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James W. Sears

Cover: Figure stands on Esplanade surface opposite Vulcan’s Throne volcano, Grand Canyon, USA. Photo by J.W. Sears. See related article, p. 4–10.
Late Oligocene–early Miocene Grand Canyon:
A Canadian connection?

James W. Sears, Dept. of Geosciences, University of Montana, Missoula, Montana 59812, USA, james.sears@umontana.edu

ABSTRACT

Remnants of fluvial sediments and their paleovalleys may map out a late Oligocene–early Miocene “super-river” from headwaters in the southern Colorado Plateau, through a proto–Grand Canyon to the Labrador Sea, where delta deposits contain microfossils that may have been derived from the southwestern United States. The delta may explain the fate of sediment that was denuded from the southern Colorado Plateau during late Oligocene–early Miocene time.

I propose the following model:
1. Uplift of the Rio Grande Rift cut the southern Colorado Plateau out of the Great Plains at 26 Ma and tilted it to the southwest.
2. The upper Colorado River and its tributaries began as consequent streams that flowed down the structural plunge of the basin toward the southwest corner of the Colorado Plateau, where the river passed through a Paleogene canyon.
3. The river turned north in the Lake Mead region to enter Paleogene rifts of the eastern Great Basin.
4. NE-trending grabens across the Idaho and Montana Rockies provided the final link to the Great Plains, where the Miocene drainage joined the “Bell River” of Canada, which drained to the Labrador Sea.
5. Faulting and volcanism began to segment the paleo-river by ca. 16 Ma.
6. Faulting dammed Miocene Grand Canyon, creating a large ephemeral lake that persisted until after 6 Ma, when the Colorado River was captured by the Gulf of California.
7. The resulting shortcut to sea level greatly increased the gradient of the Colorado River, leading to headward incision of the Inner Gorge of Grand Canyon along the trace of the Miocene bedrock valley floor and renewed late Miocene-Holocene erosion of the Colorado Plateau.
8. The Yellowstone hotspot cut the river off in Idaho after 6 Ma.
9. Pleistocene continental glaciation destroyed the Canadian Bell River and diverted Montana’s drainage into the modern Missouri River.

INTRODUCTION

Apatite fission track and (U-Th)/He data indicate that Grand Canyon probably existed in some form by late Oligocene–early Miocene time (Flowers et al., 2008; Wernicke, 2011; Cather et al., 2012; Flowers and Farley, 2012; Lee et al., 2013). However, the fate of its eroded sediment remains uncertain, as does the outlet of a hypothetical late Oligocene–early Miocene Colorado River (Karlstrom et al., 2012); the river did not reach the Gulf of California until 5.3 Ma (Dorsey et al., 2005). Several researchers have concluded that an early Miocene Colorado River most likely would have flowed northwest from a proto–Grand Canyon, because geologic barriers blocked avenues to the south and east (Lucchitta et al., 2011; Cather et al., 2012; Dickinson, 2013).

Here I propose that a late Oligocene–early Miocene Colorado River could have turned north in the Lake Mead region to follow paleovalleys and rift systems through Nevada and Idaho to the upper Missouri River in Montana. The upper Missouri joined the South Saskatchewan River of Canada before Pleistocene continental ice-sheets deflected it to the Mississippi (Howard, 1958). The South Saskatchewan was a branch of the pre-ice age “Bell River” of Canada (Fig. 1), which discharged into a massive delta in the Sagelk basin of the Labrador Sea (McMillan, 1973; Balkwill et al., 1990; Duk-Rodkin and Hughes, 1994). Could the late Oligocene–early Miocene Colorado River have ultimately discharged into the Labrador Sea?

The following paragraphs outline geologic evidence for the evolution of a proposed late Oligocene–early Miocene paleovalley from Canada upstream to the Colorado Plateau, and suggest tests at

Figure 1. Early Oligocene drainage off North American Cordilleran highlands. 1—Cypress Hills and Wood Mountain; 2—Western Grand Canyon; after Duk-Rodkin and Hughes (1994). See Figure 2 for key to abbreviations.
critical linkages between proposed paleovalley segments. Figures 1, 2, and 3 summarize the proposed evolution of the drainage.

**BELLS RIVER OF CANADA AND ITS DELTA**

The Cenozoic Bell River basin (McMillan, 1973) drained most of Canada before the basin was destroyed by Pleistocene continental glaciation. The tributaries gathered in the area of Hudson Bay and flowed out to sea through Hudson Strait (Duk-Rodkin and Hughes, 1994). Headwater valleys are preserved in the Rocky Mountains, Mackenzie Mountains, and northern Great Plains. The South Saskatchewan River, its main southern tributary, had sources in the Montana Rockies (Leckie et al., 2004).

The Bell River fed the >8-km-thick Saglek delta deposit in the Labrador Sea (Jauer and Budkewitsch, 2010). This delta comprises the largest sedimentary depocenter on the Atlantic seaboard of North America (Balkwill et al., 1990). An indication of the magnitude of the Bell River basin is given by the Northwest Atlantic Mid-Ocean Channel, one of the longest in the world, which winds along the seafloor for 3400 km, from the foot of the delta to the Sohm Abyssal Plain, east of New England. Continental glaciation beheaded the Saglek delta at Hudson Strait (Jauer and Budkewitsch, 2010).

