Early Permian (Nelson et al., 2006).

In the northern Cordillera, the Yukon-Tanana terrane is inferred to have originated along the distal Laurentian continental margin and subsequently rifted away during the mid-Paleozoic opening of the Slide Mountain ocean (Fig. 3; Tempelman-Kluit, 1979; Nelson et al., 2006). The tectonostratigraphic base of the terrane (Snowcap assemblage) has geochemical, isotopic, and provenance characteristics pointing to a source along the northwestern Laurentian margin (4 on Figs.

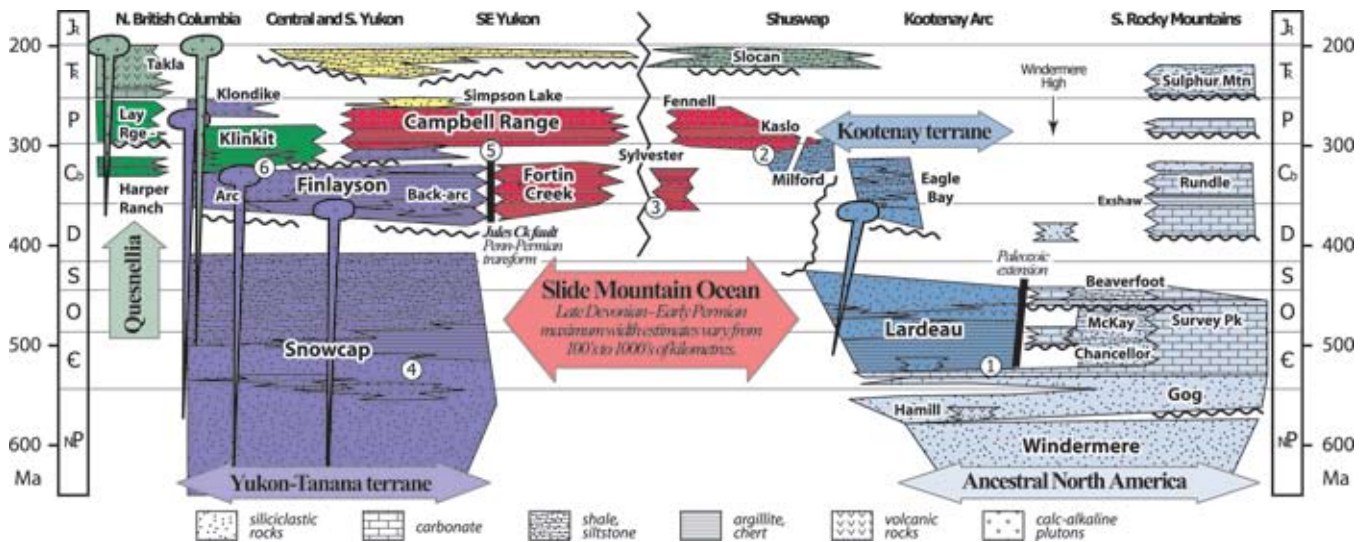


Figure 2. Schematic tectonostratigraphic relationships of the peri-Laurentian realm. The right-hand side of the diagram is constructed primarily from relationships in southeastern British Columbia (see text); the left-hand side is based on mapping of pericratonic terranes in northern British Columbia and Yukon. Numbers refer to linkages discussed in text and located on Figure 1. Only representative regional stratigraphic units are shown. Patterns illustrate dominant lithofacies; units are color-coded to terranes shown in Figure 1. Note the intricate boundaries amongst terranes of the peri-Laurentian realm. The demise of the Slide Mountain ocean began in Middle Permian time with subduction beneath the Yukon-Tanana terrane and is recorded by Permian eclogites in the Yukon-Tanana terrane, arc magmatism of the Klondike assemblage, and fore-arc deposits of the Simpson Lake Group. Triassic clastic rocks in Yukon (shown in yellow) overlap Yukon-Tanana, Slide Mountain, and North America.

1–2; Nelson et al., 2006) and forms the “nucleus” onto which Carboniferous to Permian magmatic arcs of the Yukon-Tanana terrane developed (Finlayson, Klinkit, and Klondike on Fig. 2). The Yukon-Tanana terrane shares Late Devonian to earliest Mississippian magmatism with the Laurentian margin, but younger Carboniferous to Permian magmatism is unique to the terrane.

Yukon-Tanana and Slide Mountain terranes are inferred to have evolved in adjacent geodynamic settings in mid- to late Paleozoic time. Arc magmatism in the Yukon-Tanana terrane is coeval with rift magmatism in the Slide Mountain terrane (Fig. 2); the presence of arc-derived detritus in the Carboniferous Fortin Creek group in the western part of the Slide Mountain terrane links the two into a Japanese arc–Sea of Japan-style convergent margin geodynamic setting (Fig. 3B). In southeastern Yukon, deposition of Lower Permian chert and basalt of Slide Mountain affinity (Campbell Range formation) onto Carboniferous “basements” of both Yukon-Tanana (Finlayson assemblage) and Slide Mountain affinities (Fortin Creek group) indicates that the Yukon-Tanana and Slide Mountain terranes have evolved together since at least Early Permian time (5 on Figs. 1–2; Murphy et al., 2006).

The relationship between the Yukon-Tanana and Slide Mountain terranes persisted into Late Permian time when subduction along the eastern margin of the Yukon-Tanana terrane led to the partial consumption of the Slide Mountain ocean. The Simpson Lake Group, a fore-arc basin conglomerate deposited on the Slide Mountain terrane, contains clasts of Upper Permian volcanic arc rocks akin to the Klondike assemblage of the Yukon-Tanana terrane and eclogite-facies metamorphic rocks with Late Permian cooling ages (Fig. 2; Murphy et al., 2006), showing linkages at that time.

The Yukon-Tanana terrane can be linked to Quesnellia as well. In the southern part of the Yukon-Tanana terrane, the

Late Mississippian to Early Permian Klinkit assemblage, which unconformably overlies Early Mississippian and older parts of the terrane (6 on Figs. 1–2; Colpron et al., 2006; Roots et al., 2006), has been correlated with the Lay Range stratigraphic succession of north-central British Columbia and the Harper Ranch Group of southern British Columbia on the basis of their similar stratigraphy, age, and geochemistry (Simard et al., 2003). Both the Lay Range and Harper Ranch are late Paleozoic arc–back-arc assemblages, which constitute the “basement” of the Mesozoic magmatic arc of Quesnellia and are an integral part of that terrane (Fig. 2). The Yukon-Tanana terrane is also intruded by a Late Triassic–Early Jurassic plutonic suite that it shares with Quesnellia and Stikinia (Nelson and Friedman, 2004).

The Late Permian consumption of the Slide Mountain ocean brought the remnants of the Intermontane terranes closer to the Laurentian continental margin. The approach of these terranes to the continental margin is recorded in Triassic strata deposited on both the Intermontane terranes and the Laurentian margin. In Yukon, Triassic siliciclastic rocks overlying the Laurentian miogeocline yielded detrital zircons characteristic of the Yukon-Tanana and Slide Mountain terranes (Beranek and Mortensen, 2007).

These relationships indicate that prior to their mid-Jurassic assembly, the major Intermontane terranes were not a set of unrelated, fault-bounded entities. Rather, they were interacting with each other as adjacent geodynamic elements in a complex and long-lived dance that spanned the entire history of some terranes. Relationships and boundaries between terranes evolved through time (Fig. 2). These, along with faunal and isotopic data, can be used to support reasonable inferences about the tectonic evolution of the western Laurentian margin *sensu lato*. We can, in this sense, now impose qualitative limits

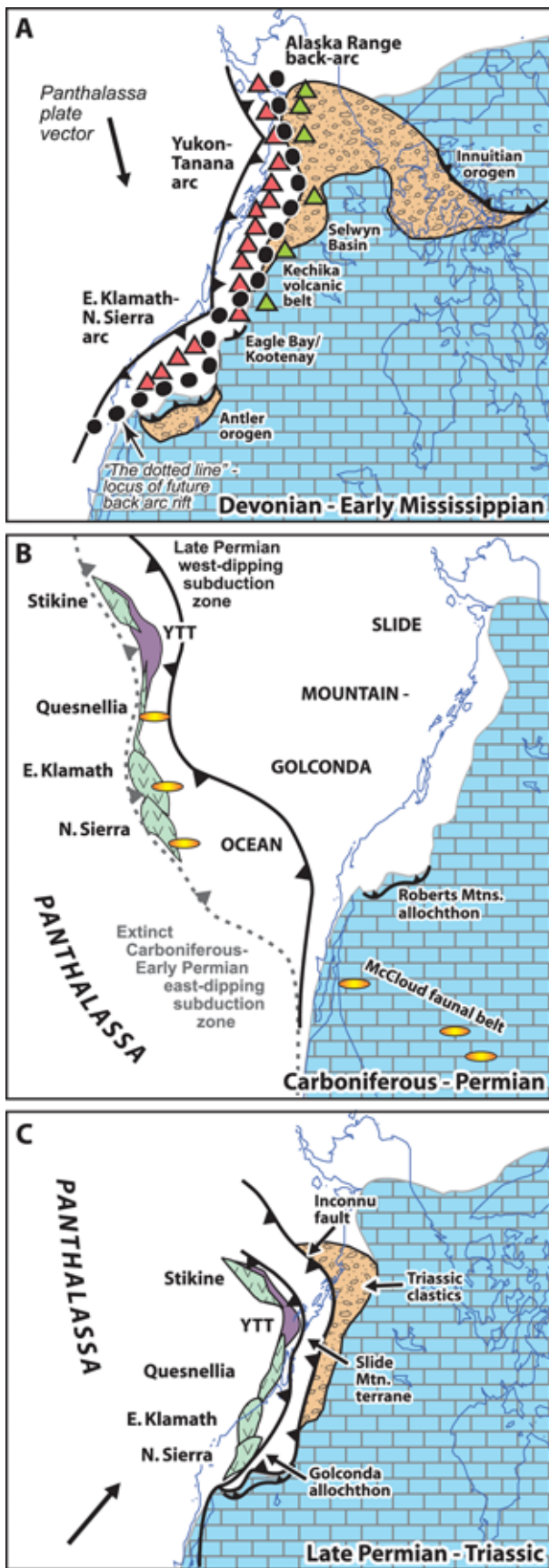


Figure 3. Mid-Paleozoic to early Mesozoic paleogeographic evolution of the peri-Laurentian realm. YTT—Yukon-Tanana terrane.

on the degree of paleogeographic suspicion amongst the Intermontane terranes and, in some cases, between them and the Laurentian craton.

DISCUSSION

The relationships amongst the Intermontane terranes summarized here clearly suggest that these entities evolved together in the peri-Laurentian realm in mid- to late Paleozoic time as a set of offshore island arcs and continental fragments outboard of the Slide Mountain ocean basin that separated them from the Laurentian margin (Fig. 2; Rubin et al., 1990). These terranes were geodynamically linked, and each of them is characterized by the tectonostratigraphic record of one or more of the depositional environments that make up the complexity of convergent plate margins. Although many of these terranes are currently separated by faults, the majority of the faults are younger, post-accretionary features superposed on the terrane boundaries. Some of them likely nucleated along major crustal anisotropies and lateral facies changes that occur at the transitions between adjacent geodynamic environments (see also Helwig, 1974). Only a few appear to have originated at subduction zones and truly represent sutures between adjacent plates.

The interterrane connections and correlations discussed here do not mean that we have arrived at a neo-fixist interpretation of the Cordillera. For instance, Permian fossil assemblages characteristic of the McCloud faunal belt in rocks of the Intermontane terranes imply considerable mobility of these terranes with respect to the Laurentian margin. On the basis of faunal affinities, Belasky et al. (2002) proposed that they probably lay ~2000–3000 km west of the Laurentian margin in Early Permian time. In our model of Cordilleran evolution (Fig. 3; Nelson et al., 2006), the Yukon-Tanana terrane (the underpinning of the Intermontane terranes) originated in northwestern Laurentia and migrated southward and westward as the Slide Mountain ocean opened in mid- to late Paleozoic time. Reversal of subduction polarity in the Middle Permian marked the onset of the demise of the Slide Mountain ocean. In the early Mesozoic, the Yukon-Tanana terrane, along with its juvenile arc cover (Harper Ranch, Quesnellia, and Stikinia), was rejoined to the Laurentian margin, apparently near its point of origin, as the Slide Mountain ocean closed. Large-scale translation of the Intermontane terranes indicated by the McCloud fauna was evidently mostly accommodated by relative plate motions and oblique subduction within the Slide Mountain ocean prior to their Jurassic accretion to North America.

Estimates of paleogeographic positions and origins of the Intermontane terranes are derived primarily from detrital zircon populations, isotopic compositions, and faunal assemblages (Nelson et al., 2006; Belasky et al., 2002). Although these methods provide imprecise pins (e.g., detrital zircons can travel long distances), they all consistently show ties to the Laurentian craton. In the case of the Yukon-Tanana terrane, the predominance of Paleoproterozoic and Archean detrital zircons, Nd-Hf-Pb isotopic data, and Late Devonian magmatic and metallogenetic histories point more specifically to a source in northwestern Laurentia (off Selwyn basin or the Kootenay terrane).

Post-accretion northward translation of the Intermontane terranes by dextral strike-slip faults, mainly in Cretaceous and younger times, is geologically constrained to be on the order of 860 km (Gabrielse et al., 2006), considerably less than the 2000+ km indicated by paleomagnetic data from Late Cretaceous rocks (Irving et al., 1996). Although a full discussion of this enduring conundrum of Cordilleran geology is beyond the scope of this paper, it is important to note that it has recently been recast from an intra-Cordilleran problem to one that now encompasses the entire northern Cordillera (see Enkin, 2006, for a review). Originally, anomalously shallow paleomagnetic inclinations from the Insular terranes were interpreted to require large latitudinal displacements on intra-Cordilleran faults, such as the Coast shear zone (CSZ on Fig. 1; Irving et al., 1996). More recently, shallow paleomagnetic inclinations have been measured at more inboard sites along the eastern edge of the Intermontane terranes and in the southern Rocky Mountains (Enkin, 2006), such that northward, large-scale translation of the entire northern Cordillera is now indicated—a concept that is difficult to reconcile with the well-established geological framework of the foreland fold-and-thrust belt. Butler et al. (2001) offered a moderate translation alternative (~1000 km), which is more in line with geological constraints and accounts for the shallow paleomagnetic inclinations in part by tilting and compaction shallowing. Regardless of how this debate is ultimately resolved, in its present incarnation, it does not affect the internal configuration and relationships of the Intermontane terranes—only the latitudinal position of the entire northern Cordillera!

CONCLUSIONS

Cordilleran terranes are defined on the basis of their distinct tectonostratigraphic records, but they are not necessarily limited to fault-bounded crustal blocks. The pattern of inter-relatedness summarized here for the Intermontane terranes of the Canadian Cordillera shows that adjacent terranes can locally share depositional and geodynamic ties and that the nature of terrane boundaries evolves through time. This emerging picture confirms the value of inferences about the geodynamic setting(s) of terranes and their potential for linkages with neighboring terranes as an integral part of terrane analysis.

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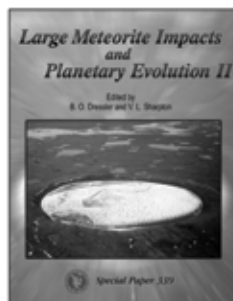
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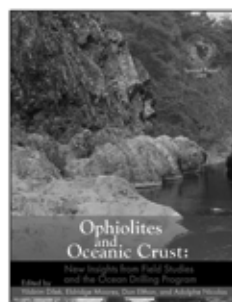
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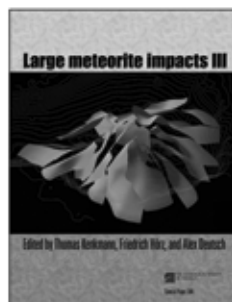
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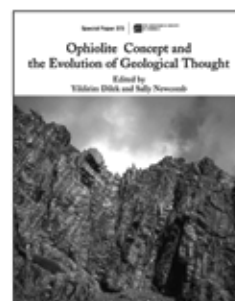
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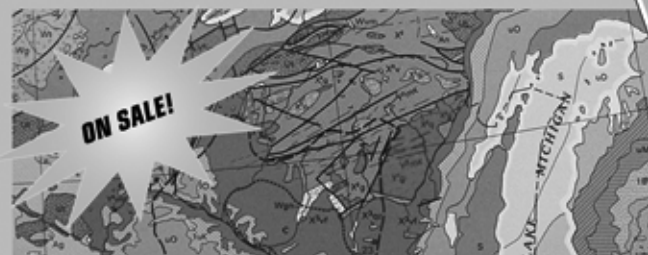


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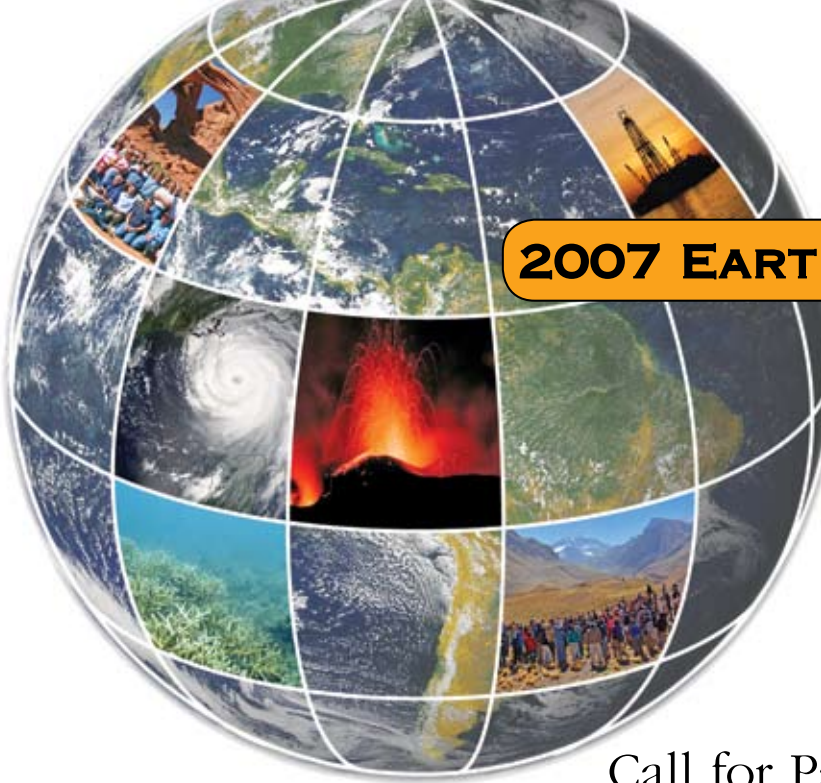
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Pardee Keynote Symposia

INVITED PAPERS

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

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

P1. Creating Citizen Scientists: Needs and Opportunities to Engage Students and the Public in the Process of Science

Cosponsored by *National Association of Geoscience Teachers; U.S. Geological Survey*
Geoscience Education; Geoscience Information/
Communication

Anne E. Egger, Stanford University, Stanford, Calif.; Robert W. Ridky, U.S. Geological Survey (USGS) Reston, Va.

The goal of this session is to highlight techniques that allow students and the general public greater access to the process of science, increasing their understanding of socioscientific issues, ideally leading to their participation in society as citizen scientists.

P2. Identifying America's Most Vulnerable Oceanfront Communities: A Geological Perspective

Marine/Coastal Science; Public Policy; Geomorphology
Joseph T. Kelley, University of Maine, Orono, Maine; Rob Young, Western Carolina University, Cullowhee, N.C.; Orrin Pilkey, Duke University, Durham, N.C.

Rising sea level and storms threaten shoreline development along America's beaches. This session focuses on 12 beaches at extreme risk of destruction. Speakers address common geologic and historic risk factors and weigh their future options.

P3. Middle Eastern Water Resources in Times of Crisis

Cosponsored by *GSA Hydrogeology Division*
Hydrogeology; Public Policy; Geology and Health
Avner Vengosh, Duke University, Durham, N.C.; John W. Lane, USGS, Storrs Mansfield, Conn.

This session seeks to provide an interdisciplinary overview of water resources in the Middle East that examines current depletion rates, degradation of water quality, and technological solutions within the socio-political context of the region.

P4. New Data, Models, and Concepts of the San Andreas Fault System

Cosponsored by *GSA Structural Geology and Tectonics Division*
Tectonics; Geophysics/Tectonophysics/Seismology;
Structural Geology

Basil Tikoff, University of Wisconsin, Madison, Wisc.; Mark Zoback, Stanford University, Stanford, Calif.

A session dedicated to integrating spatial and temporal variations of deformation observed on the San Andreas fault system in central California: The session will address new results from SAFOD (San Andreas Fault Observatory at Depth) in addition to other ongoing studies.

P5. New Eyes and Ears on Mars: Recent Advances in Understanding the Red Planet

Cosponsored by *GSA Planetary Geology Division*
Planetary Geology

Herbert Frey, National Aeronautics and Space Administration-Goddard Space Flight Center, Greenbelt, Md.

A growing armada of spacecraft has steadily increased our ability to explore Mars in more detailed ways through the use of new "eyes" and "ears." This session will highlight recent discoveries using these new sensors. The latest results will be placed in the ongoing context of both continued global mapping and persistent surface exploration.

P6. Oxygen, Evolution, and Extinction

Cosponsored by *Paleontological Society*
Paleontology, Diversity, Extinction, Origination;
Paleoclimatology/Paleoceanography; Planetary Geology
Peter Ward, University of Washington, Seattle, Wash.;
Robert Berner, Yale University, New Haven, Conn.

A major discovery of the twenty-first century is that oxygen levels in the past fluctuated more than previously realized, and that major geological and evolutionary events were a consequence. For instance, times of low oxygen can be blamed for at least six major or minor mass extinctions, while times of high oxygen allowed the evolution of giant insects (Carboniferous) and even the conquest of land, which took place in two parts, dictated by oxygen levels. Rates of evolution also appear to be related to oxygen levels, with more "sluggish" evolution during times of high oxygen. Even the major make-up of animal body plans into the various phyla show that adaptations for respiration were a primary driver of anatomy, while it was an episode of higher oxygen that seems



Colorado Convention Center photo used with permission from the Denver Metro Convention and Visitors Bureau.

to have stimulated or allowed the first evolution of animals, according to two 2006 studies. Finally, our society must come to grips with episodes of low oxygen and oxygen-free water masses in the oceans and lakes of our planet.

P7. Pulse of the Earth: Geochronology and Paleomagnetism of Large Igneous Provinces—The Key to Reconstructing Precambrian Supercontinents

Cosponsored by *Precambrian [At Large]; International Geological Correlations Program Project 509, Paleoproterozoic Supercontinents and Global Evolution Precambrian Geology; Tectonics; Planetary Geology* David A.D. Evans, Yale University, New Haven, Conn.; Joseph G. Meert, University of Florida, Gainesville, Fla.

Supercontinents and large igneous provinces (LIPs) relate mantle processes to environmental conditions in deep time. Focused

geochronologic and paleomagnetic studies of LIPs can reconstruct pre-Pangean supercontinents and assess relationships with geodynamics, metallogeny, paleoclimate, and life.

P8. The Cause of Global Warming—Are We Facing Global Catastrophe in the Coming Century?

Cosponsored by *GSA Quaternary Geology and Geomorphology Division* Environmental Geoscience; Paleoclimatology/Paleoceanography; Quaternary Geology Don Easterbrook, Western Washington University, Bellingham, Wash.

Possible causes of global warming will be discussed by distinguished scientists from geology, astrophysics, climatology, and oceanography. Various kinds of physical evidence for possible causes of climatic warming will be presented.

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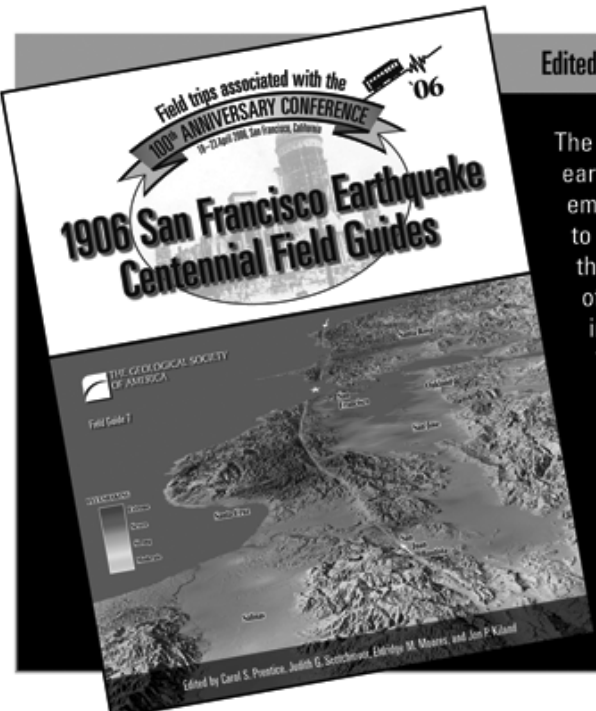
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THE GEOLOGICAL SOCIETY OF AMERICA
Field Guide 1

Edited by Carol S. Prentice, Judith G. Scotchmoor, Eldridge M. Moores, and Jon P. Kiland

Edited by Carol S. Prentice, Judith G. Scotchmoor, Eldridge M. Moores, and Jon P. Kiland

The twenty field trip guides in this volume represent the work of earthquake professionals from the earth science, engineering, and emergency management communities. The guides were developed to cross the boundaries between these professions, and thus reflect this diversity: trips herein focus on the built environment, the effects of the 1906 earthquake, the San Andreas fault, and other active faults in northern California. Originally developed in conjunction with the 100th Anniversary Earthquake Conference held in San Francisco, California, in April 2006, this book is meant to stand the test of time and prove useful to a wide audience for general interest reading, group trips, or self-guided tours.