Reworked fossil pollen recovered from exploration wells in the delta may support a direct link to headwaters in the Colorado Plateau. The pollen and associated sediment was derived from the western interior of North America (Hiscott, 1984; Williams, 1986). More than 15 recyclant palynomorphs identified by Williams (1986) match fossil pollen found in upper Paleozoic and lower Mesozoic continental strata that are widespread on the Colorado Plateau, but rarely crop out farther north (cf. Cook and Bally, 1975). From upper Eocene to lower Miocene muds drilled in the Roberval K-92 well of the Saglek basin, Williams (1986) identified *Calamospora, Convoluitispora, Densoisporites*, *Foveotriates*, *Matonisporites*, and *Osmundacidites wellmanii*, which are also known from the Chinle Formation of northern Arizona (cf. Litwin et al., 1991), and a *Lycospora-Triquitrites-Punctatisporites* assemblage, which is also known from the Supai Group of Grand Canyon (cf. McKee, 1982).

The Bell River drainage has been traced up the South Saskatchewan paleovalley to the Cypress Hills and Wood Mountain, river-gravel-capped nunatak ridges on the southern Canadian plains (Prest 1970). The gravel fills broad, overlapping Eocene to early Miocene paleovalleys (Leckie et al., 2004). Paleocurrent measurements indicate that the gravel was deposited by NNE flow in braided channels (Leckie et al., 2004). Provenance of placer gold, alkalic volcanics, and Belt Supergroup pebbles indicates derivation from the Montana Rockies (Leckie et al., 2004).

**UPPER MISSOURI PALEOVALLEY, MONTANA**

The South Saskatchewan paleovalley trends directly toward the upper Missouri River of northwest Montana (Fig. 4). Remnants of Miocene river gravel trace the ancestor of the upper Missouri for 350 km, from Great Falls southwest to the Continental Divide (Sears et al., 2009). Upper Missouri paleovalley segments are as
contain an assemblage of exotic pebbles and cobbles that have no
claystone deposits in the Renova and correlative formations.
and Utah to Idaho and Montana, where it accumulated as thick
have channeled volcanic ash from the magmatic in arc Nevada
Cordilleran magmatic arc (Mix et al., 2011). The rift system may
propagated from Montana to southern Nevada in Eocene and
Oligocene time in association with the southward-migrating
Paleogene rift that linked western Montana with Idaho and
Nevada. Fluvial transport down the rift axis could have brought
the exotic clasts into Montana.

The gravel-filled Miocene paleovalley crosses the Continental
Divide from Montana into Idaho, where it is buried by Pliocene
volcanics of the Yellowstone hotspot track and Pleistocene basalt
of the Snake River Plain (cf. Pierce and Morgan, 1992). The distinctive
river gravel reappears in windows through the basalt
more than 100 km south of the Continental Divide, where it has
been exploited in gravel pits. Detrital zircon studies show that,
after 6 Ma, the Continental Divide migrated east from the Idaho
batholith to its present location on the Montana border (Berenak
et al., 2006), where it crosses the trend of the paleovalley.
Remnants of middle and upper Miocene fluvial and lacustrine
deposits occur in isolated patches above a regional unconformity
along the trend of the Paleogene rift system in Nevada (Coats,
1987; Stewart and Carlson, 1978). The Paleogene rift system was
segmented by basin-range faulting, and the paleovalley deposits
have been variably tilted, faulted, eroded, and buried in the mod-
ern landscape (cf. Henry et al., 2011).

The Caliente caldera complex erupted near the southern end of
the rift system from 26 to 15 Ma (Axen, 1998). North of the cal-
dera complex, north-trending paleochannels contain volcanic ash
and well-rounded river pebbles of Caliente volcanics along with
metamorphic lithologies that were ultimately derived from base-
ment complexes exposed farther to the south.

Remnants of Paleogene paleovalleys may connect the Paleogene
rift system to western Grand Canyon. Reconstruction of basin-
range faulting in the Lake Mead region restores the pre-extensional,
26–16-Ma basal Horse Spring Formation against the southwest
corner of the Colorado Plateau near the western edge of Grand
Canyon (Umhoefer et al., 2010). The formation was deposited on
alluvial plains that sloped off the flanks of Laramide ridges into a
broad north-trending paleovalley on the west edge of the plateau
(Anderand and Beard, 2010). The Laramide ridges coincide with
the shoulder of the Paleogene rift system mapped by Mix et al.
(2011), which had propagated south to that latitude by 28 Ma.
Until basin-range faulting began at 17 Ma, most of the sediment
in the Horse Spring paleovalley bypassed the system toward the
northeast (Lamb et al., 2010).