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Topical and Discipline Sessions

ABSTRACTS DEADLINE: 10 JULY

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.

Submit your abstract at www.geosociety.org. An abstract submission fee of US\$18 for students and US\$30 for all others will be charged. If you cannot submit the abstract electronically, contact Nancy Carlson, +1-303-357-1061, ncarlson@geosociety.org. **Submission deadline:** 10 July 2007.

DISCIPLINE SESSIONS

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

T1. Denver Then and Now: From Paleontology to Public Policy on the Front Range Urban Corridor

Cosponsored by *Paleontological Society*; *Denver Museum of Nature & Science*; *GSA Geology and Society Division*
Paleontology; Biogeography/Biostratigraphy; Public Policy; Tectonics

Ian Miller, Denver Museum of Nature & Science, Denver, Colo.; Kirk Johnson, Denver Museum of Nature & Science, Denver, Colo.; Robert Reynolds, Denver Museum of Nature & Science, Denver, Colo.; Beth Ellis, Denver Museum of Nature & Science, Denver, Colo.

This interdisciplinary session will cover such diverse subjects as water resources, Laramide tectonics, basin evolution, paleontology, and isotope geochemistry, with a focus on the geology of the metropolitan corridor along the Colorado Front Range. ORAL

T2. Sourcing Techniques in Archaeology

Cosponsored by *GSA Archaeological Geology Division*
Archaeological Geology; Geochemistry; Mineralogy/Crystallography

Mostafa Fayek, University of New Mexico, Albuquerque, N.Mex. and University of Manitoba, Winnipeg, Manitoba; Sharon K. Hull, University of Manitoba, Winnipeg, Manitoba

The intent is to bring together researchers who have applied or developed geochemical techniques to source archaeological materials. Contributions on applications of trace element and isotopic geochemical techniques are strongly encouraged. ORAL

T3. Alluvial Cycles, Climate, and Human Prehistory

Cosponsored by *GSA Archaeological Geology Division*; *Quaternary Geology and Geomorphology Division*
Archaeological Geology; Geomorphology; Hydrogeology
Gary Huckleberry, Tucson, Ariz.

This session will focus on research regarding the timing of late Holocene valley entrenchment and filling in arid and semiarid landscapes, connections to climate change and local geomorphic controls, and correlations to prehistoric settlement changes. ORAL

T4. From Geoarchaeology and Paleoanthropology to Sedimentary Geology and Geochemistry: A Memorial to Richard L. Hay

Cosponsored by *GSA Archaeological Geology Division*; *GSA Limnogeology Division*; *GSA Sedimentary Geology Division*; *Mineralogical Society of America*

Archaeological Geology; Limnogeology; Geochemistry
Gail M. Ashley, Rutgers University, Piscataway, N.J.; Marie Jackson, Northern Arizona University, Flagstaff, Ariz.; Enrique Merino, Indiana University, Bloomington, Ind.; Thure E. Cerling, University of Utah, Salt Lake City, Utah

This interdisciplinary session in memory of Richard L. Hay encourages papers in geoarchaeology, limnogeology, tephra and sedimentary geochemistry, and zeolite minerals in order



Aerial view of Continental Divide and Front range. Photo by John Karachewski.

Topical and Discipline Sessions

to provide an opportunity for presentation of new research inspired by Hay's multifaceted career. ORAL

T5. Materials Flow in Coal Utilization

Cosponsored by *GSA Coal Geology Division*; *GSA Geology and Society Division*

Coal Geology; Environmental Geoscience; Public Policy
Allan Kolker, USGS, Reston, Va.; James C. Hower, University of Kentucky, Lexington, Ky.; Ronald H. Affolter, USGS, Denver, Colo.

This session tracks the disposition of materials from "cradle to grave" during coal utilization for electric power generation. Relevant topics include coal quality, utility emissions, fate of coal combustion products, and related environmental issues. ORAL

T6. Microbial Origin of Hydrocarbon Gases in Coal Beds and Sedimentary Basins

Cosponsored by *GSA Coal Geology Division*

Coal Geology; Geomicrobiology; Hydrogeology
Donald Klein, Colorado State University, Fort Collins, Colo.; Kevin W. Mandernack, Colorado School of Mines, Golden, Colo.; Romeo M. Flores, USGS, Denver, Colo.

Recent contributions from biogeochemistry, sedimentary geology, isotope geochemistry, and molecular biology will be discussed, in relation to better understanding biogenic gas formation in subbituminous coal beds in the Powder River Basin and other sedimentary basins. ORAL

T7. The Environmental Geology and Geochemistry of Mineral Deposits: Best Practices for Effective Prediction, Mitigation, Closure, and Remediation

Cosponsored by *Society of Economic Geologists*

Environmental Geoscience; Economic Geology; Geology and Health
Geoffrey S. Plumlee, USGS, Denver, Colo.

This session presents expert perspectives on the best practical application of geological and geochemical information throughout all phases of mineral development (exploration through closure), so that adverse environmental and health impacts can be anticipated and prevented. ORAL

T8. Role of Geology in Planning and Mitigation of Natural Hazards

Cosponsored by *GSA Engineering Geology Division*; *Association of Environmental and Engineering Geologists*; *GSA Geology and Health Division*; *GSA Geology and Society Division*
Environmental Geoscience; Geology and Health; Public Policy
Syed E. Hasan, University of Missouri, Kansas City, Mo.

The session aims at gathering experts from a diverse field comprising geoscience, engineering, public policy, emergency planning and management, health, pollution control, and hazard forecasting to discuss lessons learned from major hazards and their mitigation. ORAL

T9. Identifying America's Most Vulnerable Oceanfront Communities: A Geological Perspective (Posters)

Cosponsored by *GSA Geology and Society Division*
Marine/Coastal Science; Public Policy; Geomorphology
Joseph T. Kelley, University Of Maine, Orono, Maine; Rob Young, Western Carolina University, Cullowhee, N.C.; Orrin Pilkey, Duke University, Durham, N.C.

Rising sea level and storms threaten shoreline development along America's beaches. This session focuses on 12 beaches at extreme risk of destruction. Speakers address common geologic and historic risk factors and weigh future options. POSTER

T10. Afghanistan Reconstruction—USGS Activities in Afghanistan

Cosponsored by *GSA International Division*
Geophysics/Tectonophysics/Seismology; Hydrogeology; Economic Geology
Bruce Franklin Molnia, USGS, Reston, Va.

This session summarizes the U.S. Geological Survey's (USGS) effort in Afghanistan in support of the U.S. Government's Afghanistan Reconstruction Project. Presentations will describe specific findings related to the numerous USGS assessments and capacity-building activities currently underway. ORAL

T11. Combined Ecological and Geologic Perspectives in Modern Terrestrial Ecosystems

Cosponsored by *GSA Geobiology and Geomicrobiology Division*
Environmental Geoscience; Geomicrobiology; Geochemistry
JoAnn Holloway, USGS, Denver, Colo.; Mark Waldrop, USGS, Menlo Park, Calif.

Combined approaches from biosciences and geosciences are increasingly applied to explore structure and function of ecosystems. This session will focus on interdisciplinary approaches to ecosystem studies on scales ranging from plot to continental. ORAL

T12. The Black Sea–Mediterranean Corridor: Paleoenvironmental and Geoarchaeological Context for the Past 30 k.y.

Cosponsored by *GSA Archaeological Geology Division*; *GSA Sedimentary Geology Division*; *GSA Quaternary Geology and Geomorphology Division*; *GSA International Division*; *Avalon Institute of Applied Science*
Environmental Geoscience; Quaternary Geology; Archaeological Geology
Valentina Yanko-Hombach, Avalon Institute of Applied Science, Winnipeg, Manitoba; Ilya Buynevich, Woods Hole Oceanographic Institution, Woods Hole, Mass.; Olena V. Smyntyna, Odessa I.I. Mechnikov National University, Odessa, Ukraine

The session presents a cross-disciplinary examination of paleoenvironmental cataclysms in the Black Sea–Mediterranean Corridor over the past 30 k.y. and their influence on landscape dynamics and human adaptive strategies in semi-isolated basins. ORAL

T13. Sources, Transport, Fate, and Toxicology of Trace Elements in the Environment

Cosponsored by *International Association for GeoChemistry*
Geochemistry; Environmental Geoscience; Geomicrobiology
LeeAnn Munk, University of Alaska, Anchorage, Alaska; David Long, Michigan State University, East Lansing, Mich.; Berry Lyons, Ohio State University, Columbus, Ohio

Papers are encouraged on the study of trace elements in the environment related to sources, transport, controls on mobility, the nature and toxicological consequences of transfer through the food chain, and accumulation of toxic elements. ORAL

Topical and Discipline Sessions

T14. Innovative Approaches to Uranium Mining and Groundwater Restoration

Cosponsored by *GSA Hydrogeology Division; GSA Geology and Society Division*

Geochemistry; Environmental Geoscience; Public Policy
Patricia Beth Moran, Colorado School of Mines, Golden, Colo.;
James F. Ranville, Colorado School of Mines, Golden, Colo.

Uranium mining activities are expanding to accommodate demand. This session will highlight recent scientific, economic, and regulatory developments relevant to uranium mining and site restoration. ORAL

T15. Perspectives in Redox Geochemistry and Microbial Processes

Geochemistry; Geomicrobiology; Hydrogeology
Annette Summers Engel, Louisiana State University, Baton Rouge, La.; Jennifer A. Roberts, University of Kansas, Lawrence, Kans.

Redox gradients define fundamental life processes. We welcome contributions that relate modern or ancient redox cycling and indicators to microbial processes, mineral stability, metal speciation, and contaminant mobility/immobility utilizing genomic, spectroscopic, and geochemical/bioenergetic modeling techniques. ORAL

T16. Geological, Geophysical, Geochemical, and Environmental Studies in Big Bend National Park and the Trans-Pecos Region, Texas

Cosponsored by *GSA Geophysics Division; International Association of Geochemistry; National Park Service*

Geochemistry; Petrology, Igneous
John E. Gray, USGS, Denver, Colo.; Ric Page, USGS, Denver, Colo.

This session emphasizes synthesis studies of Big Bend National Park and the Trans-Pecos region, Texas. Welcome are studies of geology, geochronology, geophysics, volcanology, petrology, paleontology, lithologic, and environmental geochemistry of the region. ORAL

T17. Management and Restoration of Fluvial Systems with Broad Historical Changes and Human Impacts

Cosponsored by *GSA Quaternary Geology and Geomorphology Division; GSA Geology and Society Division*
Geomorphology; Engineering Geology; Environmental Geoscience

L. Allan James, University of South Carolina, Columbia, S.C.;
Sara L. Rathburn, Colorado State University, Fort Collins, Colo.;
G. Richard Whittecar, Old Dominion University, Norfolk, Va.

This session addresses river changes over intermediate time scales involving agricultural clearance, urbanization, or engineering works and practical implications to river management and restoration. Emphasis is on recognizing, understanding, and mitigating anthropogenic hydrogeomorphic changes. ORAL

T18. Hydrogeomorphic Responses of Convulsive Events

Cosponsored by *GSA Quaternary Geology and Geomorphology Division; Engineering Geology Division; Sedimentary Geology Division*

Geomorphology; Engineering Geology; Sediments, Clastic

J.J. Major, Cascades Volcano Observatory, Vancouver, Wash.;
Christopher S. Magirl, USGS, Tucson, Ariz.

Earthquakes, landslides, large storms, hurricanes, volcanic eruptions, wildfires, and other "convulsive" events can provoke significant hydrogeomorphic responses. This session seeks theoretical, empirical, and field contributions that examine all scales of hydrogeomorphic responses to such events. ORAL

T19. Geomorphology and Ecology: Interactions and Feedbacks

Cosponsored by *GSA Quaternary Geology and Geomorphology Division*

Geomorphology; Environmental Geoscience
Martha Cary Eppes, University of North Carolina, Charlotte, N.C.

Exploration of a rapidly expanding interdisciplinary field of study that examines the complex relationships between process geomorphology, ecology, and biology. ORAL

T20. Landform Scale Regolith Degradation, Transportation, and Deposition on Annual to Millennial Time Scales

Geomorphology; Quaternary Geology; Environmental Geoscience

Jaakko Putkonen, University of Washington, Seattle, Wash.

Landform-scale soil erosion, transportation, and deposition affect most geomorphological analyses but are currently relatively poorly known. Presentations on regolith degradation on scales of ~0.001 k.y. to ~100 k.y. and meters to landform size are welcomed. ORAL

T21. Episodic Landscape Change

Cosponsored by *GSA Quaternary Geology and Geomorphology Division*

Geomorphology; Quaternary Geology; Environmental Geoscience

Ellen E. Wohl, Colorado State University, Fort Collins, Colo.;
John Pitlick, University of Colorado, Boulder, Colo.

Episodic landscape change is longer periods of relative stability punctuated by shorter periods of change. This session explores how episodic landscape change scales in relation to such variables as tectonic regime, hydroclimatology, and drainage area.

T22. Evidence of Climatic and Tectonic Change Recorded in Alluvial Fans

Cosponsored by *GSA Quaternary Geology and Geomorphology Division*

Geomorphology; Quaternary Geology;
Neotectonics/Paleoseismology

Jennifer L. Pierce, Boise State University, Boise, Idaho; Tammy Rittenour, Utah State University, Logan, Utah

Alluvial fans are sensitive recorders of climatic and tectonic change. This session encourages research that uses alluvial fans to understand and quantify roles of climate and tectonics in controlling rates and processes of landscape evolution. ORAL

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Topical and Discipline Sessions

T23. Using Geochronology to Build Better Records and Solve Geomorphic and Paleoclimate Questions—Recent Advances and Findings

Cosponsored by *GSA Quaternary Geology and Geomorphology Division*

Geomorphology; Quaternary Geology; Neotectonics/Paleoseismology

Joel Pederson, Utah State University, Logan, Utah; Tammy Rittenour, Utah State University, Logan, Utah

Recent advances in geochronology provide better age control and tools for answering geomorphic and paleoclimate questions. This broad session provides a forum for reporting new applications and recent studies using geochronology as a primary tool. ORAL

T24. New Developments in Glaciation

Cosponsored by *GSA Quaternary Geology and Geomorphology Division*

Geomorphology; Remote Sensing/Geographic Info System; Hydrogeology

John Ford Shroder, University of Nebraska, Omaha, Neb.; Luke Copland, University of Ottawa, Ottawa, Ontario

Changes in present-day glacierization and comparison with past glaciation in light of the dramatic climatic variations that have been observed in recent decades. ORAL

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The Exhibit Hall welcoming party on Sunday, 28 October, from 5:30 to 7:30 p.m., kicks off the GSA Annual Meeting, providing exposure to thousands of attendees with no conflicting events! Exhibit Hall hours for Monday and Tuesday, 29–30 Oct., are 9 a.m. to 5:30 p.m., and for Wednesday, 31 Oct., the Exhibit Hall is open from 9 a.m. to 2 p.m.

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Topical and Discipline Sessions

T25. Deformation and the Landscape: Quantitative Approaches to Tectonic Geomorphology

Geomorphology; Tectonics; Neotectonics/Paleoseismology
Cameron Wobus, University of Colorado, Boulder, Colo.;
Kelin X. Whipple, Arizona State University, Tempe, Ariz.; Eric
Kirby, Penn State University, University Park, Pa.; Benjamin T.
Crosby, Idaho State University, Pocatello, Idaho

This session will showcase research that quantitatively recreates the pattern and history of tectonic deformation through studies of landscape form. We welcome empirical, theoretical, numerical, experimental, or field-based approaches describing landscape response to tectonic forcing. ORAL

T26. Field-Based Quantitative Studies of Chemical and Physical Weathering

Cosponsored by *GSA Quaternary Geology and Geomorphology Division*

Geomorphology; Quaternary Geology; Geochemistry
Jason R. Price, Millersville University, Millersville, Pa.; Todd
Grote, West Virginia University, Morgantown, W.Va.

This session will focus on innovative approaches to quantifying chemical and physical weathering at profile- through global-scales. Methods may include, but are not limited to, use of trace elements, isotopes, and cosmogenic nuclides. ORAL

T27. Inverse Methods in Practice: Perspectives and Future Directions

Cosponsored by *GSA Hydrogeology Division*

Hydrogeology; Engineering Geology; Environmental Geoscience

Michael Fienen, USGS–National Research Council, Middleton, Wisc.; Randall J. Hunt, USGS, Middleton, Wisc.; Chris Muffels, University of Wisconsin, Madison, Wisc.

This session seeks practical examples of new and existing inverse methods, parameter estimation, and uncertainty quantification for hydrogeologic problems from broad perspectives, including practitioners, researchers, and clients. Examples from practice and research are encouraged. ORAL

T28. Geologic Controls on Chemical Migration in Fractured and Carbonate Aquifers

Hydrogeology; Environmental Geoscience
Allen M. Shapiro, USGS, Reston, Va.; E. Calvin Alexander, University of Minnesota, Minneapolis, Minn.

This session will bring together hydrologists, geochemists, geologists, and geophysicists who are investigating fractured and carbonate aquifers to determine the geologic features affecting the fate of chemical constituents over physical dimensions from meters to kilometers. ORAL

T29. Arsenic: From Nature to Human

Cosponsored by *GSA Geology and Society Division; Geochemical Society; International Society of Groundwater for Sustainable Development*

Hydrogeology; Environmental Geoscience; Geology and Health
Prosun Bhattacharya, Royal Institute of Technology (KTH), Stockholm, Sweden; Abhijit Mukherjee, University of Texas at Austin, Austin, Tex.; Jochen Bundschuh, Instituto Costarricense de Electricidad (ICE), San José, Costa Rica; Alan H. Welch, Carson City, Nev.

Arsenic of geogenic origin contaminates drinking water resources, soils, and plants, and that calls for global approaches through exchange of information and experiences among different regions of the world. ORAL

T30. Ecohydrology of Riparian Zones

Cosponsored by *GSA Hydrogeology Division*
Hydrogeology; Environmental Geoscience
Steven P. Loheide, University of Wisconsin, Madison, Wisc.; Donald Whittemore, Kansas Geological Survey, Lawrence, Kans.

This session seeks to bring together scientists studying the ecohydrologic function of riparian areas. Presentations including field data, modeling, innovative measurement techniques, remote sensing, quantification of ecosystem services, and/or evaluation of restoration initiatives are encouraged. ORAL

T31. Innovations and New Technologies for Measuring and Characterizing Groundwater–Surface Water Interaction

Cosponsored by *GSA Hydrogeology Division*
Hydrogeology; Environmental Geoscience
Jeffrey M. McKenzie, McGill University, Montreal, Quebec; Laura K. Lutz, SUNY College of Environmental Science and Forestry, Syracuse, N.Y.

Assessment of surface water–groundwater interaction has traditionally been limited temporally or spatially. We encourage presentations on applications of new methods to quantify the flux and processes of this exchange, including field, laboratory, and modeling techniques. ORAL

T32. Numerical Modeling of Hydrothermal Fluids

Cosponsored by *GSA Hydrogeology Division*
Hydrogeology; Geochemistry; Economic Geology
Martin S. Appold, University of Missouri, Columbia, Mo.; Peter Nabelek, University of Missouri, Columbia, Mo.; Steven Ingebritsen, USGS, Menlo Park, Calif.

This session aims to highlight recent technical advances and case studies in numerical modeling of the physical and chemical behavior of hydrothermal fluids. Presentations may include new theoretical methods or applications to diverse hydrogeologic processes. ORAL

T33. Innovative Uses of Environmental Isotopes in Hydrology

Cosponsored by *GSA Hydrogeology Division*
Hydrogeology; Geochemistry; Environmental Geoscience
John Karl Bohlke, USGS, Reston, Va.; Shaun Frape, University of Waterloo, Waterloo, Ontario

This session provides a forum for describing new types of measurements, theories, and applications of isotopes for solving problems in hydrogeology and contaminant transport. ORAL

T34. Regional Groundwater Flow: In Honor of Jozsef Toth

Cosponsored by *GSA Hydrogeology Division; National Ground Water Association*
Hydrogeology; Geochemistry; Environmental Geoscience
Ben J. Rostron, University of Alberta, Edmonton, Alberta; Franklin W. Schwartz, The Ohio State University, Columbus, Ohio

On the 45th anniversary of the publication of “A theory of groundwater motion in small drainage basins in Central

Topical and Discipline Sessions

Alberta," this session will be to honor Jozsef Toth's contribution to hydrogeology. ORAL

T35. Solute Plume Conceptual Models: Processes, Prediction, and Paradigms

Cosponsored by *GSA Hydrogeology Division*
Hydrogeology; Geochemistry; Environmental Geoscience
Lawrence D. Lemke, Wayne State University, Detroit, Mich.;
Gary S. Weissmann, University of New Mexico, Albuquerque, N.Mex.

This session will examine case studies illustrating the limitations of classical transport theory and explore innovative approaches to incorporating nonlinear transport processes or developing alternatives to the classical Gaussian plume paradigm. ORAL

T36. Well Design Criteria Providing Reduced Concentrations of Naturally Occurring Arsenic and Uranium: San Joaquin Valley, California

Cosponsored by *GSA Hydrogeology Division*
Hydrogeology; Geochemistry; Geology and Health
Christopher S. Johnson, Fresno, Calif.

Groundwater that produces elevated concentrations of naturally occurring contaminants (e.g., arsenic) can be avoided using subsurface lithologic, geophysical, and geochemical methods. ORAL

T37. Managed Underground Storage of Recoverable Water

Cosponsored by *GSA Hydrogeology Division*
Hydrogeology; Geochemistry; Geomicrobiology
William Logan, National Research Council, Washington, D.C.;
Jean M. Bahr, University of Wisconsin, Madison, Wisc.

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

T38. Springs and Spring Deposits

Cosponsored by *GSA Hydrogeology Division; Sedimentary Geology Division; GSA Geobiology and Geomicrobiology Division*

Hydrogeology; Geochemistry; Geomicrobiology
Laura J. Crossey, University of New Mexico, Albuquerque, N.Mex.

Springs and their chemical deposits are archives for understanding exchanges between Earth's interior and surface environments at many different scales. This session brings together diverse perspectives from geochemists, hydrologists, sedimentologists, structural geology/geophysicists, biologists, and paleoclimatologists. ORAL

T39. Hydrogeology of Mountainous Terrains

Cosponsored by *GSA Hydrogeology Division*
Hydrogeology; Geochemistry; Structural Geology
Shemin Ge, University of Colorado, Boulder, Colo.; Andrew Manning, USGS, Denver, Colo.

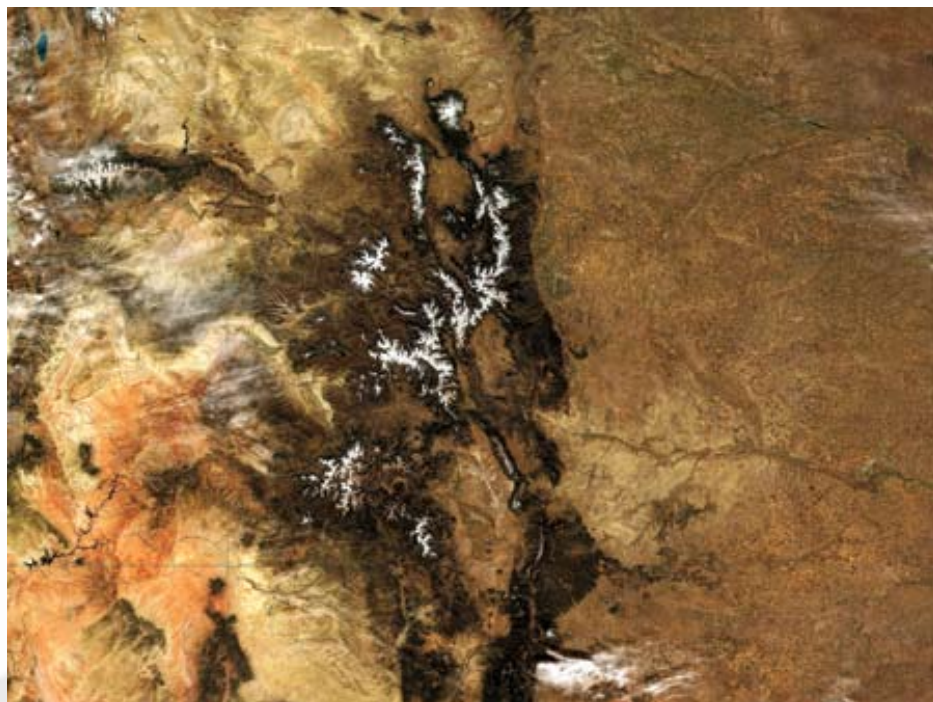
This session provides a forum for sharing research results, progress, and ideas related to hydrogeologic processes in mountainous settings. Topics may include, but are not limited to, field observations, experiments, and theoretical or numerical modeling studies. ORAL

T40. The Role of Sediments in Hydrology and Hydrogeology: Streams, Springs, Karst Systems, and Hyporheic Zones (Posters)

Cosponsored by *GSA Hydrogeology Division; GSA Quaternary Geology and Geomorphology*

Hydrogeology; Geomorphology; Quaternary Geology
Eric W. Peterson, Illinois State University, Normal, Ill.; Toby Dogwiler, Winona State University, Winona, Minn.

An interdisciplinary session designed to examine the role of sediment in stream morphology (karst and non-karst system), stream hydraulics, and hyporheic processes. POSTER



True-color moderate resolution imaging spectroradiometer (MODIS) image of Colorado and surrounding states captured 26 October 2001. Courtesy Jacques Desclotres, MODIS Land Rapid Response Team, NASA/GSFC; http://visibleearth.nasa.gov/view_rec.php?id=2302 (Accessed 25 January 2007).

Topical and Discipline Sessions

T41. High-Resolution Geophysical Methods for Hydrogeologic Site Characterization

Cosponsored by *GSA Geophysics Division; National Ground Water Association*

Hydrogeology; Geophysics/Tectonophysics/Seismology; Economic Geology

John R. Jansen, Aquifer Science and Technology, Waukesha, Wisc.

This session will present an overview of the state of practice of high resolution surface and borehole geophysical methods and their application to a variety of groundwater investigations. ORAL

T42. Remote Sensing and Geophysical Approaches for Regional Aquifer Characterization and Monitoring

Cosponsored by *GSA Hydrogeology Division*

Hydrogeology; Geophysics/Tectonophysics/Seismology; Remote Sensing/Geographic Info System

Thomas J. Burbey, Virginia Tech, Blacksburg, Va.; Fred Day-Lewis, Water Resources Division, Branch of Geophysics, Office of Ground Water, Storrs, Conn.

Remote-sensing and geophysical methods enable increasingly high-resolution aquifer characterization and monitoring. This session will focus on (1) advances in instrumentation; (2) regional-scale applications, especially InSAR, PsInSAR, and LIDAR. ORAL

T43. Hydrogeological Research, Capacity Building, and Teaching in the Developing World

Hydrogeology; Geoscience Education

David K. Kreamer, University of Nevada, Las Vegas, Nev.; Jonathan Levy, Miami University, Oxford, Ohio

Hydrogeological research and educational experiences in economically developing countries. Research emphasis on enhancing safe, sustainable drinking-water supplies. Educational emphasis on bringing students, faculty, and professionals together in the developing world to advance understanding of water resource issues. ORAL

T44. 50 Years of Hydrogeology in the Desert: A Tribute to Mahdi Hantush and His Legacy

Cosponsored by *GSA Hydrogeology Division*

Hydrogeology; History of Geology; Environmental Geoscience
M. Bayani Cardenas, The University of Texas at Austin, Austin, Tex.; David Boutt, University of Massachusetts, Amherst, Mass.

We celebrate Mahdi Hantush's contributions and commemorate the 50th anniversary of the program he chaired in New Mexico. Presentations on aquifer hydraulics, a field pioneered by Hantush, as well as semi-arid zone hydrogeology are welcome. ORAL

T45. Advances in Understanding and Detection of Groundwater-Stream Water Interactions across Temporal and Spatial Scales

Hydrogeology; Limnogeology; Environmental Geoscience

Michael N. Gooseff, Colorado School of Mines, Golden, Colo.; Brian L. McGlynn, Montana State University, Bozeman, Mont.

This session seeks to bring together scientists working to understand spatial and temporal scaling of controls on groundwater-surface water interactions to discuss advances in field and modeling techniques and implications of new findings. ORAL

T46. Climate Change Hydrology

Cosponsored by *GSA Hydrogeology Division; Limnogeology Division*

Hydrogeology; Limnogeology; Geomorphology

Mark Person, Indiana University, Bloomington, Ind.; Emi Ito, University of Minnesota, Minneapolis, Minn.

This session seeks to bring together hydrologists and limnologists to shed new light on the hydrologic response of streams, lakes, and aquifer systems in response to past and future climate change using field and modeling based studies. ORAL

T47. Conjunctive Use of Surface and Groundwater: The Role of Scientists in Informing Policy Makers, Developing Management Approaches, and Implementing Mitigation Measures

Cosponsored by *GSA Hydrogeology Division; National Ground Water Association; GSA Geology and Society Division*

Hydrogeology; Public Policy; Environmental Geoscience
Vicki J. Kretsinger Grabert, Luhdorff & Scalmanini Consulting Engineers, Woodland, Calif.; John D. Bredehoeft, The Hydrodynamic Group, Sausalito, Calif.

Managed conjunctive use of surface water and groundwater is key to addressing supply imbalances and shortages. Scientists need to inform policy makers so that science-based policies allow for managed groundwater development and use while mitigating pumping impacts. ORAL

T48. Informing Public Policy and Resource Management with Groundwater Models

Cosponsored by *GSA Hydrogeology Division; GSA Geology and Society Division*

Hydrogeology; Public Policy; Geoscience Information/Communication

Donald Sweetkind, USGS, Lakewood, Colo.; Mary C. Hill, USGS, Boulder, Colo.; Keith J. Halford, USGS, Sacramento, Calif.; Wayne R. Belcher, USGS, Henderson, Nev.

This session seeks to bring together scientists and members of the political, resource management, and legal arenas to discuss regional groundwater models and their current and potential utility in addressing societal problems. ORAL

T49. Groundwater Mining and Population Growth

Cosponsored by *GSA Geology and Society Division*
Hydrogeology

John Moore, Retired USGS, Denver, Colo.; Philip LaMoreaux, PELA, Tuscaloosa, Ala.

This session seeks to bring together hydrologists, engineers, water lawyers, legislators, regulators, state and federal agencies, and developers to discuss future developments and what action should be taken toward sustainable groundwater development. ORAL

T50. Arid Zone Hydrogeology: In Honor of Ronit Nativ

Cosponsored by *GSA Hydrogeology Division*

Hydrogeology

Fred M. Phillips, New Mexico Institute of Mining and Technology, Socorro, N.Mex.; Warren W. Wood, Michigan State University, East Lansing, Mich.; Douglas K. Solomon, University of Utah, Salt Lake City, Utah

Arid and semi-arid zone hydrogeology covering physical, biologic, and chemical aspects of this challenging environment

Topical and Discipline Sessions

in honor of Ronit Nativ. All individuals working in this area are encouraged to submit a paper for this session. ORAL

T51. The Spatial and Temporal Variability of Groundwater Recharge

Cosponsored by *GSA Hydrogeology Division*

Hydrogeology

Weston R. Dripps, Furman University, Greenville, S.C.;

Kenneth Bradbury, Wisconsin Geological and Natural History Survey, Madison, Wisc.

This session seeks papers that develop and/or apply field and/or modeling techniques for quantifying the spatial and temporal variability and distribution of groundwater recharge. ORAL

T52. Inland Waters, Playas, and Saline Lakes: More than Mini-Oceans

Cosponsored by *GSA Limnogeology Division*

Limnogeology

Kathleen Nicoll, University of Utah, Salt Lake City, Utah;

Michael Rosen, USGS, Carson City, Nev.

What are the frontiers in assessing lacustrine archives of terrestrial environmental and hydroclimatological change? This session welcomes papers addressing the diverse aspects of ancient to modern deposits, including mineralogy, stratigraphical architectural elements, geochronology, and preservation of fossil records. ORAL

T53. Evidence for Paleoenvironmental Change during the Paleogene from the Interior Basins of Western North America

Paleoclimatology/Paleoceanography; Limnogeology; Sediments, Clastic

Cynthia A. Stiles, University of Wisconsin, Madison, Wisc.;

Alan R. Carroll, University of Wisconsin, Madison, Wisc.;

Michael E. Smith, University of Wisconsin, Madison, Wisc.

This will be a multidisciplinary forum for presenting evidence of paleoclimatic and/or depositional environment changes in the North American continental interior from geochronologically correlated early Cenozoic records, including paleolakes, paleobotanic and paleontologic evidence, paleosols, and basin stratigraphy. ORAL

T54. Late Paleozoic Glacial-Interglacial Climate Changes: Analogs for Present and Future Climate Changes

Cosponsored by *GSA Sedimentary Geology Division*

Paleoclimatology/Paleoceanography; Sediments, Carbonates; Stratigraphy

Mike Pope, Washington State University, Pullman, Wash.;

Gerilyn Soreghan, University of Oklahoma, Norman, Okla.;

Isabel Montanez, University of California, Davis, Calif.

This will be a multidisciplinary theme session for sharing and integration of Late Paleozoic climate change information to determine what these data may signify about potential climatic fluctuations now and in the future. ORAL

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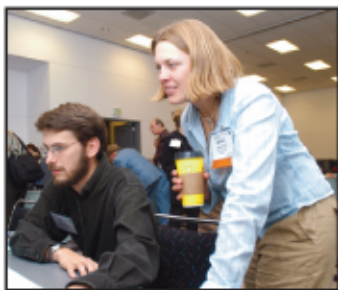
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T55. Landscape Evolution and Land Use Practices in Western Colorado

Cosponsored by *Colorado Geological Survey; Mesa State College Quaternary Geology; Engineering Geology; Geomorphology*
Andres Aslan, Mesa State College, Grand Junction, Colo.;
Matthew Morgan, Colorado Geological Survey, Denver, Colo.

This session will provide an overview of landscape evolution in western Colorado and demonstrate how an understanding of the surficial geology in the region is critical for evaluating geologic hazards and designing land-use practices. ORAL

T56. Recent Advances in Numerical Dating Techniques in Arid and Semiarid Environments

Cosponsored by *GSA Quaternary Geology and Geomorphology Division*
Quaternary Geology; Geochemistry; Geomorphology
Lewis A. Owen, University of Cincinnati, Cincinnati, Ohio

Multiple new dating techniques applied and compared with each other in dryland environments offer new insights to landscape evolution and important paleoenvironmental changes that are essential to understand in these times of global change. ORAL

T57. Geology of Groundwater-Discharge Deposits in Arid Lands

Quaternary Geology; Paleoclimatology/Paleoceanography;
Archaeological Geology
Jeffrey Pigati, USGS, Tucson, Ariz.; Jason Rech, Miami University, Oxford, Ohio

This session focuses on the geology of groundwater-discharge, or “spring,” deposits in arid lands and their potential use for reconstructing past climatic, hydrologic, and environmental conditions. ORAL

T58. Long Records of Paleoclimate in the Southern Deserts of North America

Cosponsored by *GSA Quaternary Geology and Geomorphology Division; GSA Limnogeology Division*
Quaternary Geology; Paleoclimatology/Paleoceanography;
Limnogeology
Marith Reheis, USGS, Denver, Colo.; D.M. Miller, USGS, Menlo Park, Calif.; Charles G. Oviatt, Kansas State University, Manhattan, Kans.

Interdisciplinary approaches to long glacial-interglacial records of climate change in the southern deserts of the U.S. and Mexico, including lacustrine, eolian, cave, wetland and marine systems, and middens. ORAL

T59. Explorations in Sedimentary Geology: Student Research (Posters)

Cosponsored by *GSA Sedimentary Geology Division*
Sediments, Carbonates; Sediments, Clastic; Stratigraphy
Daniel Larsen, University of Memphis, Memphis, Tenn.

This session will feature undergraduate and graduate student research from rising stars in sedimentary geology. Awards will be given for the best research papers. POSTER

T60. Esker Systems: Processes, Deposits, and Models for Aquifer Development

Cosponsored by *GSA Quaternary Geology and Geomorphology Division; Sedimentary Division*
Sediments, Clastic; Geomorphology; Marine/Coastal Science
Don Cummings, Geological Survey of Canada, Ottawa, Ontario; Hazen A.J. Russell, Geological Survey of Canada, Ottawa, Ontario

Eskers function as aquifers in glaciated terrains. Sedimentary models used to predict their hydrogeological character are poorly developed. To address this, we encourage contributions from a range of fields, including glacial hydrology, sedimentology/stratigraphy, and hydrogeology. ORAL

T61. Submarine Landslides: The Importance of Mass Movement to the Development of Continental Slopes (Posters)

Sediments, Clastic; Marine/Coastal Science; Quaternary Geology
Mason Dykstra, Colorado School of Mines, Golden, Colo.

This session aims to investigate the distribution, timing, internal and external architecture, and broader impacts that mass movements have on the development of continental margins in modern and ancient Earth. POSTER

T62. Teaching Sedimentary Geology in the Twenty-First Century

Cosponsored by *GSA Sedimentary Geology Division; National Association of Geoscience Teachers; GSA Division of Geoscience Education*
Sediments, Clastic; Stratigraphy; Geoscience Education
Heather Macdonald, College of William and Mary, Williamsburg, Va.; Thomas Hickson, University of St. Thomas, St. Paul, Minn.

Topical and Discipline Sessions

We encourage abstracts that showcase effective methods of teaching sedimentary geology in the classroom, laboratory, and field. This session will also present outcomes from the 2006 workshop "Teaching Sedimentary Geology in the 21st Century." ORAL

T63. Gas Shales of North America

Cosponsored by *GSA Sedimentary Geology Division*; *GSA Structural Geology and Tectonics Division*

Sediments, Clastic; Structural Geology; Stratigraphy
Ibrahim Çemen, Oklahoma State University, Stillwater, Okla.;
James Puckette, Oklahoma State University, Stillwater, Okla.;
Darwin Boardman, Oklahoma State University, Stillwater, Okla.

Several research groups have been studying different geological, geophysical, and economic aspects of North American gas-shale units. This session will provide a forum for formal discussion of geological problems related to gas-shales. ORAL

T64. The Sedimentary Tape Recorder: Characterizing and Quantifying the Dynamics of Geomorphic-Sedimentologic Coupled Systems

Sediments, Clastic; Tectonics; Geomorphology
Estelle Mortimer, University of Potsdam, Potsdam, Germany;
Douglas Paton, Colorado School of Mines, Golden, Colo.;
Bruce Trudgill, Colorado School of Mines, Golden, Colo.

This session aims to bring together diverse, multidisciplinary studies utilizing the clastic sedimentary record to characterize and quantify the dynamics of geomorphic-sedimentologic

coupled systems in response to spatio-temporal variations in climate and surface deformation. ORAL

T65. Metallogeny and Isotope Geochemistry—New Approaches, New Perceptions, New Paradigms

Cosponsored by *Society of Economic Geologists*

Economic Geology; Geochemistry

Holly Stein, Colorado State University, Fort Collins, Colo.;
Judith L. Hannah, Colorado State University, Fort Collins, Colo.;
Aaron Zimmerman, Colorado State University, Fort Collins, Colo.

Recent analytical advances have made it possible to measure isotopic variations in an array of elements, providing new perspectives on ore genesis and metallogeny, and challenging us to think in new ways about long-standing problems. ORAL

T66. Geology, Energy, and Mineral Resource Science on the Public Lands (Posters)

Cosponsored by *Bureau of Land Management*; *U.S.*

Geological Survey; *Park Service*; *Forest Service*; *GSA Geology and Society Division*

Economic Geology; Geophysics/Tectonophysics/Seismology;
Geoscience Information/Communication

Steven Barrell, Bureau of Land Management, Denver, Colo.;
Brent Lewis, Bureau of Land Management, Denver, Colo.

Where will new technology advances take us in exploring and developing geology, energy, and mineral resources on the public lands of the United States? POSTER

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This symposium will bring together structural geologists, tectonicists and exploration and mining geologists from around the world. The technical sessions specifically devoted to tectonics, with session chairs noted, will include:

- Plenary Session – Presentations by W. Dickinson, G. Ernst, D. Bradley, S. Tittley, R. Sillitoe
- Island Arcs and Back-Arc Basins - Brian Taylor, University of Hawaii, Session Chair
- Circum-Pacific Orogenesis I - Steve Graham, Stanford University, Session Chair
- Circum-Pacific Orogenesis II - Darrel Cowan, University of Washington, Session Chair
- NW Pacific Tectonics - Mark Brandon, Yale University, Session Chair
- SW Pacific Tectonics - David Foster, University of Florida, Gainesville, Session Chair

- South American Tectonics - Susan Beck, University of Arizona, Session Chair
- North American Tectonics - George Gehrels, University of Arizona, Session Chair
- Southwest US - Northwest Mexico Border Region – Steve Reynolds, Arizona State University, Session Chair
- Hot Topics in Tectonics (Special Session) – George Zandt, University of Arizona, Session Chair

Presentation titles and authors can be found on the symposium www.agssymposium.org. Other events focusing on tectonics include a UNESCO IGCP Symposium on "Palaeoproterozoic Supercontinents and Global Evolution," tectonics plenary and luncheon talks by William R. Dickinson, and a number of tectonics field trips.

Finally, do plan to attend the Reception and Banquet honoring Bill Dickinson - Thursday evening, September 27, 2007

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Topical and Discipline Sessions

T67. Understanding Mineral Resources: Educating the Public for Sustainable Mineral Resource Development

Cosponsored by *Society of Economic Geologists*; *National Association of Geoscience Teachers*; *GSA Geology and Society Division*

Economic Geology; Geoscience Education; Public Policy
Judith L. Hannah, Colorado State University, Fort Collins, Colo.

How is minerals development portrayed in public education and the media? Explore ways for professional geologists and educators to work together to define realistic options for sustainable and environmentally sound mining in today's global economy. ORAL

T68. Magmatic Nickel Sulfide Deposits: Geology, Geochemistry, and Genesis

Cosponsored by *Society of Economic Geologists*
Economic Geology; Petrology, Igneous; Geochemistry
Stephen J. Barnes, CSIRO Exploration & Mining, Bentley, Australia

Descriptions of new developments in the understanding of the geology, geochemistry, mineralogy, and genesis of world-class magmatic nickel ore deposits. This will include ores in The Yilgarn Craton, Voisey's Bay, Sudbury, and Noril'sk-Talnakh. ORAL

T69. Spectroscopic Mineral Mapping to Characterize Alteration Assemblages, Zonation, and Lithologic Variations in Sedimentary and Metamorphic Rocks: Applications to Ore Deposit Research

Cosponsored by *U.S. Geological Survey*; *Society of Economic Geology*

Economic Geology; Remote Sensing/Geographic Info System; Environmental Geoscience
Barnaby W. Rockwell, USGS, Denver, Colo.

This session will focus on recent research and industry investigations into the application of laboratory and remote-sensing based spectral analysis to the study of ore deposits hosted by sedimentary and metamorphic rocks. ORAL

T70. Au-Ag-Te-Se Deposits and Other Precious Metal Deposits

Cosponsored by *Society of Economic Geologists*; *International Geological Correlations Program Project 486*

Economic Geology
Cristiana L. Ciobanu, University of Adelaide and South Australian Museum, Adelaide, Australia; Nigel J. Cook, Natural History Museum, University of Oslo, Oslo, Norway; Paul G. Spry, Iowa State University, Ames, Iowa

This session will involve papers dealing with the geology, mineralogy, and/or geochemistry of precious metal telluride and/or selenide deposits, which are among the largest sources of gold and silver in the world. ORAL

T71. Modern and Ancient Fire Systems: Implications for Geomorphology, Sedimentology, Coal Geology, and Paleontology

Cosponsored by *GSA Engineering Geology Division*; *GSA Coal Geology Division*; *Paleontological Society*

Engineering Geology; Coal Geology; Paleontology, Paleocology/Taphonomy
Andrew C. Scott, Royal Holloway University of London,

Egham, UK; Susan Cannon, USGS, Denver, Colo.; Ian J. Glasspool, Field Museum of Natural History, Chicago, Ill.

Widespread occurrence of charcoal contributes to our understanding of ancient fire systems as well as impacts on coal quality. This session highlights the current understanding of modern and ancient fire systems and its relevance to earth science. ORAL

T72. Debris Flow Prediction: Probability, Magnitude, Travel Distance, and Impact

Cosponsored by *GSA Engineering Geology Division*
Engineering Geology; Geomorphology
Susan Cannon, USGS, Denver, Colo.; Paul Santi, Colorado School of Mines, Golden, Colo.

Recent research has provided numerous models for prediction of debris-flow behavior for use in hazard assessments. The session will focus on modeling of debris flows and the application and refinement of these models. ORAL

T73. New Developments in Mass-Movement Research

Cosponsored by *GSA Quaternary Geology and Geomorphology Division*
Geomorphology; Engineering Geology; Quaternary Geology
John Ford Shroder, University of Nebraska, Omaha, Neb.

Mass-movement denudation processes provide one of the chief mobilizers of the sediment cascade, as well as being a major natural hazard in need of greater exposition. ORAL

T74. Slope Stability of Sedimentary Strata Subject to Differential Weathering

Cosponsored by *GSA Engineering Geology Division*
Engineering Geology

Abdul Shakoor, Kent State University, Kent, Ohio; Paul M. Santi, Colorado School of Mines, Golden, Colo.

Stratigraphy consisting of alternating hard and soft layers is highly susceptible to differential weathering and undercutting. This session will focus on investigation, design, analysis, and remediation of slope stability problems in such sedimentary sequences. ORAL

T75. Tsunamis: Monitoring, Notification, Geology, Modeling, Education, and Outreach: The State of the Art (Posters)

Cosponsored by *GSA Geophysics Division*; *GSA Geology and Society Division*

Geophysics/Tectonophysics/Seismology; Geoscience Education; Public Policy
Walter D. Mooney, USGS, Menlo Park, Calif.; Laura Kong, Intergovernmental Oceanographic Commission-International Tsunami Information Center, Honolulu, Hawaii; Annabel Kelly, USGS, Menlo Park, Calif.

This session is open to all contributions concerning tsunami warnings, modeling, field research, and public education. Experience gained in the Indian and Pacific Oceans, the Caribbean, and elsewhere is welcomed. POSTER

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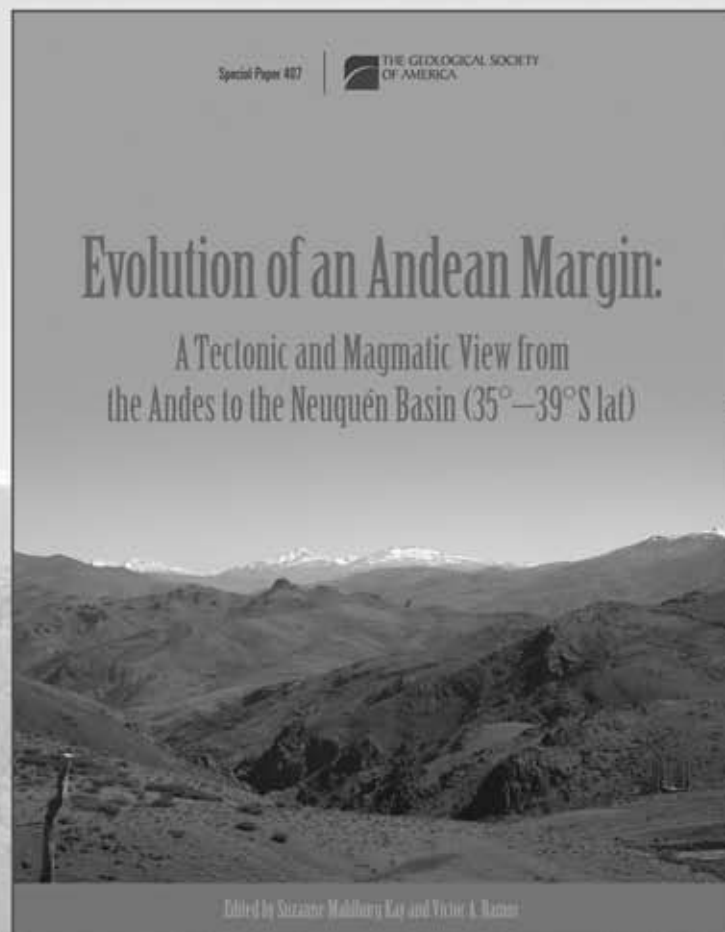
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Evolution of an Andean Margin:

A Tectonic and Magmatic View from the Andes to the Neuquén Basin (35°–39°S lat)

Edited by Suzanne Mahlburg Kay and Víctor A. Ramos

The objective of this volume is to examine the Cenozoic tectonic and magmatic evolution from the arc to the retroarc of a distinctive end-member of the Andean accretionary orogen between 35°S and 39°S. The evolution of the Andes in this region provides an outstanding case study of an orogen where periods of contraction and extension, crustal shortening and normal faulting, and differences in retroarc volcanism reflect a tectonic regime that alternates in space and time. Structural, magmatic, and paleogeographic patterns correlate strongly with the dynamics of the subduction zone. The region includes the Neuquén basin, which is one of the most prolific of the Central Andes. The tectonic setting is important in understanding hydrocarbon systems of the sub-Andean basin and the potential for ore deposits in the cordillera. The book is fundamental for researchers working on tectonics and magmatism in Andean type systems as well as those involved in exploration.



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Topical and Discipline Sessions

T76. Three-Dimensional Geological Mapping for Engineering and Environmental Geology Applications

Cosponsored by *GSA Engineering Geology Division; Association of Environmental and Engineering Geologists; GSA Geology and Society Division*
Engineering Geology; Geoscience
Information/Communication

A. Keith Turner, Colorado School of Mines, Golden, Colo.;
Carl W. Gable, Los Alamos National Lab, Los Alamos, N.Mex.;
Harvey Thorleifson, University of Minnesota, St. Paul, Minn.