**EARLY MIocene PROTo–GRAND CaNYOn?**

An early Miocene paleocanyon floor may transect the entire
length of Grand Canyon, midway between the rim and the river.
The feature is represented by a ~5-km-wide terrace that is incised
by the deep and narrow Inner Gorge. The terrace transects hun-
dreds of meters of tilted stratigraphy as it crosses the Kaibab

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*Figure 4. Miocene central-western United States drainage. Upper Colorado River basin (cross-hatched) drains structural trough toward southwest corner of Colorado Plateau, leading to rift systems through Nevada, Idaho, and Montana, to headwaters of South Saskatchewan River. Antler orogenic belt, Cambrian-Precambrian Z (SZ) quartzite, Lemhi Group, and Belt Supergroup bedrock sources feed gravel northeast along Miocene river. CCR—Crooked Ridge River; GC—Grand Canyon; GF—Great Falls; K—Kaibab Upwarp; LCR—Little Colorado River; UMR—Upper Missouri River; black—Caliente caldera complex; dotted, inverted Vs—uplifts on west flank of Miocene river. Dashed gray line—Yellowstone hotspot track. Note that northern part of upper Colorado River basin was not integrated with southern part until late Miocene (Cather et al., 2012).*
Upward, a major Laramide anticline in eastern Grand Canyon (Dickinson, 2013). It is offset by Pliocene and younger normal faults. It comprises the Hualapai Plateau in western Grand Canyon, the Esplanade terrace atop the Supai Group in central Grand Canyon, and a series of concordant buttes, mesas, spurs, and terraces on top of the Redwall Limestone in eastern Grand Canyon (Fig. 5). River-polished and fluted limestone and beheaded fluvial channels are locally preserved on the surface. The Redwall bench and Esplanade terrace are mutually exclusive; there is no Redwall bench in central and western Grand Canyon, and no Esplanade terrace in eastern Grand Canyon. They appear to be concordant parts of the same erosional surface.

The Hualapai Plateau is a mature cuestaform terrace cut by deep paleocanyons that are filled with Paleogene fluvial/alluvial sediments (Young, 2008). Wernicke (2011) and Flowers and Farley (2012) deduced from apatite dating that the paleocanyons may have been cut by 70 Ma. Wernicke (2011) proposed that the Late Cretaceous “California River” flowed eastward through the proto–Grand Canyon and delivered feldspathic sediment from the Sierra Nevada to the Cretaceous Interior Seaway in southern Utah, and later reversed its flow.

The Hualapai terrace is capped by 20- to 16-Ma volcanics that flowed across the filled paleocanyons, and is incised by the narrow, 1-km-deep Inner Gorge, which cuts across ca. 6-Ma dike swarms (Billingsley and Wellmeyer, 2003).

Lee et al. (2013) concluded from apatite dating that a canyon had eroded through the Kaibab Upwarp of eastern Grand Canyon in latest Oligocene–early Miocene time (28–20 Ma). Flowers et al. (2008) deduced from apatite dating that from 23 to 16 Ma erosion had cut a ~1-km-deep canyon through the Kaibab rim. That depth would correspond to the level of the mid-canyon bedrock bench.

East of Grand Canyon, Lucchitta et al. (2011) interpreted a meandering ridge of fluvial sediment as a topographically inverted Miocene paleovalley—the “Crooked Ridge River.” The feature crosses >100 km of the Navajo Nation and may have been a major tributary or even the main stem of the ancestral Colorado River. The fluvial sediment includes minor amounts of stream-rounded gravel ultimately derived from the San Juan and Needle Mountains of Colorado (Hunt, 1969). The gradient of the Crooked Ridge River projects toward that of the 16-Ma paleovalley of the Little Colorado River basin as well as toward that of the mid-canyon bedrock bench in eastern Grand Canyon (Dickinson, 2013).

COLORADO PLATEAU

Continental rifting separated the southern Colorado Plateau from the Great Plains beginning ca. 26 Ma (Chapin and Cather, 1994). Prior to the rifting, the region had relatively low relief and drained east from the Cordilleran highlands toward the mid-continental lowlands (Cather et al., 2008; Wernicke, 2011) (Fig. 1). The rifts formed when the western North American plate boundary became dextral-transtensional, and the crustal block that became the Colorado Plateau rotated clockwise relative to North America (Chapin and Cather, 1994). The basin is bordered by rift systems (Fig. 4). On the west is the eastern Great Basin rift and Wasatch Front, on the south, the Mogollon Highlands, on the east, the Rio Grande Rift (Chapin and Cather, 1994). The Wyoming part of the basin was not integrated until late Miocene (Cather et al., 2012).

COLORADO RIVER DURING THE 16–5-MA INTERVAL

There is no record of Colorado River gravel in Grand Wash graben to the immediate west of Grand Canyon until after ca. 6 Ma, even though thick sections of Miocene sediment are well exposed in the graben (Lucchitta, 1972; Young, 2008). The graben sediment consists mainly of locally derived alluvium and lacustrine deposits of “Hualapai Lake”—evidence of closed-basin deposition; no Miocene Colorado River delta occurs in the graben (Anderson and Beard, 2010; Howard et al., 2010). Could the river

Figure 5. Miocene(? mid-canyon bench as seen on Cheops Pyramid and adjacent ridges on top of Redwall Limestone, near Phantom Ranch, eastern Grand Canyon, USA. Photo by J.W. Sears.
have begun to carve the canyon before 6 Ma, if the adjacent down-
stream graben contains no river delta (Pederson, 2008)?

To address this problem, Lucchitta et al. (2011) and Dickinson
(2013) proposed that the river flowed through eastern Grand
Canyon, as also suggested here, but turned north before reaching
Grand Wash, and proceeded on a hypothetical route through
southern Utah.

Alternatively, Young (2008) proposed that, before 5 Ma, Hualapai
Lake had flooded Grand Wash and western Grand Canyon and
had trapped clastic fluvial sediment far upstream. The lake could
have been dammed by uplift of basin-range fault blocks on the
west side of Grand Wash at 16–14 Ma (cf. Howard et al., 2010).
A structural cross section indicates that 3 km of structural relief
was attained between the fault blocks and western Grand Canyon
by 16 Ma (Karlstrom et al., 2010).

Given the reconstructed gradient of the proposed Miocene
river, a lake dammed by the basin-range fault blocks at the mouth
of Grand Canyon could conceivably have backed water up to
Miocene Hopi Lake on the Little Colorado River (Fig. 4), if Grand
Canyon had already cut across the Kaibab Plateau. At present, the
top of 16–6-Ma deposits of Hualapai Lake (~900 m) is ~1 km lower
in elevation than the top of the lacustrine facies of the 16–6 Ma
Bidahochi Formation of Hopi Lake (~1900 m), but in the past 3.5
m.y., the Grand Canyon east of the Hurricane and Toroweap fault
systems has been uplifted ~600 m relative to the west (Karlstrom
et al., 2008). Hualapai and Hopi lakes could have been parts of the
same impoundment, if eastern Arizona shared the regional late
Miocene–Holocene isostatic rock uplift that is indicated to mea-
Sure ~1 km in southeastern Utah (cf. Cather et al., 2012). At full
lake pool, coarse fluvial sediment would have been restricted to
deltas at the mouths of drowned canyons, tens to hundreds of
kilometers upstream of Grand Wash. Delta facies indeed occur in
the Bidahochi Formation of Hopi Lake at the mouths of paleo-
valleys (Dickinson, 2013).

The lakes existed during a 15–6-m.y. period of erosional stagna-
tion on the Colorado Plateau, according to apatite (U-Th)/He
data (Cather et al., 2012). Lacustrine deposition of the Bidahochi
Formation at Hopi Lake gave way to fluvial deposition ca. 6 Ma,
after which the formation began to be incised by the Little
Colorado River (Dickinson, 2013). Incision of the Bidahochi
Formation coincided with incision of the Inner Gorge in western
Grand Canyon and dissection of Hualapai Lake beds at Grand
Wash graven by the integrated Colorado River system (Pederson,
2008; Karlstrom et al., 2008; Howard et al., 2010). Howard et al.
(2010) mapped a series of Late Miocene paleovalleys across the
fault blocks on the west side of Grand Wash that could mark
successive outflow channels.

Cather et al. (2012) determined that the southern Colorado
Plateau was denuded by ~1–2 km between 27 and 15 Ma, and that
the northern plateau was denuded by about the same amount
between 6 Ma and the present. There was apparently a relative
lack of erosion between 15 and 6 Ma (Cather et al., 2012), the
interval during which Hualapai and Hopi lakes were accumulat-
ing modest sediment loads. After 6 Ma, the sediment could have
washed to the Gulf of California.

During Miocene time (Lucchitta et al., 2011) (Fig. 4). DNA studies
show that fish of the upper Snake and upper Colorado basins have
more in common with each other than they do with fish in the
lower parts of their respective basins (Spencer et al., 2008).

**DISCUSSION AND CONCLUSION**

Capture of the Colorado River by the Gulf of California would
have shortened its route to sea level from the ~5000 km proposed
here (Lake Mead to Labrador Sea) to ~300 km (Lake Mead to the
Gulf of California). Steepened gradients and deep erosion of side
canyons would have permitted the transport of a gravel bedload,
so that the first bona-fide Colorado River gravel appears above the
6-Ma Hualapai Limestone (Lucchitta, 1972; Karlstrom et al., 2008).

In the Great Basin, extension intermittently interrupted the
flow of the proposed paleoriver after 17 Ma, so that ephemeral
lakes formed and filled with sediment until river flow was
restored. Thus, most upper Miocene sections include lacustrine,
fluvial, and alluvial beds.

The Yellowstone hotspot crossed the proposed paleovalley
between 10 and 6 Ma (cf. Pierce and Morgan, 1992). After 6 Ma,
the Snake River first delivered sediment to the Boise area, the
Continental Divide shifted eastward (Beranek et al., 2006), and
the Montana reach of the paleovalley was cut off from former
sources to the southwest.

In summary, the upper Colorado River may have been the
southern tributary of one of the largest river basins in the world
during the lead-up to the Miocene climatic optimum. Runoff may
have carried a sediment load for >5000 km from the southern
Colorado Plateau, through an early Grand Canyon, down rift
zones in Nevada, Idaho, and Montana, and across the Canadian
plains to the Labrador Sea. Turbidity flows from the delta then
carved the 3400-km-long Northwest Atlantic Mid-Ocean
Channel to spill out onto the Sohm Abyssal Plain southeast of
New England.

A number of standard provenance tests could be made to evalu-
ate the hypothesis at key locations along the trace of the proposed
paleoriver—for example, detrital zircon analyses of paleoriver
deposits, detailed petrographic comparisons of suggested sources
and pebbles, and further analysis of palynomorphs from samples
of Sagelk delta muds and proposed source regions.