This session emphasizes applications of 3-D geological mapping and modeling to site investigations and projects, including innovations in model creation, interfaces with design tools and process model applications, visualization, and data sharing and dissemination. ORAL

T77. Forensic and Engineering Geology Case Studies: A Tribute to James E. Slosson

Cosponsored by *GSA Engineering Geology Division; GSA Geology and Society*
Engineering Geology; Public Policy

J. David Rogers, University of Missouri, Rolla, Mo.; David M. Abbott, Consulting Geologist, Denver, Colo.

In order to learn by experience, this session solicits case studies across the spectrum of environmental and engineering geology topics. This session is to honor Jim Slosson's contributions to forensic geoscience. ORAL

T78. Geology and Public Policy: A Tribute to James E. Slosson

Cosponsored by *GSA Engineering Geology Division; GSA Geology and Society Division*
Engineering Geology; Public Policy

Jeffrey R. Keaton, MACTEC Engineering and Consulting, Los Angeles, Calif.; Susan D. Halsey, Admiral Coastal Consulting, Pine Beach, N.J.; Christopher Mathewson, Texas A&M University, College Station, Tex.

This session honors Jim Slosson's contributions to public service, covering the challenges of government-supported geoscience, building code development and enforcement, standards of practice, licensure, client advocacy versus practice in the public interest, and professional ethics. ORAL

T79. Landslide Processes, Case Studies, and Issues: A Tribute to James E. Slosson

Cosponsored by *GSA Engineering Geology Division; GSA Geology and Society*
Engineering Geology; Quaternary Geology; Geomorphology
Jerome DeGraff, USDA Forest Service, Clovis, Calif.; Susan Cannon, USGS, Denver, Colo.; Jerry Higgins, Colorado School of Mines, Golden, Colo.

Case studies of landslides: processes, histories, physical description, hydrogeologic effects, mitigation, and techniques for hazard recognition are welcome in this session to honor Jim Slosson's work on slope movement. ORAL

T80. Active Faulting, Neotectonics, Paleoseismology: A Tribute to James E. Slosson

Cosponsored by *GSA Engineering Geology Division; GSA Structural Geology and Tectonics Division*
Engineering Geology; Structural Geology;
Neotectonics/Paleoseismology

Wanda Taylor, University of Nevada, Las Vegas, Nev.; Keith Sverdrup, University of Wisconsin, Milwaukee, Wisc.; Vincent S. Cronin, Baylor University, Waco, Tex.

This session to honor Jim Slosson's work on seismic safety will concentrate on studies concerning the recognition or description of faults active in the Neogene, or characterization and mitigation of seismic hazards. ORAL

T81. Diversity in Crustal Fluid Compositions: Geological Origins and Consequences

Cosponsored by *Society of Economic Geologists; U.S. Geological Survey*

Geochemistry; Economic Geology;
Mineralogy/Crystallography

Brian Rusk, USGS, Denver, Colo.; Murray Allan, University of Leeds, West Yorkshire, UK

What are the compositions of aqueous crustal fluids and the importance of fluid chemistry in ore formation, hydrocarbon migration, metamorphism, metasomatism, seafloor alteration, atmosphere and ocean chemistry, subduction processes, and energy and mass transfer in geothermal systems? ORAL

T82. The Structure, Composition, and Evolution of the Lithosphere of Western North America

Cosponsored by *GSA Geophysics Division; GSA Structure and Tectonics Division*

Geophysics/Tectonophysics/Seismology; Geochemistry;
Structural Geology

Walter D. Mooney, USGS, Menlo Park, Calif.; Catherine M. Salter, University of Nevada, Las Vegas, Nev.; Eugene Humphreys, University of Oregon, Eugene, Oreg.; Richard C. Aster, New Mexico Tech, Socorro, N.Mex.

The session focuses on insights into the processes that have formed and modified the entire lithospheric column of Western North America. Results from seismic imaging, non-seismic geophysics, structural geology, and geochemistry are welcome. ORAL

T83. Relationship of the Siberian Traps Eruptions to the Mass Extinction(s) at the Close of the Permian: Do We Know Enough to Ascertain Whether a Cause and Effect Relationship Exists?

Geophysics/Tectonophysics/Seismology; Paleontology,
Diversity, Extinction, Origination; Volcanology
Maureen Steiner, University of Wyoming, Laramie, Wyo.

This session will consider whether the geological and geophysical evidence is sufficient to conclude cause and effect between Siberian large igneous province eruptions and mass extinction at the end of the Permian.

T84. Active and Ancient Tectonics along the Northern Cordillera Margin—Magmatism, Deformation, Metamorphism, and Basin Development (Posters)

Cosponsored by *GSA Structural Geology and Tectonics Division; Geophysics; Sedimentary Geology*

Geophysics/Tectonophysics/Seismology; Stratigraphy;
Tectonics

Brian Hampton, Michigan State University, East Lansing, Mich.; Jeffrey M. Trop, Bucknell University, Lewisburg, Pa.; Kenneth D. Ridgway, Purdue University, West Lafayette, Ind.

Topical and Discipline Sessions

Resolving the tectonic processes and evolution of the northern Cordillera requires integration of geological and geophysical data through time and space. We encourage studies using geochronology, geodesy, geophysics, numerical modeling, petrology, stratigraphy, and structural geology. POSTER

T85. Combining Geophysics and Geology to Solve Geoscience Problems

Cosponsored by *GSA Geophysics Division; GSA Structure and Tectonics Division; GSA Geology and Society Division*
Geophysics/Tectonophysics/Seismology; Structural Geology; Tectonics

Scott Giorgis, SUNY-Geneseo, Geneseo, N.Y.; Eric Horsman, University of California, Berkeley, Calif.; Sarah Titus, Carleton College, Northfield, Minn.

Simultaneous application of geophysics and geology to geoscience problems often generates critical insights. Geophysics provides data unavailable from geological analysis. Geology provides constraints for processing and interpreting geophysical data. This session highlights that synergistic relationship. ORAL

T86. New Perspectives on the Rio Grande Rift: From Tectonics to Groundwater

Cosponsored by *GSA Structural Geology and Tectonics Division; GSA Geophysics Division; GSA Hydrogeology Division*
Geophysics/Tectonophysics/Seismology; Tectonics; Hydrogeology

Mark R. Hudson, USGS, Denver, Colo.; V.J.S. Grauch, USGS, Denver, Colo.

Abundant new geologic and geophysical studies of the Rio Grande rift provide insights into synchronous Neogene faulting, sedimentation, and volcanism and their hydrogeologic controls on critical groundwater aquifers within multiple rift basins. ORAL

T87. A Retrospective and Prospective Look at Mineralogy, Petrology, and Geochemistry: A Session in Honor of Gordon E. Brown Jr.

Cosponsored by *Mineralogical Society of America; Geochemical Society*

Mineralogy/Crystallography; Geochemistry; Petrology, Igneous

Michael F. Hochella, Virginia Tech, Blacksburg, Va.; Jerry Gibbs
Talks will focus on where the MPG fields were 50 years ago and where they are projected to be 50 years from now. How will they impact science, society, and the world of the future? ORAL

T88. Geochemistry of Magmatic and Metamorphic Processes: In Honor of the Contributions of Joseph L. Wooden

Petrology, Igneous; Petrology, Metamorphic; Tectonics
James Wright, University of Georgia, Athens, Ga.; Drew Coleman, University of North Carolina, Chapel Hill, N.C.; Andrew P. Barth, Indiana University–Purdue University, Indianapolis, Ind.

In this session, we seek to bring together geologists to describe the latest technical and scientific advances in geochemistry that are leading to greater insights into rock-forming processes and their implications for geodynamics. ORAL

T89. Geophysics of the Terrestrial Planets: The G.K. Gilbert Award Session

Cosponsored by *GSA Planetary Geology Division*
Planetary Geology; Geophysics/Tectonophysics/Seismology
R. Aileen Yingst, University of Wisconsin, Green Bay, Wisc.; Sean Solomon, Carnegie Institution of Washington, Washington D.C.

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

T90. Geology of the Northern Plains of Mars: New Tectonic, Petrologic, and Geomorphic Perspectives

Cosponsored by *GSA Planetary Geology Division*
Planetary Geology; Geomorphology; Tectonics
Joseph Michalski, Jet Propulsion Laboratory, Pasadena, Calif.; Michael Wyatt, Brown University, Providence, R.I.

The northern plains of Mars contain an enigmatic suite of volcanic, tectonic, periglacial, sedimentary, and impact-related features. This session will explore new interpretations from recent spacecraft data and the implications for the evolution of Mars. ORAL

T91. Wet Mars: Understanding the Red Planet's Aqueous History through Terrestrial Fieldwork

Cosponsored by *GSA Planetary Geology Division*
Planetary Geology; Remote Sensing/Geographic Info System
Brian M. Hynek, University of Colorado, Boulder, Colo.; Jennifer L. Heldmann, National Aeronautic and Space Administration–Ames Research Center, Moffett Field, Calif.

We encourage results from terrestrial fieldwork that relate to understanding present or past water on Mars. This includes but is not limited to (1) gully or delta formation, and (2) low or high temperature acid-sulfate weathering. ORAL

T92. Up Close and Personal: Geology on Mars and Earth at the Handlens Scale

Cosponsored by *GSA Planetary Geology Division; GSA Sedimentary Geology Division*
Planetary Geology; Sediments, Clastic
R. Aileen Yingst, University of Wisconsin, Green Bay, Wisc.; Juergen Schieber, Indiana University, Bloomington, Ind.

Textural observations of martian rocks at the handlens-scale offer many opportunities to explore processes that formed and affected the martian crust. This session investigates handlens-scale textures on Earth and Mars diagnostic of origin and history. ORAL

T93. The First Year of Observations by the Mars Reconnaissance Orbiter

Cosponsored by *GSA Planetary Geology Division*
Planetary Geology
Laszlo Keszthelyi, USGS, Flagstaff, Ariz.; Roger Phillips, Washington University, St. Louis, Mo.

New results from the first year of Mars mapping by the High Resolution Imaging Science Experiment (HiRISE) and Context (CTX) cameras, the Compact Reconnaissance Imaging Spectrometer for Mars (CRISM), and the shallow subsurface radar system (SHARAD) onboard the Mars reconnaissance orbiter spacecraft will be presented. ORAL

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ITALY

*edited by Gian Battista Vai
and W. Glen E. Caldwell*



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This volume includes an eclectic group of papers by authors of varied backgrounds and nationality who describe contributions to natural science and philosophy by Italian or foreign geologists working in Italy between the fourteenth and nineteenth centuries. Each of these scientists contributed to the emergence of modern geology as a distinct scientific discipline, starting with Aldrovandi, who coined the term *geology* in 1603, and continuing with Agricola, the early gemologists and mineralists, the Florentine artists, Descartes, Gassendi, Kircher, Steno, Marsili, Arduino, Gregory Watt, William Maclure, Brocchi, and Pilla. When Lyell disseminated the Huttonian doctrine in his *Principles*, he fully recognized the legacy of pioneering Italian studies in geology. The aim of the volume is to restore Lyell's insights, which

were not investigated further by Italian geoscientists and historians of science during the nineteenth and twentieth centuries. Rediscovering the roots of modern geology is an invaluable and crucial goal for a sound assessment of long-term perspectives of this science and of science as a whole.

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Topical and Discipline Sessions

T94. Advanced Remote Sensing of the Earth, Moon, and Mars

Cosponsored by *GSA Planetary Geology Division*
Remote Sensing/Geographic Info System; Planetary Geology;
Geoinformatics

William H. Farrand, Space Science Institute, Boulder, Colo.;
John C. Mars, USGS, Reston, Va.

Advanced remote sensing instruments are in use on terrestrial airborne and orbital platforms and on missions in orbit or planned for the Moon and Mars. Results from these advanced remote sensing instruments will be discussed. ORAL

T95. Techniques for Studying the Development of Fields of Small Basaltic Vents on Earth and Mars

Cosponsored by *GSA Planetary Geology Division*
Volcanology; Planetary Geology; Geomorphology

Jacob E. Bleacher, Arizona State University, Tempe, Ariz.

A discussion of techniques used to characterize fields of small basaltic vents on Earth and Mars to provide a broader basis for interpreting the processes responsible for the development of these volcanic features. ORAL

T96. Ionizing Radiation Sources and Their Impact on Life

Cosponsored by *Paleontological Society; Society for Sedimentary Geology (SEPM)*

Paleontology, Diversity, Extinction, Origination;
Environmental Geoscience; Geochemistry
Stephen A. Leslie, University of Arkansas, Little Rock, Ark.;
Bruce Lieberman, University of Kansas, Lawrence, Kans.; P.
Andrew Karam; Adrian Melott; Brian Fields

This session will explore the impact of astrophysical ionizing radiation events on life through geologic time, their impact today, and how ancient ionizing radiation events may be identified.

T97. Trace Fossils, Mass Extinctions, and Event Boundaries: Endobenthic and Fossorial Responses to Terrestrial and Extraterrestrial Perturbations

Cosponsored by *Paleontological Society; GSA Geobiology and Geomicrobiology Division; GSA Sedimentary Geology Division; Society for Sedimentary Geology (SEPM)*

Paleontology, Diversity, Extinction, Origination;
Paleontology, Paleoecology/Taphonomy; Paleontology,
Biogeography/Biostratigraphy
Stephen T. Hasiotis, University of Kansas, Lawrence, Kans.;
Jared R. Morrow, San Diego State University, San Diego, Calif.

This session highlights recent advances in ichnology demonstrating that trace fossils and infaunal paleocommunities contain a valuable, detailed record of mass extinction selectivity and survivorship, extinction mechanisms, and environmental responses during crisis and event intervals. ORAL

T98. Selectivity of Ancient and Modern Extinctions: Bridging the Gap between Neontological Prediction and Paleontological Observation

Cosponsored by *Paleontological Society*
Paleontology, Diversity, Extinction, Origination; Paleontology,
Paleoecology/Taphonomy

Jonathan Payne, Stanford University, Stanford, Calif.; Seth Finnegan, Stanford University, Stanford, Calif.

This session is intended to explore ecological, physiological, environmental, and geographic selectivity of extinction in the fossil record and of extinction risk in the modern biota. ORAL

T99. Environmental Change and Evolution: Micropaleontological Case Studies

Cosponsored by *Cushman Foundation for Foraminiferal Research*

Paleontology, Diversity, Extinction, Origination;
Paleontology, Phylogenetic/Morphological Patterns;
Paleoclimatology/Paleoceanography
R. Mark Leckie, University of Massachusetts, Amherst, Mass.;
B. Huber, Smithsonian Institution, Washington, D.C.

Global change has been invoked as a major driver of microfossil evolution. This session will address issues of ancient ocean climate change, paleoenvironmental reconstruction, and the evolutionary response to environmental forcing at various time scales. ORAL

T100. Whole-Organism Paleoecology and the Relationship of Form, Function, and Ecological Interactions: In Memory of Richard Alexander

Cosponsored by *Paleontological Society*
Paleontology, Paleoecology/Taphonomy; Paleontology,
Phylogenetic/Morphological Patterns; Paleontology, Diversity,
Extinction, Origination
Lindsey Leighton, San Diego State University, San Diego,
Calif.; Gregory Dietl, Paleontological Research Institution,
Ithaca, N.Y.; Patricia H. Kelley, University of North Carolina,
Wilmington, N.C.

Session addresses the relationship between form, function, and ecological interactions of fossil and Recent organisms, in memory of Richard Alexander, whose work combined functional morphology with study of the role of ecological interactions in evolution. ORAL

T101. Emerging New Methods in Early Earth Studies: Unraveling the Co-Evolution of Earth and Life

Cosponsored by *GSA Geobiology and Geomicrobiology Division; Paleontological Society*
Precambrian Geology; Geochemistry; Paleontology,
Phylogenetic/Morphological Patterns
Dorothy Oehler, National Aeronautics and Space
Administration-Johnson Space Center, Houston, Tex.; Carrine
E. Blank, Washington University, St. Louis, Mo.; Jack Farmer,
Arizona State University, Tempe, Ariz.

This session focuses on new concepts and methodologies in the analysis of Precambrian microfossils, stromatolites, geochemical biosignatures and biomarkers, molecular phylogenetics, and interrelationships between geological processes and biochemistry to better understand how early Earth and life co-evolved. ORAL

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Topical and Discipline Sessions

T102. The Solar Stew: The Search for Ingredients of Life and Biomarkers in our Solar System: Past or Present

Cosponsored by *GSA Geobiology and Geomicrobiology Division; GSA Planetary Geology Division; Paleontological Society*

Geomicrobiology; Planetary Geology; Paleontology, Diversity, Extinction, Origination

Penny A. Morris, University of Houston–Downtown, Houston, Tex.; Steve Grasby, Geological Survey of Canada, Calgary, Alberta

Life is ephemeral and its detection in ancient and extreme environments or from extraterrestrial sources has and will continue to be difficult. We encourage papers dealing with any aspect of this subject. ORAL

T103. Pulse of the Earth: Geochronology and Paleomagnetism of Large Igneous Provinces, the Key to Reconstructing Precambrian Supercontinents

Cosponsored by *Precambrian [At Large]; International Geological Correlations Program Project 509, Paleoproterozoic Supercontinents and Global Evolution*

Precambrian Geology; Tectonics; Planetary Geology

David A.D. Evans, Yale University, New Haven, Conn.; Joseph G. Meert, University of Florida, Gainesville, Fla.; Kevin R.

Chamberlain, University of Wyoming, Laramie, Wyo.; Stephen S. Harlan, George Mason University, Fairfax, Va.

Supercontinents and large igneous provinces (LIPs) relate mantle processes to environmental conditions in deep time. Focused geochronologic and paleomagnetic studies of LIPs can reconstruct pre-Pangean supercontinents and assess relationships with geodynamics, metallogeny, paleoclimate, and life. ORAL

T104. Impact Craters and Events: From the Field to the Laboratory

Cosponsored by *GSA Planetary Geology Division; GSA Sedimentary Geology Division*

Planetary Geology; Stratigraphy; Geochemistry

Jared R. Morrow, San Diego State University, San Diego, Calif.; David T. King Jr, Auburn University, Auburn, Ala.

This session highlights recent field- and laboratory-based advances in recognizing, understanding, and modeling the proximal, distal, and paleoenvironmental effects of bolide impact events. ORAL

T105. The Chesapeake Bay Impact Structure: Results from the 2005–2006 ICDP-USGS Deep Drilling Project

Cosponsored by *GSA Planetary Geology Division; GSA Structural Geology and Tectonics Division; GSA Geophysics Division; GSA Sedimentary Geology Division; GSA Hydrogeology Division; International Continental Scientific Drilling Program (ICDP)*

Planetary Geology; Stratigraphy;

Geophysics/Tectonophysics/Seismology

Chris Koeberl, University of Vienna, Vienna, Austria; Greg S. Gohn, USGS, Reston, Va.; Wolf Uwe Reimold, Humboldt-Universität zu Berlin, Berlin, Germany; Kenneth Miller, Rutgers University, Piscataway, N.J.

In this session the first scientific results from the multidisciplinary and multinational studies related to the International

Continental Scientific Drilling Program–U.S. Geological Survey deep drilling project at the Chesapeake Bay impact structure will be presented. ORAL

T106. Geologic Structures, Fluid Flow, and Ore Deposits

Cosponsored by *GSA Hydrogeology Division; GSA Structure and Tectonics Division; GSA Geophysics Division; Society of Economic Geologists; U.S. Geological Survey; GSA Geology and Society Division*

Structural Geology; Economic Geology; Hydrogeology

Jonathan Saul Caine, USGS, Denver, Colo.; Eric P. Nelson, Colorado School of Mines, Golden, Colo.

This session focuses on the structure of ore deposits integrated using advances in tectonics, fluid flow, permeability structure, and geochemical processes. Research from field, laboratory, geophysical, remote sensing, and conceptual and computer modeling studies are welcome. ORAL

T107. Recognition and Implications of Coseismic Fault-Zone Structures

Cosponsored by *GSA Structural Geology and Tectonics Division; GSA Geophysics Division*

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

Laurel B. Goodwin, University of Wisconsin, Madison, Wisc.; James P. Evans, Utah State University, Logan, Utah

Fault-zone structures provide an enigmatic record of earthquake and fault mechanics. We will focus on how to read this record more effectively, utilizing ideas and approaches from both geology and geophysics. ORAL

T108. Reservoirs to Ruptures: Multidisciplinary Approaches to Studying Fault Rock Distribution and Evolution in the Seismogenic Crust

Cosponsored by *GSA Structural Geology and Tectonics Division; GSA Geophysics Division*

Structural Geology; Hydrogeology;

Geophysics/Tectonophysics/Seismology

Ruth H. Wightman, University of Durham, Durham, UK;

Jonathan Imber, University of Durham, Durham, UK;

Steven Smith, University of Durham, Durham, UK; Robert

E. Holdsworth, University of Durham, Durham, UK; Zoe K.

Shipton, University of Glasgow, Glasgow, UK

This session brings together a range of earth scientists from industry, academia, and government research organizations to discuss multidisciplinary approaches to characterizing and predicting the nature and distribution of fault rocks within the seismogenic crust. ORAL

T109. Mélanges: Processes of Formation and Societal Significance

Cosponsored by *GSA International Division; GSA Structural Geology and Tectonics Division; GSA Engineering Geology Division; GSA Sedimentary Geology Division*

Structural Geology; Sediments, Clastic; Engineering Geology

John Wakabayashi, California State University, Fresno, Calif.;

Yildirim Dilek, Miami University, Oxford, Ohio

This session explores advances in the study of mélanges. We seek to bring together researchers from around the world, spanning a wide range of geoscience disciplines, including structural, sedimentary, and engineering geology. ORAL

Topical and Discipline Sessions

T110. Combining Kinematics and Mechanics in Understanding Deformation Processes

Cosponsored by *GSA Structural Geology and Tectonics Division*
Structural Geology; Tectonics; Geophysics/Tectonophysics/Seismology
David Wiltschko, Texas A&M University, College Station, Tex.; John Spang, Texas A&M University, College Station, Tex.

Kinematic and mechanical models are often viewed as competing methods of understanding structures. The purpose of this session is to bring together researchers attempting to apply both geometric and mechanical analyses to understand deformation processes. ORAL

T111. Understanding Orogenesis through Paleoelevation

Cosponsored by *Geochemical Society; Mineralogical Society of America*
Tectonics; Geomorphology; Paleoclimatology/Paleoceanography
Matthew Kohn, University of South Carolina, Columbia, S.C.

Contributions are encouraged in all areas of paleoelevation research, including theory and case studies using stable and radiogenic isotope geochemistry, geomorphology, atmospheric pressure proxies, and geodynamics. This session follows a Mineral Society of America–Geochemical Society short course on paleoelevation on 26–27 Oct. 2007. ORAL

T112. A Synoptic Crustal Section from the Cascadia Margin to the Southern Appalachians: Focusing EarthScope Research on Crustal Domains, Their Boundaries, and Fundamental Processes of the U.S. Continent

Cosponsored by *GSA Structural Geology and Tectonics Division; GSA Geophysics Division*

Tectonics; Geophysics/Tectonophysics/Seismology; Geochemistry
Ben A. van der Pluijm, University of Michigan, Ann Arbor, Mich.; G. Randy Keller, University of Oklahoma, Norman, Okla.; Basil Tikoff, University of Wisconsin, Madison, Wisc.

Exploring the 4-D construction, stabilization, and modification of a continent—the aim is to construct a testable section across the United States that defines major research questions and offers a framework for EarthScope research. ORAL

AUTHORS



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Topical and Discipline Sessions

T113. Regional Tectonics of Basement-Cored Foreland Shortening: Integrating Geological and Geophysical Insights from Laramide and Analog Orogens

Cosponsored by *GSA Structural Geology and Tectonics Division*; *GSA Geophysics Division*

Tectonics; Geophysics/Tectonophysics/Seismology; Structural Geology

Eric A. Erslev, Colorado State University, Fort Collins, Colo.; Tim F. Wawrzyniec, The University of New Mexico, Albuquerque, N.Mex.

We'll explore tectonic controls on basement-involved foreland shortening in orogens like the Laramide of the Rockies by integrating lithosphere-scale observations from the Rockies with the tectonics of adjoining regions and insights from active analog orogens.

T114. Mantle Dynamics and Crust-Mantle Interactions in Collisional Orogens

Cosponsored by *GSA International Division*; *GSA Structure and Tectonics Division*; *GSA Geophysics Division*; *MARGINS Initiative*

Tectonics; Petrology, Igneous;
Geophysics/Tectonophysics/Seismology

Yildirim Dilek, Miami University, Oxford, Ohio; Paul T. Robinson, Dalhousie University, Halifax, Nova Scotia

Ophiolite emplacement and magmatism contribute significantly to continental growth in collisional orogens and are strongly controlled by mantle dynamics and crust-mantle interactions. This session will examine relevant processes involved in the evolution of collisional orogens. ORAL

T115. The Blue Mountains Region of Oregon, Idaho, and Washington: Recent Advances in the Mesozoic and Cenozoic History of an Enigmatic Accretionary Province

Cosponsored by *GSA Sedimentary Geology Division*; *GSA Structural Geology and Tectonics Division*

Tectonics; Stratigraphy; Petrology, Igneous

Todd LaMaskin, University of Oregon, Eugene, Oreg.; Joshua Schwartz, University of Wyoming, Laramie, Wyo.; Victor Camp, San Diego State University, San Diego, Calif.

The Blue Mountains region offers insights into classic problems including the nature of the Mesozoic margin and plume versus non-plume origin of the Columbia River Basalts. We are soliciting abstracts for a multidisciplinary theme session. ORAL

T116. Evolution of Appalachian-Ouachita Salients and Recesses from Reentrants [Embayments] and Promontories in the Continental Margin: Thirtieth Anniversary Celebration of Advances Derived from Bill Thomas' 1977 *American Journal of Science* Paper

Cosponsored by *GSA Structural Geology and Tectonics Division*

Tectonics; Structural Geology;

Geophysics/Tectonophysics/Seismology

Allen J. Dennis, University of South Carolina, Aiken, S.C.; Jim Hibbard, North Carolina State University, Raleigh, N.C.

From defining tectonic events with rift-drift sequences and clastic wedges, to contrasting lower-upper plate rift stratigraphy, origins and consequences of long-lived lithospheric fracture zones, rifting diachroneity, development of ribbon continents, and far-traveled terranes. ORAL

T117. The Track of the Yellowstone Hot Spot: What Do Neotectonics, Climate Indicators, Volcanism, and Petrogenesis Reveal about Subsurface Processes?

Cosponsored by *U.S. Geological Survey*

Volcanology; Geophysics/Tectonophysics/Seismology;
Quaternary Geology

Lisa A. Morgan, USGS, Denver, Colo.; Kenneth L. Pierce, USGS, Bozeman, Mont.; Henrietta E. Cathey, University of Utah, Salt Lake City, Utah

This session seeks to advance understanding of volcanism, faulting, and uplift of the Yellowstone–Snake River Plain province by highlighting recent advances testing the plume hypothesis. Multidisciplinary contributions focused on coupled processes are encouraged. ORAL

T118. Sigma Gamma Epsilon Undergraduate Research (Posters)

Cosponsored by *Sigma Gamma Epsilon*

Environmental Geoscience; Stratigraphy; Petrology, Igneous
Richard L. Ford, Weber State University, Ogden, Utah; Charles Mankin, Oklahoma Geological Survey, Norman, Okla.; Donald Neal, East Carolina University, Greenville, N.C.

This poster session will showcase undergraduate research in all areas of geoscience. POSTER

T119. The Impact of Geoinformatics on Geoscience Research and Education (Posters)

Cosponsored by *GSA Geoinformatics Division*; *GSA Geoscience Education Division*

Geoinformatics; Geoscience Education;
Geophysics/Tectonophysics/Seismology

Dogan Seber, University of California at San Diego, La Jolla, Calif.; Krishna Sinha, GSA Geoinformatics Division, Blacksburg, Va.

Discovery, integration, and analysis of geoscience data is a prerequisite for a more comprehensive understanding of Earth as a dynamic system leading to new paradigms in research and education. POSTER

T120. Geological and Geophysical Data Preservation Best Practices

Cosponsored by *U.S. Geological Survey*; *Association of American State Geologists*; *GSA Geoinformatics Division*; *GSA Geology and Society Division*; *Paleontological Society*
Geoinformatics; Geoscience Information/Communication;
Public Policy

Tamara L. Dickinson, USGS, Reston, Va.; John C. Steinmetz, Indiana University, Bloomington, Ind.

This session will highlight minimum standards and best practices for geological and geophysical data preservation. This will serve as input to the National Geological and Geophysical Data Preservation Program, which was established in 2005.

T121. Growing the Cyberinfrastructure for the Geosciences: Contributions from State and Federal Agencies

Cosponsored by *U.S. Geological Survey*; *Association of American State Geologists*; *GSA Geoinformatics Division*; *GSA Geology and Society Division*

Geoinformatics; Geoscience Information/Communication;
Public Policy

Topical and Discipline Sessions

Linda C. Gundersen, USGS, Reston, Va.; M. Lee Allison, Arizona Geological Survey, Tucson, Ariz.; Tamara L. Dickinson, Reston, Va.

The session will focus on state and federal roles in geoinformatics and data integration. ORAL

T122. Geoinformatics and Computational Earth Science: New Trends Promoting Data to Knowledge through Shared Resources and Tools toward New Research and Educational Opportunities in Geosciences

Cosponsored by *GSA Geoinformatics Division*

Geoinformatics; Geoscience Information/Communication
Hassan Babaie, Georgia State University, Atlanta, Ga.; Krishna Sinha, GSA Geoinformatics Division, Blacksburg, Va.; Walter S. Snyder, Boise State University, Boise, Idaho

The emerging geoinformatics will allow geoscientists to discover, integrate, and analyze complex geoscience data through Web-based technologies. It will promote true interdisciplinary research required to advance the understanding of Earth as a complex system. ORAL

T123. Geoscience Data for Geoinformatics

Cosponsored by *GSA Geoinformatics Division*

Geoinformatics

Kerstin Lehnert, Palisades, N.Y.; G. Randy Keller, University of Oklahoma, Norman, Okla.

This session emphasizes the relevance of digital data collections for geoinformatics. It provides an overview of existing disciplinary data collections, and addresses technical, organizational, and cultural challenges related to building and maintaining such collections. ORAL

T124. Medical Geology

Cosponsored by *GSA Geology and Society Division*

Geology and Health; Environmental Geoscience; Non-Geoscience

Stephen York, Mendham, N.J.

Considering anthropogenic-health-related activities that cause redistributions of naturally occurring substances, medical geology investigates broader considerations and relationships between geologic environments and diseases in people, animals, and plants living in those respective environments. ORAL

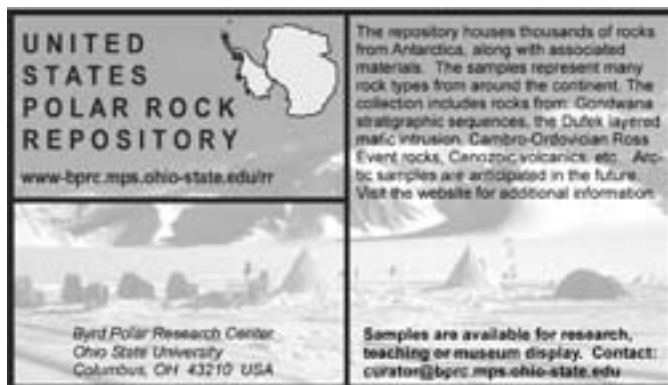
T125. Climate Change and Human Health: From Subtle Changes to Potential Disasters, Past, Present, and Future

Cosponsored by *GSA Geology and Health Division; GSA Geology and Society Division*

Geology and Health; Paleoclimatology/Paleoceanography; Public Policy

Matthew Huber, Purdue University, West Lafayette, Ind.; Gabriel Filippelli, Indiana University–Purdue University, Indianapolis, Ind.

This session will include studies of past climatic impacts on societies, the current state of climate modeling and risk analysis, and the variety of future scenarios, prioritized from the standpoint of risk potential. ORAL



T126. Malice and Medical Geology: From Arsenic to Polonium—An Examination of Geological Agents as Poisons

Cosponsored by *GSA Geology and Health Division; GSA Geology and Society Division*

Geology and Health; Public Policy

Gabriel Filippelli, Indiana University–Purdue University, Indianapolis, Ind.; Geoffrey Plumlee, USGS, Denver, Colo.

This session will include techniques and case studies involving the identification and use of geological agents as human poisons in the past and current efforts to quickly identify and treat toxicity cases. ORAL

T127. Positive and Beneficial Aspects of Earth Sciences in Public Health

Cosponsored by *GSA Geology and Health Division; GSA Geology and Society Division*

Geology and Health

Ulli Limpitlaw, University of Northern Colorado, Greeley, Colo.; Lynda Williams, Arizona State University, Tempe, Ariz.

We are seeking to bring together researchers of various disciplines including but not limited to geology, mineralogy, geomicrobiology, hydrology, medicine, dentistry, and geochemistry, who investigate Earth materials that benefit humans and animals. ORAL

T128. Charting the Future of Geological and Environmental Science Undergraduate Programs

Cosponsored by *GSA Geoscience Education Division; National Association of Geoscience Teachers*

Geoscience Education; Environmental Geoscience; Geoscience Information/Communication

Kristen E. St. John, James Madison University, Harrisonburg, Va.; S.A. Hovan, Indiana University of Pennsylvania, Indiana, Pa.

Discussion of the steps undergraduate geoscience programs are taking to define key variables, make pivotal decisions, and construct models for charting future successful paths for two- and four-year degree programs in an evolving academic world. ORAL

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Topical and Discipline Sessions

T129. Teaching Climate Change and Energy Issues in the Classroom: An Imperative for Educated Citizens and Geoscientists

Cosponsored by *National Association of Geoscience Teachers; GSA Geology and Society Division; GSA Geology and Health Division; GSA Geoscience Education Division*

Geoscience Education; Environmental Geoscience; Geoscience Information/Communication

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

Presentations will provide geoscience educators essential knowledge and methodologies for effectively communicating salient conclusions and predictions of climate change science and energy policy analysis in the classroom and the public arena. ORAL

T130. Forensic Geoscience: Research and Case Studies

Cosponsored by *GSA Geology and Society Division; American Society of Forensic Geologists; GSA Geology and Health Division*

Environmental Geoscience; Geology and Health; Geochemistry

Elisa Bergslien, Buffalo State College, Buffalo, N.Y.; C.E. Nehru, Brooklyn College—CUNY, Brooklyn, N.Y.

Applications of geoscience research to the law. A forum to share active research projects or present case studies. Use of analytical techniques, geophysical tools, database development, provenance, remote sensing, disturbed stratigraphy, and other investigative techniques. ORAL

T131. Forensic Geoscience: Innovative Educational Strategies for Attracting Students to the Geosciences (Posters)

Cosponsored by *GSA Geoscience Education Division*
Geoscience Education; Geoscience Information/Communication; Public Policy

Elisa Bergslien, Buffalo State College, Buffalo, N.Y.

Innovative ways of attracting students, especially urban students, to geoscience. A chance for those with experience teaching forensic geoscience, or similar courses, to share information about what does and does not work in the classroom. POSTER

T132. Innovative, Inquiry-Based Approaches That Bring the Field into the Classroom: Moving from Virtual Tour to Virtual Fieldwork

Cosponsored by *GSA Geoscience Education Division*
Geoscience Education; Geoscience Information/Communication; Public Policy

Don Duggan-Haas, Colgate University, Hamilton, N.Y.; Robert M. Ross, Paleontological Research Institution, Ithaca, N.Y.

Most virtual field trips are tours in which teachers point things out. This session focuses on virtual experiences that mimic actual fieldwork in which students figure things out through exploration, inquiry-based discussion, and problem solving. ORAL

T133. Innovative Approaches to Injecting Controversial Topics from the History of Geology into Today's Geoscience Education

Cosponsored by *GSA Geoscience Education Division; GSA Geology and Society Division*

Geoscience Education; History of Geology

James H. Wandersee, Louisiana State University, Baton Rouge, La.; Renee M. Clary, Mississippi State University, Mississippi State, Miss.

Investigates potential and actual impacts on students' geology learning resulting from innovative approaches to injecting controversial topics from the history of geology into today's geoscience education—across all phases: classroom, laboratory, field, and online. ORAL

T134. Professional Development for the Professional Developers: Aspects of Effective Teacher Professional Development Programs in the Earth Sciences

Cosponsored by *GSA Geoscience Education Division; GSA Geology and Society Division*

Geoscience Education; Public Policy; Geoscience Information/Communication

Eric J. Pyle, James Madison University, Harrisonburg, Va.; Don Duggan-Haas, Colgate University, Hamilton, N.Y.

How can a professional development program be designed to address the multiple and varied needs of teachers of earth science? This session will explore the contemporary knowledge of earth science teacher professional development. ORAL

T135. Early Undergraduate Research Experiences (Posters)

Cosponsored by *GSA Geoscience Education Division; Council on Undergraduate Research; National Association of Geoscience Teachers*

Geoscience Education

Laura A. Guertin, Penn State Delaware County, Media, Pa.; Linda Reinen, Pomona College, Claremont, Calif.; Jill Singer, Buffalo State College, Buffalo, N.Y.

Research experiences in the first two years of college provide students skill sets needed to succeed in upper-level research. This session highlights classroom to independent research projects in community colleges to research institutions. POSTER

T136. Involving Students with Little Science Background in Authentic Research: Challenges and Victories

Cosponsored by *GSA Geoscience Education Division; National Association of Geoscience Teachers*

Geoscience Education

Prajukti Bhattacharyya, University of Wisconsin, Whitewater, Wisc.; Joy Branlund, Southwestern Illinois College, Granite City, Ill.

In this session, two- and four-year college educators will share ideas for fostering research done by introductory students. The small-group and panel discussion format will help participants explore the topic. ORAL

T137. Involvement in Geological Research: Close Collaboration among the Faculty, Undergraduate, and K–12 Students (Posters)

Cosponsored by *GSA Geoscience Education Division*
Environmental Geoscience; Geoscience Education; Geoscience Information/Communication

Nazrul I. Khandaker, York College of CUNY, Jamaica, N.Y.; Stanley Schleifer, York College of CUNY, Jamaica, N.Y.

For recruitment and retention of potential geoscience majors, faculty-supervised undergraduate and high school students involved in various aspects of geoscience topics are encour-

Topical and Discipline Sessions

aged to present their applied research outcomes to the diverse geoscience community. POSTER

T138. Learning in the Field: Effective Strategies for Teaching Undergraduate Geology Outside the Classroom

Cosponsored by *GSA Geoscience Education Division*; *National Association of Geoscience Teachers*
Geoscience Education

Jacqueline A. Smith, The College of Saint Rose, Albany, N.Y.;
John I. Garver, Union College, Schenectady, N.Y.

We encourage presentations that explore approaches to teaching geology through field-based learning. Of particular interest are local projects linked to primary course objectives, sequences of projects with a common focus, and stand-alone thematic excursions. ORAL

T139. The Future of Geoscience Field Courses

Cosponsored by *GSA Structural Geology and Tectonics Division*; *GSA Geoscience Education Division*; *National Association of Geoscience Teachers*; *GSA Geophysics Division*; *GSA Quaternary Geology and Geomorphology Division*

Structural Geology; Geoscience Education; Geomorphology
Steven J. Whitmeyer, James Madison University, Harrisonburg, Va.; L. Scott Eaton, James Madison University, Harrisonburg, Va.; Charles Onasch, Bowling Green State University, Bowling Green, Ohio; Lee J. Suttner, Indiana University, Bloomington, Ind.

This session will focus on future directions of geoscience field camps. Principal themes will include traditional goals of teaching field geology and mapping, recent technological advances, and modern topics like geomorphology, geophysics, and environmental assessment. ORAL



Late Paleozoic sedimentary rocks exposed near Colorado River. Photo by John Karachewski.

T140. Geosciences and Web 2.0—Blogs, Wikis, Podcasts, and Web Video

Geoscience Information/Communication; Geoscience Education; Public Policy

Ronald C. Schott, Fort Hays State University, Hays, Kans.

Professional geologists, geoscience educators, and interested amateurs explore the ways that “Web 2.0” technologies are currently being used and how they might be leveraged in the future to build richer online community in the geosciences. ORAL

T141. Geology in the National Parks: Research, Mapping, and Resource Management

Cosponsored by *GSA Geology and Society Division*
Geoscience Education

Bruce A. Heise, National Park Service, Lakewood, Colo.

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

T142. Geology of Parks and Public Lands: Effective and Innovative Informal Earth Science Education for the Masses

Cosponsored by *National Park Service*; *Bureau of Land Management*; *Association of Earth Science Editors*
Geoscience Information/Communication; Geoscience Education

Marion Malinowski, U.S. Bureau of Land Management, Lakewood, Colo.; Jim F. Wood, National Park Service, Lakewood, Colo.; Melanie V. Ransmeier, National Park Service, Denver, Colo.; Monica Gaiswinkler Easton, Ontario Geological Survey, Sudbury, Ontario

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

T143. Geoscience and the Community: An Exploration of Ways to Become Involved

Cosponsored by *GSA Geology and Society Division*; *American Geological Institute*; *GSA Geoscience Education Division*; *National Association of Geoscience Teachers*
Geoscience Information/Communication; Geoscience Education

Michael A. Phillips, Illinois Valley Community College, Oglesby, Ill.; Linda Rowan, American Geological Institute, Alexandria, Va.

The geoscience perspective is often overlooked to the detriment of society. This session will present various ways geoscientists can promote our perspective through participation in the community and government with an emphasis on being proactive. ORAL

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Topical and Discipline Sessions

T144. GeoScience Information: Making the Earth Sciences Accessible for Everyone

Cosponsored by *Geoscience Information Society*
Geoscience Information/Communication; Public Policy;
Geoscience Education

Claudette Cloutier, University of Calgary, Calgary, Alberta

Informed decision making for a sustainable Earth depends on information being accessible to the public. Join us as we discuss how geoscience information is created, disseminated, organized, accessed, used, and archived. ORAL

T145. Challenges in Geoscience Publishing: Perspectives of Communicating Geoscience to Scientists and to the General Public

Cosponsored by *Association of Earth Science Editors*
Geoscience Information/Communication

Monica Gaiswinkler Easton, Ontario Geological Survey, Sudbury, Ontario

Editors will discuss issues that authors, reviewers, editors, publishers, and readers confront in geoscientific manuscripts (e.g., intellectual property rights and copyright, confidentiality, conflicts of interest, plagiarism, electronic publication, quality of review). They will also offer some solutions. ORAL

T146. Geologic Mapping: Innovations and Interoperability (Posters)

Cosponsored by *GSA Engineering Geology Division; GSA Geology and Society Division; GSA Hydrogeology Division; GSA Quaternary Geology and Geomorphology Division; Association of American State Geologists*
Geoscience Information/Communication

Harvey Thorleifson, University of Minnesota, St. Paul, Minn.; David Soller, USGS, Reston, Va.; Richard Berg, GSA Geology and Society Division, Champaign, Ill.; Peter Lyttle, USGS, Reston, Va.; Hazen Russell, Geological Survey of Canada, Ottawa, Ontario

This session will highlight innovations in geological mapping by showing new mapping, strategies for managing data, new methods for publication and Web accessibility, applications, and how digital procedures have advanced the effectiveness of mapping worldwide. POSTER

T147. Exemplars and Exceptions: Using Individual and Group Biography to Understand Critical Issues in the History of Geology

Cosponsored by *GSA History of Geology Division; GSA Geology and Society Division; History of the Earth Sciences Society*

History of Geology

Julie R. Newell, Southern Polytechnic State University, Marietta, Ga.; Stephen M. Rowland, University of Nevada, Las Vegas, Nev.

Biographical studies of individuals, groups, or institutions use the particular to make visible broader patterns such as the development of ideas, the practices of geology, and the cultural or political roles of geology. ORAL

T148. The Science of Groundwater Recharge, Coal Mine Hydrology and Geochemistry, and Stream Restoration and its Application to the Public Good: In Honor of Mary W. Stoertz

Cosponsored by *GSA Hydrogeology Division*
Hydrogeology

William W. Simpkins, Iowa State University, Ames, Iowa; Joseph J. Donovan, West Virginia University, Morgantown, W.Va.; Kenneth Bradbury, Wisconsin Geological and Natural History Survey, Madison, Wisc.; Maureen Muldoon, University of Wisconsin, Oshkosh, Wisc.; Laura Toran, Temple University, Philadelphia, Pa.; Weston R. Dripps, Furman University, Greenville, S.C.

Dr. Mary Stoertz studied the science of groundwater recharge, coal mine hydrology and geochemistry, and stream restoration, while demonstrating a passion for applying her findings for public benefit. We seek papers on all these topics. ORAL

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

Abstract Body

Please keep the body of the abstract to 2,000 characters or less. 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. 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).

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.) 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 10 July 2007.

Presentation Modes

Select your preferred mode of presentation: oral, poster, or either (no preference).

Please note: 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 ~8' wide × ~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.

NEW FOR 2007! You may present two volunteered abstracts during the Annual Meeting, as long as one of these abstracts is a poster presentation. This limitation does not apply to, nor does it include, invited contributions to keynote symposia or topical sessions.

Speaker Equipment

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

- One desktop PC 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).
 - One desktop Macintosh computer (10.4.6 Tiger, Keynote 3.0)
 - One LCD projector
 - One screen
 - One laser pointer
 - One lectern/podium with light and microphone
- Overhead projectors and multiple screens are no longer part of the standard set-up;

however, these are available for an additional fee. Slide projectors are not available. More information will be included in the speaker guide, to be posted online in August.

Scientific Categories

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

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

CALL FOR PAPERS

JTPC to Finalize Program in Late July

The Joint Technical Program Committee (JTPC) selects abstracts and determines the final session schedule. All authors will be notified in early 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.

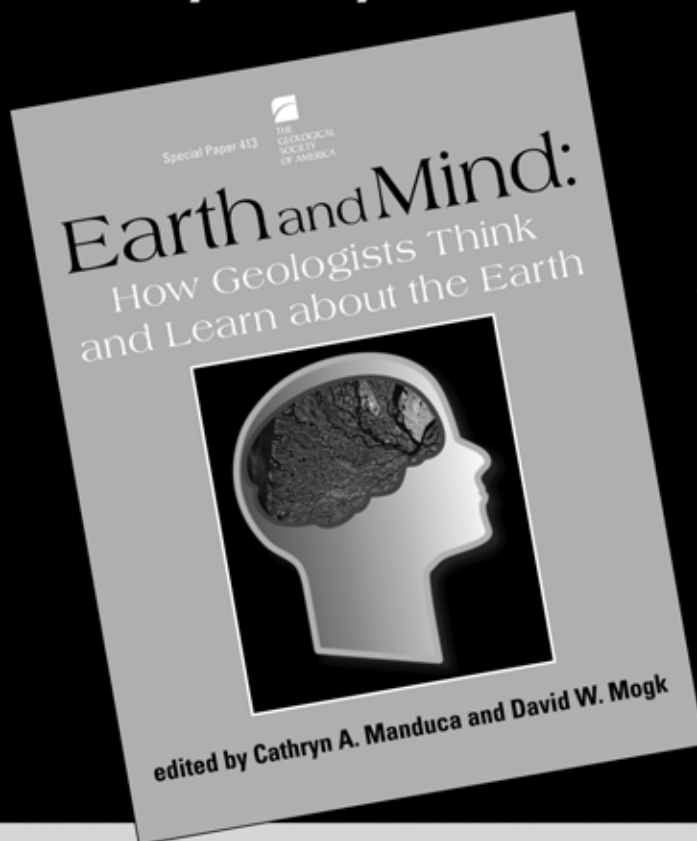


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Denver 2007 Field Trips



Yellowstone Lake, Yellowstone National Park, USA. Astronaut photograph ISS011-E-10575, taken 15 July 2005 by the International Space Station Crew Earth Observations experiment and the Image Science & Analysis Group, Johnson Space Center, http://visibleearth.nasa.gov/view_rec.php?id=17295 (Accessed 9 Feb. 2007).

This year's slate of field trips is themed "the mysteries in the Rockies." The 2007 GSA Annual Meeting in Denver will bring you into the heart of a vast area of poorly understood geology, notwithstanding the heroic labors of our peers, colleagues, and illustrious predecessors upon whose shoulders we all stand. Come learn with us about the unknown, probe the limits of understanding, and have fun!

We have selected a roster of over thirty trips to demonstrate current thought and insight on challenges ranging from early man's lifestyle to the genesis of ore deposits and the accumulation of mineral fuels. Trips include visits to mysterious lineaments, peculiarly contorted strata, fabulous chasms, enigmatic plumes, and the lowest point in North America. Some are by bike, some by van, and some on foot. Some will span several days (both before and after the meeting), and some will be quick, cost-effective, one-day investigations of critical issues, with guidance by leaders in the field.

Be sure to budget extra time for a field trip in conjunction with your visit to Denver this October and encourage your friends and colleagues to spend some extra quality time in the Rocky Mountain West as well! Your committee and Society are doing everything possible to bring you these opportunities at the least possible cost.

This year's field trip chair is Bob Reynolds of the Denver Museum of Nature & Science. Please feel free to contact him at +1-303-370-6047 or denverbasin@dmns.org for trip information. You may also wish to contact trip leaders directly as the meeting draws near.

PREMEETING

Track of the Yellowstone Hot Spot: Young and On-Going Geologic Processes from the Snake River Plain to Yellowstone. Tues.–Sat., 23–27 Oct. Lisa A. Morgan, U.S. Geological Survey, Denver, Colo., +1-303-273-8646, lmorgan@usgs.gov; Kenneth L. Pierce.

Clastic Sedimentology, Sedimentary Architecture, and Sequence Stratigraphy of Fluvio-Deltaic, Shoreface, and Shelf Deposits, Book Cliffs, Eastern Utah and Western

Colorado. Thurs.–Sat., 25–27 Oct. Simon A.J. Pattison, Brandon University, Brandon, Manitoba, +1-204-727-7468, pattison@brandonu.ca; Paul Davies; Huw Williams.

Cornucopia of Coal and Coalbed Gas in the Powder River Basin: From Mining and Utilization to Methane and Methanogens. Thurs.–Fri., 25–26 Oct. Romeo M. Flores, U.S. Geological Survey, Denver, Colo., +1-303-236-7774, rflores@usgs.gov; Gary D. Stricker; Michael Brownfield; Margaret Ellis; Edward Heffern; Jason D. Putnam.

River Incision Histories of the Black Canyon of the Gunnison and Unaweep Canyon: Interplay between Late Cenozoic Tectonism, Climate Change, and Drainage Integration in the Western Rocky Mountains. Cosponsored by *Quaternary Geology and Geomorphology Division*. Wed.–Sat., 24–27 Oct. Andres Aslan, Mesa State College, Grand Junction, Colo., +1-970-248-1614, aaaslan@mesastate.edu; Karl Karlstrom.