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Gregory (Greg) L. Hempen has been named the 2013–2014 Richard H. Jahns Distinguished Lecturer in Applied Geology. Hempen is a geophysicist and geological engineer, currently consulting for URS Corporation’s St. Louis (Missouri, USA) Office. Throughout his 40+-year career, he has held only one title: geophysicist. He specializes in all types of vibration mitigation, including earthquakes, blasting, and pile driving, and in recommending appropriate geophysical studies for complex sites. His job history includes a long tenure at (and retirement from) the St. Louis District Corps of Engineers.

Hempen has conducted business for all levels of government and now works in the private sector. His duties have included assessment of dam sites and regional earthquake studies for federal dam sites, probabilistic and deterministic appraisal of potential earthquake impacts, varied geophysical studies for different project concerns (from archeological to environmental transport to groundwater to rock weaknesses), blast vibration mitigation while effectively achieving the blasting goal, environmental mitigation, and the dreaded “other duties, as assigned.”

Hempen received a B.S. in geophysical engineering from St. Louis University, a M.S. in geo-engineering from the University of Minnesota–Minneapolis–St. Paul, and a Ph.D. in geological engineering from the University of Missouri–Rolla (now Missouri University of Science & Technology). He is a registered professional engineer in Missouri and a registered professional geologist in Arkansas and Missouri.

Hempen has authored a variety of publications that share the understanding of procedures instead of keeping proprietary control of methodologies. Hempen has been an adjunct professor at all the engineering universities in the St. Louis area, teaching environmental science and geotechnical engineering courses. His longest running class (1989–2004) was “Seismology and Seismic Design,” in the Civil Engineering Dept. of Washington University of St. Louis. Hempen has also taught several Corps of Engineers professional training courses.

Several causes have gained Hempen’s attention over the years. He has long been active with the Association of Geologists (AEG), serving as AEG president in 1989–1990, and with GSA’s Environmental & Engineering Geology Division. He had a minor role in developing the administration of the Jahns’ Lectureship. Hempen is also active with several other professional organizations and public issues such as geologists registration, public disaster preparedness, and building-code adoption. He has served on state commissions and is presently serving on two Missouri state organizations.

Some of the accolades that Hempen has received are the Otto Nuttli Award from the St. Louis Section of the American Society of Civil Engineers in October 2011; a professional (honorary) degree from Missouri University of Science & Technology in December 2010; an award with the Army and Corps team for the Embrey Dam removal in May 2004; the Johnston Service Award from AEG in October 2002; an Achievement Medal for Civil Service in December 1998; and Regional Outstanding Engineer from the Missouri River Region of the Society of American Military Engineers in 1991.

Interested geology departments should contact Greg Hempen at +1-314-743-4136 or greg.hempen@urs.com to make arrangements for one or more of the following talks:

1. **Hello?? Are you ready for the Big One?** This presentation discusses the application of recent research to the paleoseismic and historic events of the New Madrid Seismic Zone and considers some actions to inform the public about appropriate preparedness.

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3. **What’s my line? Site assessment!** This presentation on the applied geologist’s most important duty—site assessment—explains how geophysics may advance the information at a site and reduce the risk of unanticipated site conditions.

4. **You’re going to drink THAT water?!!** This talk weighs the challenges of reducing groundwater impacts at old, low-level radioactive waste sites. The issues are not only the problem of assessing waste transit, but also convincing the public of what is known/unknown, and what is an acceptable, plausible solution.
Larry Band is the Voit Gilmore Distinguished Professor of Geography and the Director of the Institute for the Environment at the University of North Carolina at Chapel Hill and a Visiting Professor at the Chinese Academy of Science. Band’s research is in watershed ecohydrology, including the co-evolution of ecological and hydrological systems. His current research focuses on two long-term ecological research sites: Coweeta (North Carolina, USA) and the Baltimore (Maryland, USA) Ecosystem Study. In 2010, Band was board chair for the Consortium of Universities for the Advancement of Hydrologic Science Inc. (CUAHSI) and was a deputy editor for Water Resources Research. Band was a visiting scientist at the Australian Cooperative Research Centre for Catchment Hydrology in 1992–1993 and at the Bureau of Meteorology and CSIRO in 2008, the latter on science and management response to the Australian drought. Band has published more than 130 papers, book chapters, and technical reports. His 2014 Birdsall-Dreiss lectures will be based on research linking surface/subsurface flowpath dynamics with ecosystem development in forested and urban sites.

Interested institutions should contact Larry Band at lband@email.unc.edu to schedule a lecture on one of the following topics:

1. Critical zone processes at the watershed scale: Hydroclimate and groundwater flowpath-mediated evolution of forest canopy patterns. Abstract: Since the classic work by Hack and Goodlett in 1960, it has been recognized that there is a close coupling of geomorphic, groundwater, ecosystems, and soil processes in mountainous catchments. In the southern Appalachians, forest cover provides high-quality fresh water and regulates net recharge and is in turn strongly influenced by subsurface redistribution and the availability of water and nutrients. Classic experiments by Hewlett and Hibbert in lined soil troughs fifty years ago at Coweeta Hydrologic Laboratory suggested stream baseflow may be supplied by shallow subsurface throughflow, and this has since been a dominant paradigm. However, deeply weathered saprolites and fracture networks may be responsible for a range of shallow to deeper flowpaths, resulting in distinct, observable space/time distributions of soil water, nutrients, and canopy patterns. In this presentation, Band will combine long-term observations from Coweeta with coupled simulation of ecosystem, hydroclimate, and subsurface hydrology to explore co-evolution of critical zone hydrologic and ecosystem dynamics. The three-decade, high-resolution remote-sensing record confirms distinct signatures of the response of catchment canopy patterns to hydroclimate change mediated through subsurface flowpaths.