Stratigraphy and Sedimentology of the Green River Formation in the Piceance Basin—The Richest Oil Shale Deposits in the World. Thurs.–Sat., 25–27 Oct. Yuval Bartov, Colorado School of Mines, Golden, Colo., +1-303-273-3841, ybartov@mines.edu; Rick Sarg.

Coal Geology in the Mesaverde Group along the Eastern Edge of the Greater Green River Basin in Northwestern Colorado and South-Central Wyoming. Fri.–Sat., 26–27 Oct. Nick Jones, Wyoming State Geological Survey, Laramie, Wyo., +1-307-766-2286 ext. 243, njones@uwyo.edu.

From Buttes to Bowls: Repeated Inversions in the Landscape of the Colorado Piedmont. Fri., 26 Oct. Matthew Morgan, Colorado Geological Survey, Denver, Colo., +1-303-866-2066, matt.morgan@state.co.us; Vincent Matthews.

Proterozoic Geology and Phanerozoic Reactivation of the Newly Recognized Grizzly Creek Shear Zone, Glenwood Canyon, Colorado. Coposponsored by *GSA Structural Geology and Tectonics Division*. Fri.–Sat., 26–27 Oct. Joseph L. Allen, Concord University, Athens, W.Va., +1-304-384-5238, allenj@concord.edu; Colin A. Shaw.

Fish, Turtles, Plants, and Insects within the Morrison Formation: A Walk through a Late Jurassic Ecosystem. Sat., 27 Oct. Mark A. Gorman II, University of Colorado, Boulder, Colo., +1-303-786-0999, mark.gorman@colorado.edu; Jason Pardo; Bryan Small; Ian Miller.

From the Crest of the Front Range to the Depths of the Denver Basin. Sat., 27 Oct. Shari Kelley, New Mexico Institute of Mining and Technology, Socorro, N.Mex., +1-505-661-6171, sakelley@ix.netcom.com; Bob Reynolds.

Geoarchaeological Context of Paleoindian Sites in Middle Park, Colorado. Cosponsored by *GSA Archaeological Geology Division*. Sat., 27 Oct. James H. Mayer, University of Arizona, Tucson, Ariz., +1-520-400-6470, jhmayer@email.arizona.edu; Todd Surovell.

Geoarchaeology of the Clary Ranch Paleoindian Sites, Western Nebraska. Sat., 27 Oct. David W. May, University of Northern Iowa, Cedar Falls, Iowa, +1-319-273-6059, dave.may@uni.edu; Dave Rapson; Matthew G. Hill.

Geology of the Cripple Creek Gold–Telluride Deposit, Colorado. Cosponsored by *Society of Economic Geologists; International Geological Correlations Program (IGCP486)*. Sat., 27 Oct. Paul G. Spry, Iowa State University, Ames, Iowa, +1-515-294-9637, pgspry@iastate.edu; Eric P. Jensen.

Hydrology and Geochemistry of the Boulder Creek Watershed. Sat., 27 Oct. Cosponsored by *U.S. Geological Survey; GSA Quaternary Geology and Geomorphology Division*. Philip L. Verplanck, U.S. Geological Survey, Denver, Colo., +1-303-236-1902, plv@usgs.gov; John Pitlick; Peter W. Birkeland; Sheila F. Murphy; Larry B. Barber; Travis Schmidt.

The Beautiful Vail Valley: A Classroom in Geologic Hazards and Mitigation. Cosponsored by *Colorado Geological Survey*. Sat., 27 Oct. Vincent Matthews, Colorado Geological Survey, Denver, Colo., +1-303-866-3028, vince.matthews@state.co.us; Jonathan White.

The K-T Boundary and Associated Volcanic Tuffs at West Bijou Creek, Denver Basin. Cosponsored by *EARTHTIME*. Sat., 27 Oct. Kirk R. Johnson, Denver Museum of Nature & Science, Denver, Colo., +1-303-370-6448, kirk.johnson@dmns.org; Samuel Bowring.

DURING THE MEETING

Old and New Geologic Studies along the Front Range between Golden and Morrison, Including Structural, Volcanic, and Economic Geology and Paleontology. Cosponsored by *Friends of Dinosaur Ridge; GSA Geoscience Education Division; GSA Sedimentary Geology Division*. Sun., 28 Oct. Chris Carroll, Friends of Dinosaur Ridge, Morrison, Colo., +1-303-697-3466, Carroll_Chris@msn.com; T. Caneer; Tim Connors; Norbert Cygan; Harald Drewes.

Revisiting the South Canon Number 1 Coal Mine Fire. Sponsored by *GSA Coal Geology Division*. Sun., 28 Oct. Glenn B. Stracher, East Georgia College, Swainsboro, Ga., +1-478-289-2073, stracher@ega.edu; Nancy Lindsley-Griffin; Steven Renner; Janet Lynn Stracher.

Behind the Scenes at the Denver Museum of Nature & Science. Tues., 30 Oct. Stephen M. Rowland, University of Nevada, Las Vegas, Nev., +1-702-895-3625, steve.rowland@unlv.edu.

Denver's Building Stones. Tues., 30 Oct. Robert G. Reynolds, Denver Museum of Nature & Science, Denver, Colo., +1-303-370-6047, denverbasin@dmns.org; Jack Murphy.

Kirk Bryan Field Trip: Fluvial-Hydraulic Processes in the Colorado Front Range. Cosponsored by *GSA Quaternary Geology and Geomorphology Division*. Tues., 30 Oct. John Pitlick, University of Colorado, Boulder, Colo., +1-303-492-5906, pitlick@colorado.edu; Ellen Wohl.

POSTMEETING

Late Quaternary through Holocene Landscape Evolution of the White River Badlands, South Dakota. Cosponsored by *Patrick Burkhardt, J. Elmo Rawling III, Jack Livingston, and Rachel Benton of Slippery Rock University; Badlands National Park*. Wed.–Sat., 31 Oct.–3 Nov. Patrick Burkhardt, Slippery Rock University, Slippery Rock, Pa., +1-724-738-2502, patrick.burkhardt@sru.edu; Rachel Benton; Michael Jahn; J. Elmo Rawling III; Jack Livingston.

A GeoMystery Field Trip to the Anton Escarpment. Cosponsored by *GSA Engineering Geology Division; GSA Quaternary Geology and Geomorphology Division*. Thurs., 1 Nov. David C. Noe, Colorado Geological Survey, Denver, Colo., +1-303-866-2432, dave.noe@state.co.us.

Aquifer Stratigraphy in the Denver Basin. Fri., 2 Nov. Robert G. Reynolds, Denver Museum of Nature & Science, Denver, Colo., +1-303-370-6047, denverbasin@dmns.org; John Moore; Marieke Dechesne; Steven A. Board.

Coeval Miocene Magmatism and Crustal Extension in the Colorado River and Death Valley Extensional Terrains. Thurs.–Sun., 1–4 Nov. J.P. Calzia, U.S. Geological Survey, Menlo Park, Calif., +1-650-329-5538, jcalzia@usgs.gov; O. Tapani Ramo; C.F. Miller.

Geomorphic Effects of a Catastrophic Forest Fire. Thurs., 1 Nov., Lee McDonald, leemac@cnr.colostate.edu; Robert Reynolds.

Integrated Analysis of Laramide to Holocene Deformation of the Northeastern Front Range Using 3-D Balancing and Comparative Fracture Analysis of Pre- and Post-Laramide Strata. Thurs., 1 Nov., Eric A. Erslev, Colorado State University, Fort Collins, Colo., +1-970-491-6375, erslev@warnercnr.colostate.edu; Scott M. Larson.

Laramide Paleoseismites of the Bighorn Basin. Thurs.–Sun., 1–4 Nov., Mervin J. Bartholomew, University of Memphis, Memphis, Tenn., +1-901-678-1613, jbrthlm1@memphis.edu; Kevin G. Stewart.

Old and New Geologic Studies along the Front Range between Golden and Morrison Including Structural, Volcanic, and Economic Geology and Paleontology. Cosponsored by *Friends of Dinosaur Ridge; GSA Geoscience Education Division; GSA Sedimentary Geology Division*. Thurs., 1 Nov. Chris Carroll, Friends of Dinosaur Ridge, Morrison, Colo., +1-303-697-3466, carroll_chris@msn.com; T. Caneer; Tim Connors; Norbert Cygan; Harald Drewes.

Stratal Architecture and Sequence Stratigraphy of the Mount Garfield Formation, Grand Junction Area, Colorado. Thurs.–Sat., 1–3 Nov. Diane L. Kamola, University of Kansas, Lawrence, Kans., +1-785-864-2724, kamola@ku.edu; Andrew S. Madof; Mustapha Zater.

Walking with Dinosaurs along Colorado's Front Range. Thurs., 1 Nov. Joanna Wright, University of Colorado, Denver, Colo., +1-303-556-6007, jwright@carbon.cudenver.edu.

New Perspectives and an Update on Continental Accretion—Colorado Style: Island Arcs and Backarcs of the Central Front Range. Fri., 2 Nov. Thomas R. Fisher, Colorado School of Mines, Golden, Colo., +1-303-349-2303, tfisher@mines.edu; Lisa Rae Fisher.

Future GSA Annual Meetings

2008*	Houston, Texas (5–8 October)
2009	Portland, Oregon (18–21 October)
2010	Denver, Colorado (31 October–3 November)
2011	Minneapolis, Minnesota (9–12 October)

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

FLOODS, FAULTS, and FIRE

Geological Field Trips in Washington State and
Southwest British Columbia

Edited by Pete Stelling and David S. Tucker



Field Guide 9

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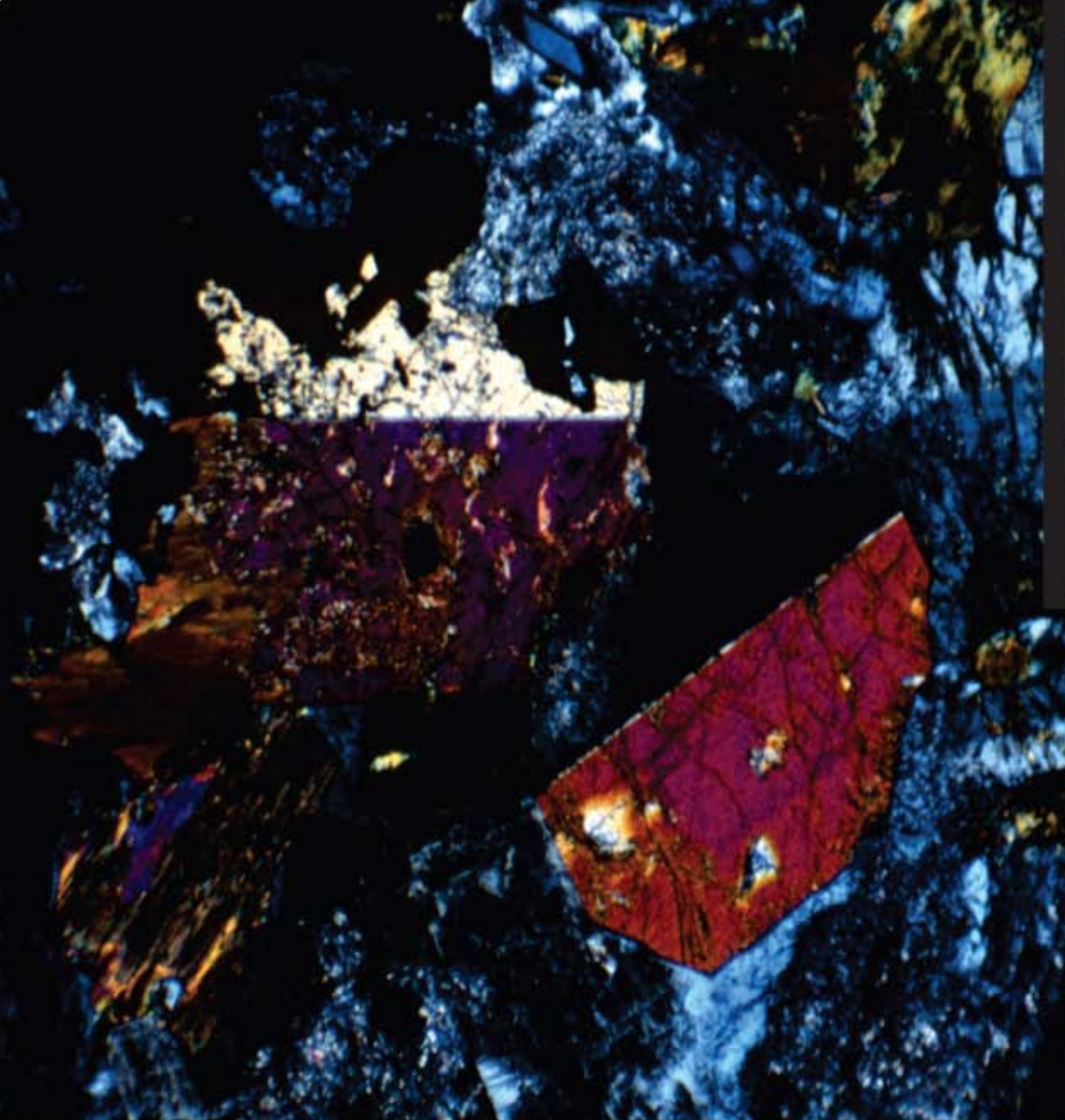
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Denver 2007 Short Courses

Early Registration Deadline: 24 Sept. 2007

Registration information, prices, and course descriptions will be published online at www.geosociety.org/meetings/2007/cw.htm and in the June issue of *GSA Today*. For additional information, contact Jennifer Nocerino, jnocerino@geosociety.org.

PROFESSIONAL COURSES

Estimating Rates of Groundwater Recharge

Sat., 27 Oct., 8 a.m.–5 p.m. Rick Healy, U.S. Geological Survey; Bridget Scanlon, Bureau of Economic Geology, University of Texas at Austin

Laser Ablation ICP-MS: Fundamentals and Applications to Geological, Environmental, and Biological Problems

Sun., 28 Oct., 8 a.m.–5 p.m. Alan Koenig, U.S. Geological Survey; Ian Ridley, U.S. Geological Survey

FACULTY AND GRADUATE STUDENT COURSES

Sequence Stratigraphy for Graduate Students

Fri.–Sat., 26–27 Oct., 8 a.m.–5 p.m. K.M. Campion, ExxonMobil Upstream Research Company; A.D. Donovan, British Petroleum

Three-Dimensional Geologic Mapping for Groundwater Applications

Sat., 27 Oct., 8 a.m.–5 p.m. Richard C. Berg, Illinois State Geological Survey; Harvey Thorleifson, Minnesota Geological Survey; Hazen Russell, Geological Survey of Canada

Processing and Analysis of GeoEarthscope and Other Community LiDAR Topography Datasets

Sat., 27 Oct., 9 a.m.–5 p.m. Ramon Arrowsmith, Arizona State University; Chris Crosby, Arizona State University; David Phillips, UNAVCO

New Tools for Quantitative Geomorphology: Extraction and Interpretation of Stream Profiles from Digital Topographic Data

Sun., 28 Oct., 9 a.m.–5 p.m. Kelin Whipple, Arizona State University; Cameron Wobus, University of Colorado; Eric Kirby, Pennsylvania State University; Benjamin Crosby, Idaho State University

Seismic Data Usage for Undergraduates: Options for Both Majors and Non-Majors

Sat., 27 Oct., 8 a.m.–5 p.m. Michael Hubenthal, Incorporated Research Institutions for Seismology (IRIS) Consortium; Michael Wyssession, Washington University; John Taber, IRIS Consortium; Jeff Barker, Binghamton University

Teaching Field Methods in Hydrogeology

Sat., 27 Oct., 8 a.m.–5 p.m. Todd Halihan, Oklahoma State University; Shemin Ge, University of Colorado

Introduction to the "Learning with Data Workshop"

Sun., 28 Oct., 8 a.m.–noon. William A. Prothero, Jr., University of California at Santa Barbara; Sabina Thomas, Baldwin Wallace College

Strategies for Successful Recruitment of Geoscience Majors: Conceptual Framework and Practical Suggestions

Sat., 27 Oct., 9 a.m.–5 p.m. Randall M. Richardson, University of Arizona; Carolyn Eyles, McMaster University

Starting Out in Undergraduate Research and Education: A Professional Development Workshop for Young Faculty

Cosponsored by *Council on Undergraduate Research*; *National Association of Geoscience Teachers*. Sat., 27 Oct., 8 a.m.–5 p.m. Jeffrey G. Ryan, University of South Florida; Lydia K. Fox, University of the Pacific; Jill Singer, Buffalo State College.

Education Research: An In-Depth Look at Qualitative Methods

Sat., 27 Oct., 1–5 p.m. Julie Sexton, Colorado State University

K–12 TEACHER COURSES

Teaching College-Level Earth Science to High-School Students

Sat., 27 Oct., 8 a.m.–noon. Wendy Van Norden, Harvard-Westlake School; Raymond V. Ingersoll, University of California at Los Angeles

Using GPS Data to Learn about Tectonic Plate Movement, Earthquakes, Volcanoes, and Other Applications: A Workshop for Educators in Secondary Education

Sun., 28 Oct., 1–5 p.m. Susan C. Eriksson, UNAVCO; Shelley E. Olds, UNAVCO



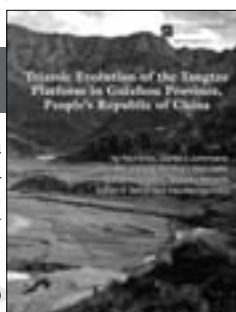
Special Paper 417

Triassic Evolution of the Yangtze Platform in Guizhou Province, People's Republic of China

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Mentor Programs at the Denver 2007 GSA Annual Meeting

You can read full program descriptions at www.geosociety.org/science/. For additional information, contact Jennifer Nocerino, jnocerino@geosociety.org.

Geology in Government Mentor Program

Mon., 29 Oct., 11:30 a.m.–1:30 p.m. A free lunch for undergraduate and graduate students will be provided at this popular annual event, which features a select panel of mentors representing various government agencies. These mentors 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. **Registration not required.**

Careers Roundtable Discussions Program

Tues., 30 Oct., 11:30 a.m.–1:00 p.m. 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.**

John Mann Mentors in Applied Hydrogeology Program

Date TBA. This program underwrites the cost for up to 25 students to attend the distinguished Hydrogeology Division Luncheon and Awards Presentation. **Eligible students are those who have: (1) checked the box on their membership application indicating their professional interest in hydrology or hydrogeology, and (2) registered for the Annual Meeting by 14 September 2007.** Tickets will be awarded to the first 25 students who respond to an **e-mail invitation**, based on the eligibility criteria noted here. The lucky recipients of these free tickets will have the chance to meet with some of the nation's most distinguished hydrogeologists. **Registration required.**

Denver 2007 Registration Information

Early Registration Deadline: 24 September

Cancellation Deadline: 1 October

REGISTRATION FEES

	EARLY	STANDARD/ON-SITE
Prof. Member—Full Meeting	\$310	\$399
Prof. Member—1 Day	\$205	\$225
Prof. Member >70—Full Meeting	\$255	\$340
Prof. Member >70—1 Day	\$150	\$175
Nonmember Prof.—Full Meeting	\$405	\$499
Nonmember Prof.—1 Day	\$240	\$265
Student Member—Full Meeting	\$99	\$135
Student Member—1 Day	\$70	\$75
Nonmember Student—Full Meeting	\$130	\$165
Nonmember Student—1 Day	\$85	\$90
High School Student	\$40	\$40
K–12 Teacher—Full Meeting	\$45	\$50
K–12 Teacher Member—Short Course Only	no fee	no fee
Field Trip or Short Course Only	\$40	\$40
Guest or Spouse	\$85	\$90
Low Income Country*	50% of category fee	50% of category fee

*GSA is now offering a 50% discount on annual meeting registration fees for individuals who are both residing in and are citizens of low and low-middle income countries as classified by the World Bank.

Further registration information will be printed in the June issue of *GSA Today* and posted at www.geosociety.org in early June. Online registration begins in early June.

GSA will provide each meeting registrant (field trip or short course only and guest or spouse registrants excluded) with a copy of the *Abstracts with Programs* on CD-ROM. The 2007 Section Meeting Abstracts are also included on the CD.

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 when you register! 100% of the contributions received will go to help fund student travel. To get the fund started off on the right foot, GSA and GSA Foundation are both happy to contribute US\$1,000 each.

LODGING

The 2007 GSA Annual Meeting headquarters hotel is the new Hyatt Regency Denver at the Colorado Convention Center. Most activities will take place at the Colorado Convention Center and the Hyatt Regency. Denver offers high-quality, affordable hotels near the convention center; GSA has booked rooms at 8 hotels, offering special convention rates starting at US\$119.00 per night. Additional housing information will be included in the June issue of *GSA Today* as well as on the meeting Web site, www.geosociety.org/meetings/2007/, beginning in June.

Graduate School Information Forum

Exhibit Hall

Sun., 28 Oct., 8 a.m.–7:30 p.m. • Mon.–Wed., 29–31 Oct., 8 a.m.–5:30 p.m.

Take full advantage of this opportunity to promote your school to over 1,500 students at the upcoming GSA Annual Meeting and Exposition in Denver, Colorado!

Meet face-to-face with prospective students in a relaxed, informal setting. GSIF booths will be located in the Exhibit Hall between the exhibits and poster sessions. The forum opens Sunday, 28 October, at 8 a.m. and will remain open into the evening (until 7:30 p.m.) so that students at the welcoming party will have a chance to stop by. Monday through Wednesday, GSIF hours run from 8 a.m. to 5:30 p.m.

You may book a booth in the forum for one day or up to all four days. Space is limited: Sunday and Monday will be the first to sell out, so reserve early! Schools reserving multiple days will be assigned first and to the most visible booths.

Reserve your space at https://rock.geosociety.org/forms/xGSIF_form.asp.

Participating schools will be promoted in the September *GSA Today* (pending submittal date of reservation form), the 2007 Annual Meeting Program, and e-mail links on the GSA Web site so prospective students may schedule appointments prior to the Annual Meeting.

For more information, contact Kevin Ricker, +1-303-357-1090, kricker@geosociety.org.

GSA TRIVIA NIGHT

Tues., 30 Oct., 7–9 p.m.
Come test your knowledge of geoscience trivia at this evening of fun. Over 100 questions have been prepared to rack your brain and test your skills! Come as a team or join a mixed team, meet new people, share your knowledge, and have a great evening in Denver! Winning teams will be awarded fabulous prizes and the prestige of being GSA Trivia Night winners!

Registration not required.

Denver 2007 Guest Program

Guest Hospitality Suite Hours

Sun.–Wed., 28–31 Oct. 2007, 8 a.m.–5:30 p.m.

Spouses, family members, and friends of meeting attendees:

We encourage you to accept this invitation to register for our Guest Program at the 2007 GSA Annual Meeting.

Make plans to participate on 28–31 October, and get ready to be pampered!

The guest or spouse registration fee of only US\$85 per person (\$90 after 24 Sept.) applies to non-geologist spouses, family members, and friends of professional and/or student registrants at the GSA Annual Meeting. The guest registration fee is required for entrance to the Exhibit Hall and covers guest activities, seminars, and workshops (to be listed in the June issue of *GSA Today*), as well as refreshments in the Guest Hospitality Suite. The guest registration fee will NOT provide access to all technical sessions; however, guests can sign in with the hostess in the Guest Hospitality Suite and get a visitor badge allowing them to attend a specific presentation. Registration for the Guest Program begins in June.

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

Please contact Erin Pitner with any guest program questions: epitner@geosociety.org.

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EMPLOYMENT

SERVICE CENTER

GSA will again offer its popular Employment Service Center (ESC) at this year's Annual Meeting in Denver. This service matches employers with job seekers for onsite interviews, message exchange, and more.

Last year, 384 interviews were conducted with 148 registered applicants for applied, government, and academic positions in the geosciences.

Register early for the best exposure in the ESC Web-based database, which is accessible by participating employers.



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STUDENTS:

Apply for Travel Grants Today!

The GSA Foundation has made US\$4,500 in grants available 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 Section Web sites 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.

Rocky Mountain www.geosociety.org/sectdiv/rockymtn/
Kenneth E. Kolm, +1-303-231-9115, ext.110, kkolm@bbl-inc.com

North-Central www.geosociety.org/sectdiv/northc/
Joseph T. Hannibal, +1-216-651-6981, jhannibal@cmnh.org

Northeastern www.geosociety.org/sectdiv/northe/
Stephen G. Pollock, +1-207-780-5353, pollock@usm.maine.edu

South-Central www.geosociety.org/sectdiv/southc/
Matthew W. Totten, +1-785-532-2227, mtotten@ksu.edu

Southeastern www.geosociety.org/sectdiv/southe/
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ATTENTION ALL STUDENT MEMBERS!



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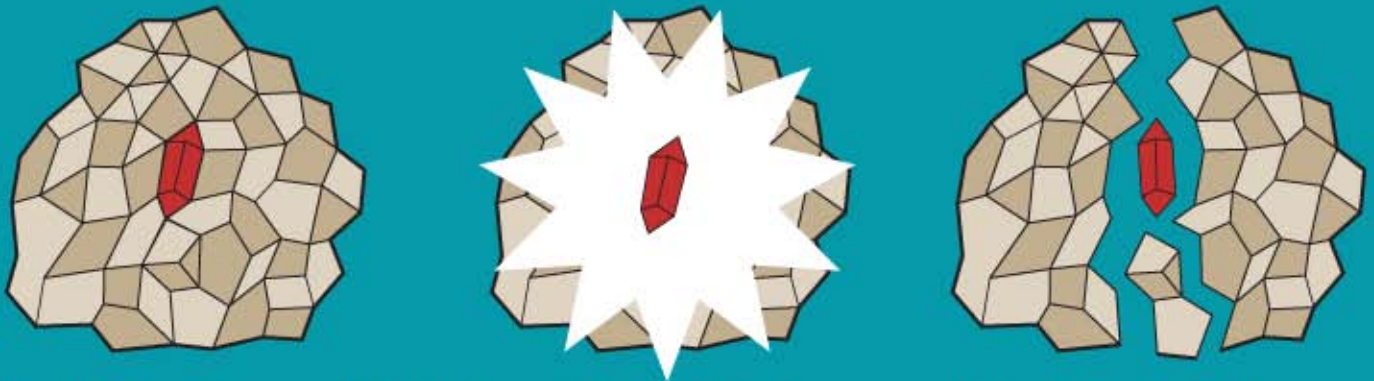
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GEOLOGIC PAST

Highlighting Articles from *GSA Bulletin*

ONE INTERESTING MEETING

Proceedings of the Forty-Fourth Annual Meeting of the Geological Society of America

At GSA's 44th Annual Meeting (1931), quite a few papers were presented by geologists of note. Their abstracts appear in the *Proceedings (GSA Bulletin, v. 43, p. 1–220)*; two are highlighted here.

Whose Hypothesis Was It?

Frank Bursley Taylor's abstract addressed the so-called "Taylor-Wegener Hypothesis" of continental drift (p. 173), remarking, "Since the views of the two authors differ in several respects, and the first-named author's paper preceded the earliest of Wegener's published work, it seems best to discontinue the hyphenated relation." Taylor followed with a brief explanation of his understanding of the "splitting of [Earth's] crust" and the "deforming force pulling it toward the equator," noting that Greenland "stuck fast while the crust around it moved." See Taylor's 1910 article on continental drift in *GSA Bulletin, v. 21, p. 179–226*; for a brief summary, see page 29 of the July 2005 issue of *GSA Today*, or view it on the Web at <ftp://rock.geosociety.org/pub/GSAToday/gt0507.pdf>.

How Did They Get There?

At that 1931 meeting, **Bailey Willis**, GSA President in 1928, presented the abstract (p. 120) that would develop into his seminal paper, *Isthmian Links (GSA Bulletin, v. 43, p. 917–952)*.

He began the abstract with this statement and call to action: "It is being established beyond question by biological evidence that migrations of terrestrial organisms have occurred in the past, where now wide seas intervene, the fact of former connections between such continents as South America and Africa or Africa and India demands recognition and explanation." His methodical and thorough paper published in the same volume went on to do just that.

The Penrose Legacy

Alfred C. Lane's President's Report (p. 7–9) acknowledged the generous bequest left to the Society by his friend and colleague, **R.A.F. Penrose**, just months before the 1931 meeting. Penrose's philosophy behind the bequest was clear in this excerpt from a 1929 letter included in Lane's report (p. 8–9): "... a national institution like the Geological Society of America, which is not bound to any particular institution but is on terms of friendship and good will with all of them, might be the best source through which to distribute the funds of a paleontologic or other geologic endowment."

The December 1931 meeting took place in Tulsa, Oklahoma, only the second GSA Annual Meeting to be held west of the Mississippi.

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Washington's Changing Climate

Craig Cooper, 2006–2007 GSA–U.S. Geological Survey
Congressional Science Fellow

What is life like on “the Hill” this year? Probably the best answer I can give is “two PowerBars, a bag of nuts, and a leftover muffin”—none of which has been supplied by lobbyists. It has been so busy and unpredictable that even eating cannot be taken for granted! On the geopolitical scale, the 2006 elections were a major tectonic event that reshaped the political landscape, and the aftershocks are still being felt. The new political morphology has yet to be fully characterized, but one rapidly expanding hotspot is the climate change debate. The Senate Environment and Public Works Committee of the previous Congress (109th) held hearings on climate change in which the star witness was Michael Crichton, a climate skeptic best known for writing science fiction. The list of potential witnesses for the new 110th Congress includes such established leaders as Al Gore, former World Bank chief economist Sir Nicholas Stern, and Governor Arnold Schwarzenegger. In the case of Governor Schwarzenegger, I find it interesting that life may imitate art, with the Terminator warning us of the potentially catastrophic implications of our actions.

As important as the 2006 elections have been in reshaping the debate on this issue, they are only one factor among many. Like physical landscapes, political landscapes are the result of numerous interlocking forces. The climate change debate has been shaped by the efforts of many people over many years—all of it building political pressure to take action. Recently, the pressure to act has become overwhelming. The combination of forces, including the Stern Review; the recent Intergovernmental Panel on Climate Change (IPCC) report; the film *An Inconvenient Truth*; California's commitment to reduce its overall greenhouse gas emissions to 1990 levels by 2020; the coalition of northeastern states' adoption of the Regional Greenhouse Gas Initiative (RGGI), in which they agreed to work together to reduce greenhouse gas emissions from electric utilities; and the U.S. Climate Action Partnership (USCAP), through which major corporations recently announced support for mandatory climate change legislation, have fundamentally altered the structure of the climate change debate. Aside from a small minority of hardcore skeptics, officials in Washington are no longer debating whether climate change is real or whether human activities are the primary cause. The debate has shifted to the question of what we can do that is effective, pragmatic, and economically sustainable in the context of a changing climate. This tough question has inspired vigorous debate.

I'm grateful that GSA has provided me with the unique opportunity to participate in this debate. As a legislative fellow in the office of California Senator Dianne Feinstein, I am helping to craft a sector-by-sector approach that has economy-wide coverage. This approach includes five bills: utility sector cap and trade, industrial sector cap and trade, improving fuel economy standards, promoting low-carbon fuels, and improving energy efficiency. The utility bill (S.317), introduced by Senator Feinstein and Delaware Senator Tom Carper, is supported by six leading electric utility companies. To me, this endorsement demonstrates that America is ready to act—if only our political leaders will join us.

Many different approaches to climate change are being considered in the Senate, and nobody knows what will come out of committee hearings—or what can pass on the Senate floor. The yet-to-be-determined bill that emerges will likely reflect

the general principles of the USCAP “Call for Action” and be somewhere between what California and RGGI have adopted. The consensus seems to be that such a bill would face an uphill battle in the Senate, where 60 votes are needed to avoid filibuster.

Climate change issues are only part of what I am working with and learning about during my fellowship. Another lesson I've learned is that policy is as different from science as the Hadean is from the Cenozoic. Policy is about discovering how to resolve the differences between what people believe, and some policy makers' definition of science can be described as “what the science community believes.” Communicating effectively with policy makers requires that we accept science as only one of many considerations, and often not as the most important one to politicians. It also helps to remember that the public rarely forgets the times when scientists have “gotten it wrong” and may be suspicious that the science isn't correct this time either. Communicating with policy makers requires a fair amount of humility, a skill I'm still learning. Practice helps, which is why I caught myself wondering, “Which has the smallest carbon footprint: the PowerBars, the bag of nuts, or the leftover muffin?”

This manuscript is submitted for publication by Craig Cooper, 2006–2007 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. 06HQGR0169. 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. Cooper can be reached at craig_cooper@feinstein.senate.gov.



Stimulate Growth and Change

Serve on a GSA Committee!

2008–2009 COMMITTEE VACANCIES

Terms begin 1 July 2008 and run for three years (unless otherwise indicated).

GSA is seeking candidates to serve on Society committees and as GSA representatives to other organizations. Contribute to our science by volunteering yourself or nominating others you think should be considered for any of the following openings. Younger members are especially encouraged to become involved in Society activities. (**Graduate Students:** You are eligible to serve on GSA committees as full members, and Council encourages you to volunteer or nominate others for committee service.) If you volunteer or make recommendations, please give serious consideration to the specified qualifications for serving on a particular committee. **Please be sure that your candidates are GSA Members or Fellows and that they fully meet the requested qualifications.**

Volunteer or nominate online! The nomination form and instructions are available at www.geosociety.org/aboutus/commtees. Click on the **Nominate Online for 2008–2009** button to access a secure form. If you prefer, you may download and complete the paper nomination form, also located at this site, and return it to Pamela Fistell, GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA, fax +1-303-357-1070. If you have questions, please contact Pamela Fistell, +1-303-357-1000 ext. 0, 1-800-472-1988 ext. 0, or pfistell@geosociety.org.

Nominations received at GSA headquarters by **15 July 2007** on the official one-page form will be forwarded to the Committee on Nominations. Please use one form per candidate. Information provided on the form will assist the committee members with recommendations for the July 2008 committee vacancies. The committee will present at least two nominations for each open position to GSA Council at its fall meeting. Appointees will then be contacted and asked to serve, thus completing the process of bringing new expertise into Society affairs.

Academic and Applied Geoscience Relations Committee (AM, T/E)

Three member-at-large vacancies

Strengthens and expands relations between GSA Members in the academic and applied geosciences. Proactively coordinates the Society's effort to facilitate greater cooperation between academia, industry, and government geoscientists. **Qualifications:** Members from academia,

industry, and government who are committed to developing better integration of applied and academic science in our meetings, publications, short courses, field trips, and education and outreach programs.

Arthur L. Day Medal (T/E)

Two member-at-large vacancies

Selects candidates for the Arthur L. Day Medal. **Qualifications:** knowledge of those who have made "distinct contributions to geologic knowledge through the application of physics and chemistry to the solution of geologic problems."

Geology and Public Policy (AM, B/E, T/E)

Two member-at-large vacancies

Translates knowledge of earth sciences into forms most useful for public discussion and decision making. **Qualifications:** experience in public-policy issues involving the science of geology; ability to develop, disseminate, and translate information from the geologic sciences into useful forms for the general public and for GSA Members; familiarity with appropriate techniques for the dissemination of information.

GSA Public Service Award (T/E)

One member-at-large vacancy

Generates, receives, and evaluates candidate nominations for the GSA Public Service Award and the AGI Outstanding Contribution to the Public Understanding of the Geosciences Award. Each award is given in recognition of outstanding individual contributions to either the public awareness of the earth sciences or the scientific resolution of earth-science problems of significant societal concern. **Qualifications:** knowledge of those whose contributions and accomplishments have enhanced the general public's understanding of earth science.

Honorary Fellows (T/E)

Two member-at-large vacancies

Selects candidates for Honorary Fellows, who are usually non-North Americans. **Qualifications:** knowledge of geologists throughout the world who have distinguished themselves through their contributions to science.

Membership (B/E)

Three vacancies: One member-at-large; one member-at-large, government-employment category; one member-at-large, student category

Evaluates membership benefits and develops recommendations that address the changing needs of the Society's membership, attracts new members, and recommends new GSA Fellows to Council. **Qualifications:** experience in benefit, recruitment, and retention programs is desired.

July 2008 Committee Vacancies: *Extensive time commitment required AM—Meets at Annual Meeting
B/E—Meets in Boulder or elsewhere T/E—Communicates by phone or electronically

Minorities and Women in the Geosciences (AM)

Three member-at-large vacancies

Stimulates recruitment and promotes positive career development of minorities and women in the geoscience professions. **Qualifications:** familiarity with the education and employment issues of minorities and women; expertise and leadership experience in such areas as human resources and education desired.

Nominations (B/E, T/E)

One member-at-large vacancy

Recommends nominees to Council for the positions of GSA Officers and Councilors, Committee members, and Society representatives to other permanent groups. **Qualifications:** familiarity with a broad range of well-known and highly respected geological scientists.

Penrose Conferences and Field Forums (T/E)

One member-at-large vacancy

Reviews and approves Penrose Conference proposals and recommends and implements guidelines for the success of the conferences. **Qualifications:** past convener of a Penrose Conference or a Field Forum.

Penrose Medal (T/E)

Two member-at-large vacancies

Selects candidates for the Penrose Medal. Emphasis is placed on "eminent research in pure geology, which marks a major advance in the science of geology." **Qualifications:** familiarity with outstanding achievers in the geosciences who are worthy of consideration for the honor.

Professional Development (T/E)

Two member-at-large vacancies

Directs, advises, and monitors GSA's professional development program, reviews and approves proposals, recommends and implements guideline changes, and monitors the scientific quality of courses offered. **Qualifications:** familiarity with professional development programs or adult education teaching experience.

Research Grants* (B/E)

Seven member-at-large vacancies

Evaluates student research grant applications and selects grant recipients. **Qualifications:** should have experience in directing research projects and in evaluating research grant applications.

Treatise on Invertebrate Paleontology Advisory Committee (AM)

One member-at-large (paleontologist) vacancy

Advises Council, the Committee on Publications, and the *Treatise* editor on matters of policy concerning this publication. **Qualifications:** must be a paleontologist.

Young Scientist Award (Donath Medal) (T/E)

Two vacancies: One member-at-large; one councilor/former councilor

Investigates the achievements of young scientists who should be considered for this award and makes recommendations to Council. **Qualifications:** should have knowledge of young scientists with "outstanding achievement(s) in contributing to geologic knowledge through original research which marks a major advance in the earth sciences."

GSA REPRESENTATIVES TO OTHER ORGANIZATIONS

GSA-AAAS Consortium of Affiliates for International Programs (CAIP) (AM, B/E)

One GSA Representative vacancy (1 Jan. 2009–31 Dec. 2011)

Encourages cooperation on projects with international aspects and facilitates networking in its member societies. Meets twice yearly, providing a forum for scientific societies to discuss their international activities and exchange information on the status of international science.

AAPG Publication Pipeline Committee (B/E)

One GSA Conferee vacancy (1 July 2008–30 June 2011)

Provides the best-possible advice to assist the committee in its efforts to improve the task process and to spread the word of its activities to retired GSA Members or others who wish to dispose of books for donation to overseas libraries.

North American Commission on Stratigraphic Nomenclature (NACSN) (AM, possibly B/E)

One GSA Representative vacancy (Nov. 2008–Nov. 2011)

Develops statements of stratigraphic principles, recommends procedures applicable to classification and nomenclature of stratigraphic and related units, reviews problems in classifying and naming stratigraphic and related units, and formulates expressions of judgment on these matters.



COMMITTEE, SECTION, AND DIVISION VOLUNTEERS: COUNCIL THANKS YOU!

The GSA Council acknowledges the many Member-volunteers who, over the years, have contributed to the Society and to our science through involvement in the affairs of the The Geological Society of America.

July 2008 Committee Vacancies: *Extensive time commitment required AM—Meets at Annual Meeting
B/E—Meets in Boulder or elsewhere T/E—Communicates by phone or electronically

GSA Committees: Progress through Service

The Geology and Public Policy Committee

Last year, working directly with GSA's executive director and president, the GPPC engaged in a particularly important effort to develop

The Geology and Public Policy Committee (GPPC) is GSA's centerpiece component in the effort to guide, facilitate, and encourage the engagement of the Society, its Members, and the broader geoscience community in public policy dialogue. The GPPC is charged with developing and disseminating information from the geological sciences, thereby promoting the use of that information in public policy formulation. The committee, in accord with the objective of the GSA to advance the science of geology, uses education in its broadest sense by translating earth-science knowledge into forms most useful for public discussion and decision making.

It is increasingly important that the geosciences community be involved in the public policy-making process. This need derives from two considerations. First, for many of the most prominent issues—e.g., energy, mineral resources, sustainability, global warming, water supply and quality—it is critical that public policy dialogue be informed by the thoughtful input of geoscientists. Second, many of those issues carry with them implications relative to the funding of various programs and initiatives on which geoscientists depend for the support of their home institutions and their research.

THE GPPC AT WORK

The GPPC, with its broad and vital mandate, is very active. The committee directs its educational efforts not only toward the leadership of GSA and the membership at large, but also toward the general public. These efforts include preparation of articles for publication, sponsorship of symposia, and other methods of communication to the broadest audience. An important element of this effort is the preparation of position statements and white papers. Recent position statements (www.geosociety.org/aboutus/position.htm) have covered global climate change, evolution, natural hazards policy, and geosciences data preservation. Statements on water resources, minerals and energy policy, and landscape degradation are currently in the works. The preparation of these position statements takes considerable thought and effort, but that effort has little value if the position statements are not used. Therefore, the GPPC is continually seeking new and better ways to encourage GSA Members to use the statements as they engage in policy issues at all levels of government.

a conceptual plan for the National Leadership Initiative (NLI), which is presented in a white paper that you can access via www.geosociety.org/geopolicy/. The NLI will further GSA's core mission to be a leader in advancing the geosciences, enhancing the professional growth of GSA's 20,700 members, and promoting the geosciences in the service of humankind.

SERVING ON THE GPPC

GPPC members represent a balance of individuals from academia, government, and the private sector, with expertise in engineering geology, hydrogeology, mineral resources, energy resources, Quaternary geology, geochemistry, and geophysics. GSA's six Sections and the Geology and Society Division have representatives on the GPPC. Each year, GSA and the U.S. Geological Survey jointly sponsor a Congressional Science Fellow (CSF); the two most recent CSFs are members of the GPPC. Committee members also include a Council liaison and conferees from the American Geological Institute, the Association of American State Geologists, and the American Geophysical Union. GSA's executive director serves as Headquarters liaison.

The GPPC welcomes input from GSA Members on subjects for new position statements and white papers, as well as other actions Members would like the committee to undertake. Individuals interested in working on new statements and in serving on this important committee are especially welcome.

You can volunteer to serve on the GPPC or nominate someone you know would fit well with the GPPC's mission: See page 52 of this issue to find out how.

Editor's note: This article is the first in a series highlighting the work of GSA's committees. Look for articles on the Joint Technical Program Committee, the Annual Program Committee, the Awards Committee, and the Research Grants Committee in upcoming issues of GSA Today.



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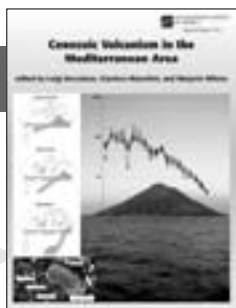
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The Kerry Kelts Research Awards of the Limnogeology Division

APPLICATION DEADLINE: 10 AUGUST 2007

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 US\$350 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, Kevin M. Bohacs, kevin.m.bohacs@exxonmobil.com.

Awards will be announced in October at the Limnogeology Division Business Meeting and Reception at the 2007 GSA Annual Meeting in Denver.

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.

2007

GSA Section Meetings

Joint Meeting
**South-Central and
North-Central Sections**
11–13 April 2007
Kansas Memorial Union, University of Kansas
Lawrence, Kansas


Information: Greg Ludvigson, +1-785-864-2734, gludvigson@kgs.ku.edu or Greg Ohlmacher, +1-785-749-4502, ohlmac@kgs.ku.edu; both at Kansas Geological Survey, University of Kansas, 1930 Constant Ave., Lawrence, KS 66047-5317, USA.

Cordilleran Section
4–6 May 2007
Western Washington University
Bellingham, Washington


Information: Bernie Housen, Western Washington University, Dept. of Geology, MS 9080, 516 High St., Bellingham, WA 98225-5946, USA, +1-360-650-6573, bernieh@cc.wvu.edu.

Rocky Mountain Section
7–9 May 2007
Dixie Center
St. George, Utah

Information: Jerry Harris, Dixie State College, Science Building, 225 South 700 East, St. George, UT 84770-3875, USA, +1-435-652-7758, jharris@dixie.edu.



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CALL FOR NOMINATIONS

Sixteenth Annual Biggs Award

for Excellence in Earth Science Teaching for Beginning Professors

GSA established the Biggs Award to reward and encourage teaching excellence in beginning college-level earth science professors.

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) may be nominated for this award.

AWARD AMOUNT

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

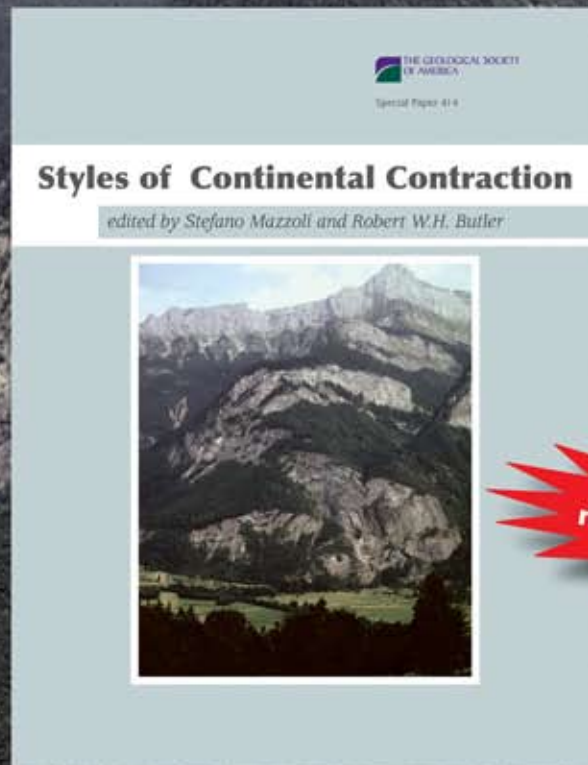
DEADLINE AND NOMINATION INFORMATION

Nomination forms (*and updated nomination guidelines*) for the 2007 Biggs Earth Science Teaching Award are posted at www.geosociety.org/aboutus/awards/biggs.htm. Or, contact the Program Officer of Grants, Awards, and Recognition at +1-303-357-1028, awards@geosociety.org. Nominations must be received by **9 June 2007**.

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

Styles of Continental Contraction

edited by Stefano Mazzoli and Robert W.H. Butler



**\$60.00,
member price \$42.00**

This Special Paper includes a selection of material on the various contractional styles and modes of deformation in internal and external zones, and in deep and shallow parts of orogens. The collection of case studies discusses a broad range of processes and phenomena, including thrust tectonic styles (detachment-dominated vs. thick-skinned, or crustal ramp-dominated) in different subduction and collision orogens; modes and timing of thrust-fold and fabric development; the role of tectonic inversion processes and of strain localization vs. distributed deformation; and syn-convergence extensional deformation (and related tectonic exhumation) in orogens. Case studies are

from the Zagros, the Apennines, the Appalachians, the Tasmanides of Eastern Australia, and the Moine Thrust Belt. A review of the main subduction- and collision-related orogens of the world is also provided, including the Alps, the Himalayas, the North American Cordillera, the Andes, the Caledonides of Scotland, the Appalachians, the Alice Springs orogeny in Australia, and the Aleutian and Makran accretionary wedges.

SPE414, 184 p., ISBN-10: 0-8137-2414-7;
ISBN-13: 978-0-8137-2414-0

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“Would some form of accreditation of academic programs be beneficial to the geosciences?”

That profound question has been under debate in our profession for some time and in many ways. Several different professional societies have considered accreditation, and multiple surveys have been conducted. Currently, GSA has an ad hoc committee studying the question. The committee was appointed to follow up on discussions that began in the meeting of the GSA Associated and Allied Societies in February 2004; discussions have continued in subsequent meetings of that and other groups within GSA.

In September 2006, as a prelude to the first meeting of the ad hoc committee on accreditation, GSA conducted a survey of academic department chairs. The survey asked the chairs to identify pros and cons, and concluded with a direct question, “Are you in favor of some type of accreditation for academic programs in the geosciences?” The number of responses to the survey was an unusually high 34% (225 returned of 662 distributed), and the responses to the direct question were 51% (115) “no” and 49% (110) “yes.” Sorting the responses by department size (number of graduating majors per year) shows that the proportion of yes responses is inversely related to department size (the smaller departments responded 60% “yes” and 40% “no”).

The following is a listing of pros and cons derived from the survey, from volunteered correspondence, and from committee discussions:

The primary points in favor of accreditation say that it may:

- enhance professional recognition of the geosciences;
- assist departments in obtaining resources;
- strengthen the geosciences (as the American Chemical Society strengthens chemistry);
- enhance the role of the geosciences in K–12 education;
- identify a common knowledge base for the geosciences;
- establish standards for curriculum content; and
- provide a basis for assessment tools.

The primary points opposing accreditation say that it may:

- be too restrictive and too controlling of curriculum design in individual departments;
- require excessive time and energy to establish and administer;
- stifle innovation in our rapidly evolving science;
- leave some subdisciplines out;
- restrict the number and diversity of students; and
- lead to the closure of small departments.

We have begun a healthy debate, one that is a vital component of our overall concern for the future of the geosciences. We are a growing science: in the quality of our science, in the numbers of professional practitioners, in the diversity of subdisciplines, in innovative and interdisciplinary research, and in the practical applicability of our results. Yet we remain concerned about the degree of public and political recognition we receive, as manifest in our dissatisfaction with our professional stature relative to other fields, in levels of funding for our research, in the use of our expertise in public policy decisions, and in levels of salaries for our graduates. A greater unity and sense of common purpose will improve our status. The immediate question before us is whether some form of academic accreditation will help move the geosciences toward the corporate goals to which we all aspire.