2. Green infrastructure, groundwater, and the sustainable city. Abstract: Provision of sufficient quantities and quality of freshwater, treatment and disposal of wastewater, and flood protection are critical for urban sustainability. Over the last century, two major shifts in drainage paradigms have occurred; the first to improve public health with centralized sanitary effluent collection and treatment, and the rapid drainage and routing of stormwater. A second shift is now being implemented to retain, rather than rapidly drain, stormwater, with a focus on infiltration-based methods shifting hydrologic behavior to depression-focused recharge. While stormwater is defined as surface flow resulting from developed areas, an integrated hydrologic systems approach to urban water management requires treatment of the full critical zone, extending from the top of the vegetation and building canopy to depths including natural soils, fill, saprolite, and bedrock. In addition to matrix and network flow in fracture systems, an urban “karst” includes multiple generations of infrastructure, with extensive supply and drainage pipe networks, enhancing surface/groundwater exchange. In this presentation, Band will focus on the urban critical zone, and the synthesis of modeling and analytical approaches to understand and plan green infrastructure based on surface/groundwater/ecosystem interactions, as well as implications for the restoration and new design of cities.

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GSA is pleased to announce our 2014 Distinguished International Lecturer: **Marjorie A. Chan.**

Chan is a professor of geology at the University of Utah in Salt Lake City, Utah, USA. She earned a B.S. in geology from the University of California–Davis in 1977 and a Ph.D. in geology from the University of Wisconsin–Madison in 1982.

Chan’s research spans the geologic time scale from the Precambrian to the Pleistocene, and her recent projects connect geology and planetary science to better understand and interpret Mars. She has authored or co-authored more than 100 peer-reviewed articles on a wide range of sedimentary topics involving clastic depositional environments, sedimentology, fluid flow/diagenesis (e.g., iron oxide sandstone coloration and concretions), Earth analogs to Martian environments, and geoconservation.

Chan is a popular, sought-out speaker—she is on the speaker bureau list for the Association of Women Geoscientists (AWG) and received two national meeting “excellence of presentation awards” from SEPM (Society for Sedimentary Geology). Her research has been featured in several television documentaries, including shows on the National Geographic Channel and the Discovery Channel. In 2013, Chan was a guest on National Public Radio’s “Science Friday,” and she is a science advisor for the PBS Nova “ScienceNow” series. Chan is experienced in giving public lectures to a variety of audiences and is known for making science interesting and accessible.

Chan has been a strong advocate and role model for women in science for the past three decades, and she is active in encouraging women and minorities in science disciplines. She is excited to represent GSA and a new age of science that will be dependent on sustainable practices, global cooperation, and engaged students who will help lead our future.

**LECTURE TOPICS**

Eolian Explorations: Dunes, Deformation, and Diagenesis

Mars for Earthlings: Using Earth Analogs to Decode the Sedimentary History of Mars

The GSA International Lecture Tour is made possible through a gift to the GSA Foundation and is organized under the guidance of GSA's International Section. Chan’s lectureship is cosponsored with generous support from the University of Utah.

Please visit the GSA International Lecture Tour webpage for Chan’s 2014 lecture tour dates and detailed information. [http://www.geosociety.org/Sections/International/LectureTour.htm](http://www.geosociety.org/Sections/International/LectureTour.htm)
2013 International Section Honorary Fellow

The GSA International Section is pleased to announce the selection of their 2013 International Honorary Fellow, Dong Shuwen, professor of geology and Vice President of the Chinese Academy of Geological Sciences. Dong also serves as treasurer for the International Union of Geological Sciences.

Since 1996, Dong has published five books and more than 140 research papers. Many of the published papers appeared in top international journals and received high citations. Dong thinks broadly and works widely with top international researchers, such as Lothar Ratschbacher in Germany and Simon Klemperer, Larry Brown, Randy Keller, and Mian Liu in the United States, and numerous scientists from central Asian countries.

Dong is one of the most prominent leaders in the Chinese earth sciences community today. He was the main driver for the successful funding of the multi-billion dollar project—SinoProbe. As a result, he is appointed as the chief scientist overseeing its entire scientific operation. This project has already gained international attentions with several featured articles published in Nature, Science, and EOS.

In addition to his remarkable scientific achievements, Dong has also been an active member of several international organizations, which includes his service as a board member of the International Union of Geological Sciences (IUGS), International Lithosphere Programme (ILP), the International Geoscience Programme (IGCP), and the International Continental Scientific Drilling Programme (ICDP). Dong was instrumental in developing and coordinating the very successful joint GSA–Geological Society of China meeting, Roof of the World, held in Chengdu, China, in June 2013.

2014 Graduate Student Research Grants

Submission deadline: 3 Feb. 2014 at 11:59 p.m. (MST)

GSA is proud to offer research grants to its highly qualified student members. Last year, GSA awarded 307 grants, totaling US$582,340. Graduate students may receive two grants during their academic career, regardless of the program in which they are enrolled. The standard maximum award per grant is US$2,500.