The ad hoc committee will continue to explore the general question. For example, we are studying the system of accreditation that is already well established in the UK. Our previously circulated survey referred to accreditation only in a generic way; however, the responses commonly addressed assumed specifics. As a follow-up, we will prepare a straw program, incorporating the features that are viewed favorably and eliminating features that are viewed unfavorably. We will conduct another survey with the specifics of the straw program to obtain feedback. We already have received the comment, “If it ain’t broke, don’t fix it.” There are many indications that our current status may not be exactly “broke,” but on the other hand, few would argue that we have everything we would like to have as a science and a profession. We all agree that it is our obligation to provide the best opportunity for the next generation of geoscientists; now our responsibility is to strive to find the best way to do that. Clearly, we can do better than the status quo; to be workable, any solution must have widespread support and collaboration. We solicit your comments and concrete suggestions*. Opinions that this is a great idea or that it would be a disaster are not particularly helpful; we need explanations of how and why something might work or might not work. From those explanations, we can work toward ultimate solutions.

For the committee, Bill Thomas, chair

Committee members: Michael Arthur, Jack Sharp, Randy Keller, Chris Hepburn, John Anderson, Darrel Schmitz, Ira Sasowsky, Robert Eves, Joan Fryxell, Ed Roy, Mary Beth Gray, David Best, Edmund Nickless, Duane A. Eversoll, Jack Hess

*Go to www.geosociety.org/aboutus/accreditation.htm.



Northeastern Section Endowment Fund Announcement

The Management Board of the Northeastern Section of The Geological Society of America has approved a five-year fund-raising program to increase its endowment fund in The Geological Society of America Foundation to US\$500,000. The fund raising cycle began at the forty-second annual meeting of the Northeastern Section and will conclude with the fiscal year ending 30 June 2012. The Northeastern Section Endowment Fund was established in March 2001 with a transfer of US\$25,000 from the Section's operating account to GSA Foundation. As of 31 December 2006, the value of the Northeastern Section Endowment Fund has grown to US\$65,627. The growth is due to return on the investment combined with individual gifts.

Use of the Endowment Fund Proceeds

- Increase the Kenneth Weaver Student Travel Fund from US\$4,500 per year to US\$9,000 per year. Currently, the US\$4,500 spent annually from the section operating account is matched by an additional US\$4,500 from the GSA Foundation.
- Increase the amount available for undergraduate student research from US\$5,000 per year to US\$7,500 per year.
- Provide honoraria or support for speakers and/or plenary sessions at the Northeastern Section's annual meeting.
- Subsidize professional and student registration fees at the Northeastern Section's annual meeting.

Did You Know?

- Between March 1997 and March 2007, the Northeastern Section provided travel support to more than 860 students who presented the results of their research at both GSA section and annual meetings. The amount provided to student presenters for travel exceeds US\$83,000.
- The total amount available to support student presenters has not changed since 1997.
- To date, all travel and research awards have been made entirely from the Section's operating account.
- The Northeastern Section awarded 37 student presenters US\$128 each to attend the GSA Annual Meeting in 1997; 81

student presenters were awarded US\$55 each to attend the Philadelphia meeting in 2006.

- Between 1998 and 2006, the Northeastern Section funded 57 undergraduate research projects, totaling more than US\$45,000.
- Between 65% and 75% of the Section's annual non-meeting –related expenditures are for the two student programs.
- Student registration fees at the annual Section meetings are effectively subsidized and kept low because of careful budgeting by the local committee chairs.
- Student registration fees rose from US\$27 in 2002 to US\$50 in 2007.
- Professional registration fees rose from US\$74 to US\$145 between 2002 and 2007.
- Northeastern Section Meeting facility charges in 2002 were US\$19,735; in 2006, meeting facility charges were US\$37,622. The 2007 Northeastern Section Meeting facility rental is expected to exceed US\$45,000.

Stephen Pollock

Secretary-Treasurer, Northeastern Section of The Geological Society of America

You may contribute to the Northeast Section Endowment Fund via the coupon below.



Most memorable early geologic experience:

A proudest moment: After showing the results of three field seasons in Southwest New Mexico to USGS veteran Bob Hermon and Bill Jones, Bill proposed "Let's constitute ourselves as a committee and vote to give Wolf his degree right now!"

Written in memory of two fine geologists, killed in a road accident on 29 June 1995.

—Wolfgang E. Elston



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Are You Considering Buying or Leasing a New Car? Read This First!

If you're a current GSA member and have been for at least six months, you may purchase or lease a new Subaru at dealer invoice cost. Before visiting a Subaru dealer in the U.S. (Hawaii not included), contact the **VIP Partners Program Administrator** at GSA and request a Dealer Visit Authorization form and letter of introduction. Present the letter to the participating dealer sales manager upon entry to your preferred Subaru dealership, and before pricing negotiations are initiated. It's that simple! The savings vary by vehicle, but may range from approximately \$1,300 to more than \$3,000.

For every car sale or lease reported, Subaru of America will donate \$100 to the GSA Foundation. Subaru of America and GSA are very pleased to extend their partnership by providing this benefit to GSA members.

For more information or to request a letter of introduction, contact the **VIP Partners Program Administrator**, at gsaservice@geosociety.org, +1-888-443-4472.



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CONTINENTAL DYNAMICS

UNIVERSITY OF CALIFORNIA AT SANTA BARBARA
The Department of Earth Science at the University of California at Santa Barbara seeks a broadly educated geoscientist who conducts creative research on the structural/petrological evolution of the continents. A field orientation combined with expertise in analytical tools, such as geochronology or isotope geochemistry, or computational skills, such as numerical modeling or GIS analysis, is required. The appointee is expected to develop a vigorous, externally funded research program and teach undergraduate and graduate courses. This tenure-track appointment will be as an Assistant Professor to begin 1 July 2008.

A Ph.D. is required at the time of appointment. Review of applications will begin 15 October 2007. Applicants should submit a PDF file containing a letter of application, curriculum vita, a description of teaching and research objectives and accomplishments, and a list of names and contact information of the referees. The application file and letters of reference should be submitted via e-mail to continental_dynamics@geol.ucsb.edu. Queries about this position can be directed to Bradley Hacker (hacker@geol.ucsb.edu).

The Department of Earth Science is dedicated to the diversity and excellence of the academic community through research, teaching and service. For more information about the department visit our Web page (www.geol.ucsb.edu). UCSB is an Equal Opportunity/Affirmative Action employer.

ASSISTANT PROFESSOR DEPARTMENT OF GEOSCIENCES MURRAY STATE UNIVERSITY

Full-time, tenure track position to begin August 2007. **Qualifications:** Ph.D. required by date of appointment. Must have excellent teaching skills that include modern classroom technologies. Must provide evidence of teaching excellence and have research potential in environmental geology and/or geoarchaeology. Experience in the application of geophysical survey techniques is required. Must have demonstrated ability to conduct research as evidenced by publication or other scholarly activity. **Responsibilities:** Duties include teaching introductory courses in geology, core courses in the core curriculum, and specialty courses in environmental geoscience, geoarchaeology, geographic information science or geology. The candidate will be expected to conduct research, pursue external funding and supervise student research at the undergraduate and graduate levels. **Application Deadline:** April 15, 2007. **To Apply:** Submit a curriculum vita, statement of teaching and research interests, copies of transcripts and three letters of reference to: Dr. Kit Wesler, Chair Search Committee, Department of Geosciences, Murray State University, Murray, KY 42071. Women and minorities are encouraged to apply. Murray State University is an equal education and employment opportunity, M/F/D, AA employer.

RITCHIE DISTINGUISHED PROFESSOR SEDIMENTARY GEOLOGY/SEQUENCE STRATIGRAPHY THE UNIVERSITY OF KANSAS

The Department of Geology at The University of Kansas seeks applications for the Scott and Carol Ritchie Distinguished Professorship in Sedimentary Geology, an

academic year, tenured faculty position. The successful candidate will use sequence stratigraphy to study sedimentary and tectonic processes, basin-scale or larger sedimentary accumulations, and distribution of natural resources, preferably in siliciclastic successions, and must be internationally recognized for research, teaching, and service, whether in an academic or an industrial environment. The successful candidate will be expected to publish results of research actively, seek and obtain external funding for that research, teach courses in the area of specialty at all levels, supervise graduate and post-doctoral students and perform service to the university and the profession at a high level.

Applicants must have the accomplishments and qualifications, including an earned Ph.D., to meet the criteria appropriate for appointment as a distinguished professor with tenure as defined by the University of Kansas [see www.provost.ku.edu/policy/faculty/dp_guidelines.shtml]. The successful candidate should be eligible to work in the US before the starting date of appointment. Refer to www.geo.ku.edu and links for additional information about the department and KU. Appointment will begin 18 August 2007 or later. Review of completed applications will begin 1 May 2007, and will continue until the position is filled. Applicants should submit with their letter of application their Curriculum Vitae, statements outlining teaching and research interests, and names and contact information of at least three persons who can be contacted for letters of reference. All materials should be sent to Chair, Ritchie Search Committee, Department of Geology, 1475 Jayhawk Blvd., 120 Lindley Hall, University of Kansas, Lawrence, KS 66045-7613, +1-785-864-2726; fax +1-785-864-5276, e-mail: twalton@ku.edu. EO/AA Employer.

TENURE-TRACK ASSISTANT PROFESSOR OF GEOLOGY LOS ANGELES PIERCE COLLEGE

Pierce College is a two-year public institution that is part of the Los Angeles Community College District. This position will start with the fall 2007 semester, scheduled to begin on 1 September 2007. This is a teaching position. There is no research requirement.

The starting salary ranges from \$45,200 to \$70,370 for the 10 month academic year, depending on experience and professional preparation. There is a Ph.D. differential of \$2,850 per academic year.

The minimum qualification is a master's in geology, geophysics, earth sciences, meteorology, oceanography, or paleontology OR a bachelor's in geology AND a master's in geography, physics, geochemistry OR the equivalent.

For more information and application forms, please browse to www.laccd.edu. Then, click on "Jobs with the District," then on "Academic Job Openings," and finally: on "Geology Instructor-Tenure Track."

Please address questions to Dr. William M. Duxler, Los Angeles Pierce College, 6201 Winnetka Ave., Woodland Hills, CA 91371, +1-818-710-2931, duxlerwm@piercecollege.edu.

HARVARD UNIVERSITY DEPT. OF EARTH & PLANETARY SCIENCES

The Department of Earth & Planetary Sciences at Harvard University invites applications for tenure-track faculty positions at the assistant or associate professor level. We are seeking exceptional scientists and educators in the broadly defined field of earth and planetary sciences including, but not limited to, the areas of geobiology, planetary science, geology and earth history, and solid earth geophysics. We particularly encourage applications from and nominations of women and minorities.

Applicants should send (by mail or email) a statement of research and teaching interests, curriculum vitae, and the names and contact information, including email addresses, of three references to: EPS General Search Committee, c/o Maryorie Grande, Department of Earth & Planetary Sciences, Harvard University, 20 Oxford Street, Cambridge, MA 02138 USA, e-mail: grande@eps.harvard.edu

Applications will be reviewed immediately and continue until the positions are filled. Harvard University is an Affirmative Action/Equal Opportunity Employer. For more information about the Department, please visit our Web site at www.eps.harvard.edu.

ASSISTANT PROFESSOR GEOLOGIST/SOIL SCIENTIST THE UNIVERSITY OF WISCONSIN-RIVER FALLS

The Department of Plant and Earth Science seeks a dynamic teacher to complement our diverse programs. Course responsibilities will include geomorphology, pedology, meteorology and other courses in geology and soil science dependent on expertise of the successful candidate. Interest in global systems and sustainability is desirable. This is a full-time, nine-month, assistant professor

level, tenure-track faculty position starting in August 2007. Compensation is based on qualifications, including education and experience. The normal teaching load is 12 units. Other expectations include advising, scholarly activity and service. Required qualifications include a Ph.D. and teaching and/or field experience. Review of applications will begin on 1 April 2007 and continue until the position is filled. See the University's Web site at www.uwrf.edu/hr for the application process, deadlines, complete position description and qualifications.

UNIVERSITY OF NEW ORLEANS DEPT. OF EARTH AND ENVIRONMENTAL SCIENCES TENURE-TRACK FACULTY VACANCY COASTAL PLANT ECOLOGIST

The Department of Earth and Environmental Sciences (EES) at the University of New Orleans invites applicants to fill a tenure-track position as an Assistant Professor in the field of Coastal Plant Ecology starting in the 2007 calendar year. EES is particularly interested in an individual whose work focuses on coastal wetland and barrier island vegetation and plant response to changes in salinity, inundation and/or fertility.

Applicants with research interest at the landscape scale of the Mississippi River delta plain are highly desirable. Scientists with experience in working with multidisciplinary teams using remote imaging and geospatial tools are also highly desirable. Other desirable talents and expertise include: Coastal plant communities response to changes in physical environment, climate, sea level and wildlife; Coastal restoration ecology; Environmental controls on plant recruitment and succession; Wildlife habitat use, and Seabird habitat and population dynamics.

This position is well-supported with start-up funds commensurate with the successful candidates experience, publication record and funding record. Research facilities will be available for the successful candidate in the UNO Geology Building and/or UNO Research and Technology Park. This position will hold a joint position with the Pontchartrain Institute for Environmental Sciences. EES is well endowed with research facilities for fieldwork in coastal plant communities as well as laboratory investigations. We seek an individual committed to research, teaching and graduate training. A PhD is required.

Interested applicants should send their resume, selected publications and three letters of reference to: Dr. Shea Penland, Chair, Department of Earth and Environmental Sciences, University of New Orleans, 2000 Lakeshore Dr., New Orleans, LA 70148, 504.280.6325, spenland@uno.edu.

The University of New Orleans, a member of the Louisiana State University System, is an EEO/AA employer.

UNIVERSITY OF NEW ORLEANS DEPT. OF EARTH AND ENVIRONMENTAL SCIENCES TENURE-TRACK FACULTY POSITION PETROLEUM GEOLOGIST

The Department of Earth and Environmental Sciences (EES) at the University of New Orleans invites applicants to fill a tenure-track position as an Assistant Professor in the field of Petroleum Geology anticipating starting in the 2007 calendar year. Commensurate with this position, the successful candidate could also be awarded the Braunstein Professorship in Petroleum Geology reflecting the successful candidate's distinguished career in the petroleum geosciences. The mission of EES is to build a center of excellence in earth and environmental sciences in the heartland of America's energy coast, Louisiana's Mississippi River delta.

UNO is seeking an experienced petroleum geologist with broad experience in the Gulf of Mexico Basin. Previous experience within the oil and gas industry is highly desirable. Other desirable talents and expertise we seek in a candidate include: Structural geology-tectonics, Sedimentary basin analysis, Subsurface exploration, and Reservoir characterization-evaluation.

This position is well-supported with start-up funds commensurate with the successful candidate's experience, publication record and funding record. Research facilities will be available for the successful candidate in the UNO Geology Building and/or UNO Research and Technology Park. EES is well-endowed with field and laboratory resources. We seek an individual committed to research, teaching and graduate training. A Ph.D. is required.

Interested applicants should submit a curriculum vita, a statement of research and teaching interest, selected publications and three letters of reference by 30 March 2007 to Dr. Shea Penland, Chair, Department of Earth and Environmental Sciences, University of New Orleans, 2000 Lakeshore Drive, New Orleans, LA 70148, 504.280.6325, spenland@uno.edu.

The University of New Orleans, a member of the Louisiana State University System, is an EEO/AA employer.

Opportunities for Students

University at Buffalo. Graduate student assistantships will be available in August 2007 for motivated students with interests in biogeochemistry and environmental geochemistry. The assistantships carry a 12 month stipend as well as health insurance and a tuition waiver. Research topics include mineral-microbe interactions, bioremediation of metals in soils, and colloidal stability. Interested students should have a strong background in geology and geochemistry and be eager to work on multidisciplinary research. Please contact Dr. Tracy Bank, tbank@buffalo.edu, Dept. of Geology, University at Buffalo, to apply.

Graduate Student Research Grants (the Spackman Award), The Society for Organic Petrology (TSOP). TSOP invites applications for one or two graduate student research grants of up to US\$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 Spackman Award supports qualified graduate students from around the world who are actively seeking advanced degrees. Each grant is to be applied to expenses directly related to the student's thesis work such as summer fieldwork, laboratory expenses, etc.

Grant application deadline is 1 May 2007. The award(s) will be made in August 2007. Detailed information and an application form are on the TSOP Web site, www.tsop.org/grants.htm, or from S.J. Russell, 2218 McDuffie St., Houston, TX 77019-6526 USA; e-mail: sjruss@sbcbglobal.net.

Visiting Fellowships—Institute for Rock Magnetism. Applications are invited for visiting fellowships (regular and student) lasting for up to 10 days during the period from July 1 through December 31, 2007. Topics for research are open to any field of study involving fine particle magnetism, but preference will be given to projects relating magnetism to geological or environmental studies, or to fundamental physical studies relevant to the magnetism of Earth materials.

A limited number of travel grants of up to \$750 are available to cover actual travel costs. No funds are available for per diem expenses. Application forms and information necessary for proposal preparation may be obtained from IRM manager Mike Jackson at the address below, or online at www.irm.umn.edu.

Short proposals (two pages, single-spaced text plus two forms and necessary figures and tables) are due by 30 April 2007 for consideration by the IRM's Review and Advisory Committee. Successful applicants will be notified in June, 2007. Proposals should be sent by e-mail to irm@umn.edu, or by post to: Facilities Manager, Institute for Rock Magnetism, University of Minnesota, 291 Shepherd Laboratories, 100 Union St. SE, Minneapolis, MN 55455-0128.

Ph.D. Student Opportunities in Marine Sedimentology Memorial University of Newfoundland. Ph.D. research assistantships in marine sedimentology are available for immediate application at Memorial University of Newfoundland Earth Sciences Department, St. John's, Newfoundland (www.mun.ca/earthsciences/). We are seeking highly qualified and motivated students to participate in the following field-oriented research programs: nearshore cohesive sediment dynamics, and river-ocean interactions in Arctic Canada. These projects are large international team efforts that will provide excellent opportunities to meet and work with experts.

Memorial University is the largest university in Atlantic Canada. Memorial's Earth Science Department is one of the largest and most diverse Earth Sciences departments in Canada, with 28 faculty members, 15 staff members and a new and well equipped building. The university is located in the provincial capitol St. John's, a small vibrant city of 170,000 with all the benefits of a large urban centre.

Potential applicants may send CV with reference contacts to Dr. Sam Bentley, +1-709-737-2097, sjb@esd.mun.ca. Admissions requirements may be viewed at www.mun.ca/sgs/prospective/.

**ASSISTANT/ASSOCIATE PROFESSOR
HYDROCLIMATE- HYDROMETEOROLOGY**



FISA Status: Exempt
Compensation: Assistant Professor - \$45,533 - \$66,292, Associate Professor - \$53,562 - \$76,449
College Web Site: www.cuny.cuny.edu
Notice Number: FY - 13000
Closing Date: Open until filled with review of applications to begin 03/1/2007.

POSITION DESCRIPTION AND DUTIES

The Department of Earth and Atmospheric Sciences invites applications for a tenure track position for a candidate with strong academic credentials in hydroclimate - hydrometeorology. The candidate is expected to implement an externally funded research program in areas that may include aerosol transport, meteorology, hydrological concerns in climate modeling, hydroinformatics, remote sensing, satellite sensing of atmosphere and precipitation, or similar areas related to ongoing research in environmental remote sensing at CUNY. Ability in Geographic Information Science is highly regarded.

The candidate will be expected to teach graduate courses in his/her area of specialty and collaborate with Cooperative Remote Sensing Science and Technology Center at CUNY. The candidate will also be responsible for setting up a laboratory by obtaining space in the Science Building and equipping the laboratory with equipment provided through external funding. The candidate will also recruit and advise students in the undergraduate and graduate programs.

QUALIFICATION REQUIREMENTS

Applicants must hold a Ph.D. at the time of appointment; candidates with Post Doctoral experience are especially encouraged to apply.

The City College of New York has a strong institutional commitment to the principle of diversity. In that spirit, we are particularly interested in receiving applications from a broad spectrum of individuals, including women and under-represented groups. Upon request, reasonable accommodations provided for individuals with disabilities.

All candidates must provide documentation to prove employment eligibility in compliance with IRCA.

TO APPLY

Please send a curriculum vitae, statement of research and teaching interests, and the names and addresses of at least 3 references: **Professor Jeffrey Steiner - PVN#, Department of Earth and Atmospheric Sciences, City College of New York, 160 Convent Ave, MR 106, New York, NY 10031, e-mail: steiner@sci.cuny.cuny.edu.**

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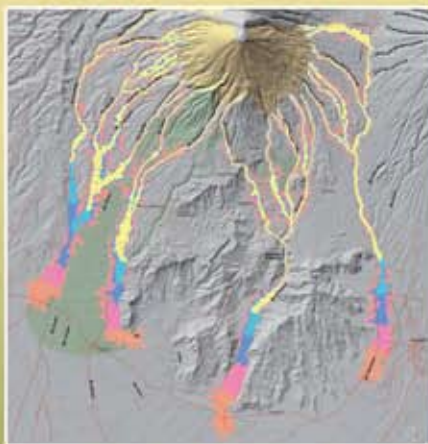
Volcanic Hazards in Central America

Edited by William I. Rose, Gregg J.S. Bluth, Michael J. Carr, John W. Ewert, Lina C. Patino, and James W. Vallance

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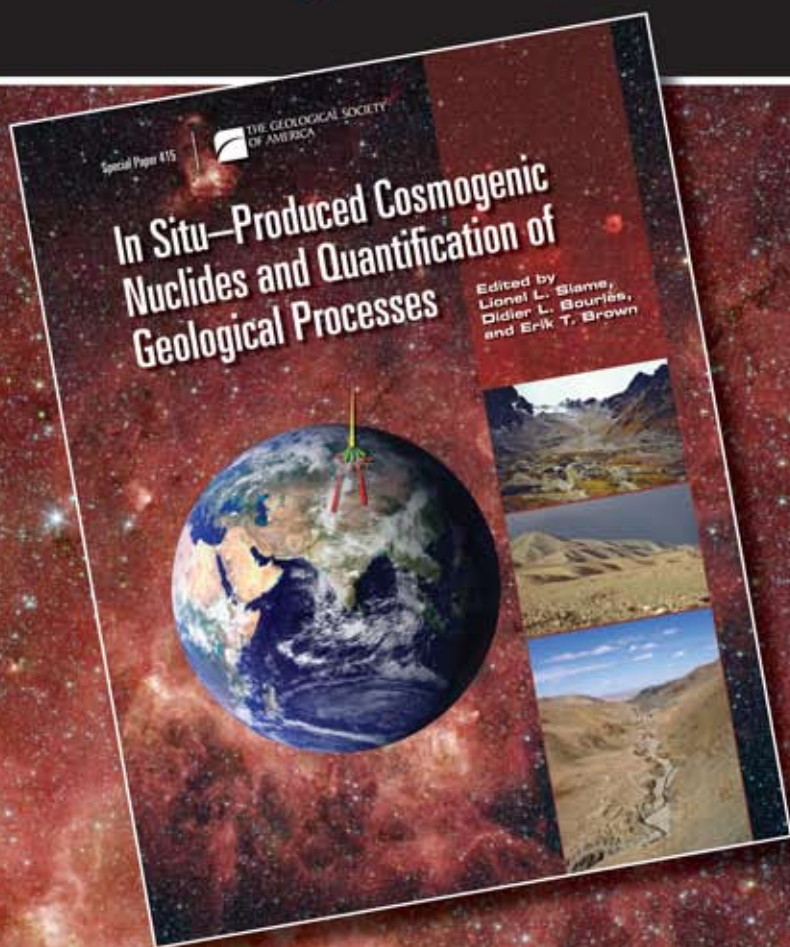
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In Situ—Produced Cosmogenic Nuclides and Quantification of Geological Processes

Edited by
**Lionel L. Siame,
Didier L. Bourlès,
and Erik T. Brown**



In situ—produced cosmogenic nuclides can provide chronologies of environmental change over the past few thousand to several millions of years and may be used to quantify a wide range of weathering and sediment transport processes. These nuclides are thus now used across a broad spectrum of earth science disciplines, including paleoclimatology, geomorphology, and active tectonics. This book is organized around sections that focus on specific aspects of the utilization of cosmogenic nuclides in earth sciences: (1) development of new methods for application of in situ—produced cosmogenic nuclides (burial dating methods, extending their utilization to carbonate-rich and mafic environments); (2) glacial geology (Laurentide Ice Sheet, northern Alps); (3) active tectonics, focusing on applications to constrain slip rates of active faults in Asia (Tibet and Mongolian Gobi-Altay); and (4) landscape development (quantifying sediment production or erosion rates and processes and application of exposure dating to landslides in Hong Kong).

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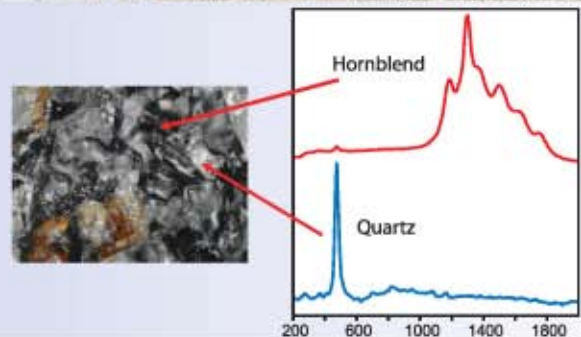
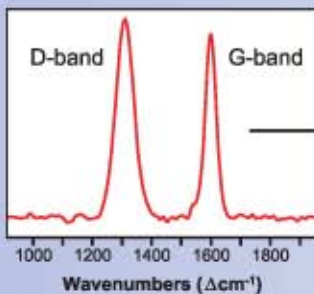
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