New! Starting in 2014, ExxonMobil will sponsor 10 research grants at US$7,500 per grant. All applicants in the GSA Student Research Grant Program are eligible for these awards, regardless of the topic or location of their research. ExxonMobil will select the top ten proposals based on merit as recommended by the GSA Research Grant Review Committee.

Applications should be submitted online only beginning later this month at www.geosociety.org/grants/gradgrants.htm. Paper applications and letters will not be accepted.

Questions? Call +1-303-357-1028 or e-mail awards@geosociety.org.
For details on the following awards and grants, see the October GSA Today or go to www.geosociety.org/awards/nominations.htm. Information and nomination forms can also be obtained from GSA Grants, Awards, and Recognition, P.O. Box 9140, 3300 Penrose Place, Boulder, CO 80301-9140, USA, +1-303-357-1028, awards@geosociety.org.

2014 GSA MEDALS AND AWARDS
Nomination deadline: 1 Feb. 2014
• Penrose Medal
• Day Medal
• Young Scientist Award (Donath Medal)
• GSA Public Service Award
• The Bromery Award for the Minorities
• GSA Distinguished Service Award
• Subaru Outstanding Woman in Science Award

GSA FELLOWSHIP
Nomination deadline: 1 Feb. 2014

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

AGI MEDAL IN MEMORY OF IAN CAMPBELL
Nomination deadline: 1 Feb. 2014

This award recognizes singular performance in and contribution to the profession of geology. To submit a nomination, go to www.agiweb.org/direct/awards.html.

AGI MARCUS MILLING LEGENDARY GEOScientist MEDAL
Nomination deadline: 1 Feb. 2014

This medal is given to a recipient with consistent contributions of high-quality scientific achievements and service to the earth sciences having lasting, historic value; who has been recognized for accomplishments in field(s) of expertise by professional societies, universities, or other organizations; and is a senior scientist nearing completion or has completed full-time regular employment. To submit a nomination, go to www.agiweb.org/direct/awards.html.

2014 NATIONAL AWARDS
• William T. Pecora Award: http://remotesensing.usgs.gov/pecora.php
• National Medal of Science: www.nsf.gov/od/nms/medal.jsp
• Vannevar Bush Award: www.nsf.gov/nsb/awards/bush.jsp
• Alan T. Waterman Award: www.nsf.gov/od/waterman/waterman.jsp
• G.K. Warren Prize: www.nasonline.org/site/PageServer?pagename=AWARDS_warren

JOHN C. FRYE ENVIRONMENTAL GEOLOGY AWARD
Nomination deadline: 31 March 2014

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

2014 POST-DOCTORAL RESEARCH AWARDS
Application deadline: 1 Feb. 2014

The following post-doc research awards are managed by the GSA Foundation. Learn more at www.geosociety.org/grants/postdoc.htm.
• The Gladys W. Cole Memorial Research Award for research on the geomorphology of semiarid and arid terrains in the United States and Mexico is awarded annually to a GSA member or Fellow between 30 and 65 years of age who has published one or more significant papers on geomorphology.
• The W. Storrs Cole Memorial Research Award for research on invertebrate micropaleontology is awarded annually to a GSA member or Fellow between 30 and 65 years of age who has published one or more significant papers on micropaleontology.

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James Hall
(1811–1898)
First President and Active Founder of GSA.
GSA’s K–12 Teacher Programs are continuing to grow, and as they grow, we continue to examine ways to make the K–12 GSA membership even more valuable.

Teachers often comment on the excellent articles published in GSA Today; however, they also comment that many articles are too technical for them. GSA’s Education & Outreach Dept. is looking for two or three geologists who excel in communicating complex geologic concepts to audiences with an introductory background in geology. Selected geologists will be asked to find two or three previously published GSA Today articles and write summaries about the science behind the articles. Summaries will be posted within GSA’s Connected Community and will be sent out via GSA’s e-newsletter for teachers. As a thank you, the selected geologists will receive free registration for GSA’s 2014 Annual Meeting in Vancouver.

If you are interested in assisting with this project, please submit a sample of your writing to Davida Buehler, dbuehler@geosociety.org, by 15 January. This sample should clearly demonstrate your ability to write about geological concepts for those with only an introductory background in geology.

FOR MORE INFORMATION, please contact Davida Buehler at dbuehler@geosociety.org.

FIELD CAMPS for K–12 Teachers

In 2014, GSA’s Teacher Advocate Program (TAP) will present three special field camps designed just for K–12 educators. These camps are a great way for educators to gain real geoscience field experience and collect great rock and mineral samples to share with their students. For more information, contact Davida Buehler, dbuehler@geosociety.org.

15–19 June: Illinois Basin Field Camp for K–12 Educators
21–26 June: Rocky Mountain Field Camp for K–12 Educators
14–19 July: Mammoth Cave Field Camp for K–12 Educators

www.geoventures.org
www.facebook.com/GSAK12Education
Explore Midcontinental Geology and Walk with Mammoths in Nebraska’s Beautiful Capital City!

LOCATION

Lincoln, Nebraska, USA, is located near the boundary between the Great Plains and the glaciated Central Lowlands and the Nebraska Sand Hills—the largest dunefield in the Western Hemisphere as well as the thickest loess sequence in North America—all within a half-day’s drive. The Missouri River, which drains a significant portion of the North American continent, and the Platte River, which is a classic braided stream, lie within 60 km. Rock strata from Upper Pennsylvanian to Upper Neogene in age are exposed in the eastern half of Nebraska, including the type sections of the Cretaceous Niobrara and the Dakota Formations. Nebraska is one of the most important regions in the world for the collection and study of Cenozoic mammals, and the University of Nebraska State Museum is one of the premier repositories for such fossils.
14. **Undergraduate Research (Posters).** *Cospunored by the Council on Undergraduate Research Geoscience Division.*
Robert Shuster, University of Nebraska–Omaha.

15. **Pennsylvania Cyclothem and Stratigraphy of the Midcontinent and Illinois Basins.** John P. Pope, Northwest Missouri State University.


**FIELD TRIPS**

Field Trip Chairs: Duane Eversoll, deversoll2@unl.edu; Jesse Korus, jkorus3@unl.edu.

1. **Building and Ornamental Stones in the Nebraska State Capital Building.** Wed., 23 April. Location: Lincoln, Nebraska, USA. Principal organizer: Joe Hannibal, Cleveland Museum of Natural History.

2. **Ashfall Fossil Beds State Historical Park, Orchard/Royal, Nebraska.** Sat., 26 April. Location: Royal, Nebraska, USA. Principal organizer: Shane Tucker, University of Nebraska State Museum; stucker3@unl.edu.

3. **Pleistocene Geology and Classic Type Sections along the Missouri River Valley.** Sat., 26 April. Location: area near Council Bluffs, Iowa, USA. Principal organizer: Charles Rovey, Missouri State University, charlesrovey@missouristate.edu.

4. **The Nebraska Sand Hills.** Sat.–Sun., 26–27 April. Location: area near Thedford, Nebraska, USA. Principal organizer: Dave Loope, University of Nebraska–Lincoln.

**REGISTRATION**

Early Registration Deadline: 24 March
Cancellation Deadline: 31 March

Registration opens in February 2014. For further information or if you need special accommodations, please contact Local Chair R. Matthew Joeckel at rjoeckel3@unl.edu, or Vice Chair Paul R. Hanson at phanson2@unl.edu.

**ACCOMMODATIONS**

A block of rooms has been reserved at The Cornhusker, a Marriott Hotel, 333 S. 13th Street, Lincoln, Nebraska 68508, USA, at US$104 + 16.48% hotel tax per night. Please call The Cornhusker, a Marriott Hotel, reservation line, +1-866-706-7706, and request a reservation under “The Geological Society of America Group Rate.”

**OPPORTUNITIES FOR STUDENTS**

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WWW.UPENN.EDU/MSAG.

Earn a masters degree in Applied Geosciences without interrupting your career. Full-time and part-time tracks are available. Students can complete this 12-course geology masters program in just two to four years.
Enjoy a free lunch while meeting with mentors working in geoscience. Times and locations will be announced as the meeting date draws closer. The popularity of these programs means that space is limited, so plan to arrive early, because lunch is first-come, first-served.

**SOUTH-CENTRAL SECTION**
Fayetteville, Arkansas, USA
Shlemon Mentor Luncheon Program:
Monday, 17 March
Mann Mentors in Applied Hydrology Luncheon:
Tuesday, 18 March

**NORTHEASTERN SECTION**
Lancaster, Pennsylvania, USA
Shlemon Mentor Luncheon Program:
Sunday, 23 March
Mann Mentors in Applied Hydrology Luncheon:
Monday, 24 March

**SOUTHEASTERN SECTION**
Blacksburg, Virginia, USA
Shlemon Mentor Luncheon Program:
Thursday, 10 April
Mann Mentors in Applied Hydrology Luncheon:
Friday, 11 April

**NORTH-CENTRAL SECTION**
Lincoln, Nebraska, USA
Shlemon Mentor Luncheon Program:
Thursday, 24 April
Mann Mentors in Applied Hydrology Luncheon:
Friday, 25 April

**JOINT MEETING: ROCKY MOUNTAIN AND CORDILLERAN SECTIONS**
Bozeman, Montana, USA
Shlemon Mentor Luncheon Program:
Monday, 19 May
Mann Mentors in Applied Hydrology Luncheon:
Tuesday, 20 May

For further information, contact Jennifer Nocerino at jnocerino@geosociety.org.
SOUTH-CENTRAL SECTION
Fayetteville, Arkansas, USA
17–18 March 2014
University of Arkansas Global
Local Committee chair: Steve Boss
Abstracts deadline: 3 Dec. 2013
Early registration deadline: 10 Feb. 2014

NORTHEASTERN SECTION
Lancaster, Pennsylvania, USA
23–25 March 2014
Lancaster Marriott
Local Committee co-chairs: Noel Potter and Roger Thomas
Abstracts deadline: 10 Dec. 2013
Early registration deadline: 18 Feb. 2014

SOUTHEASTERN SECTION
Blacksburg, Virginia, USA
10–11 April 2014
Skelton Conference Center at Virginia Tech
Local Committee chair: Robert Tracy
Abstracts deadline: 7 Jan. 2014
Early registration deadline: 10 Mar. 2014

NORTH-CENTRAL SECTION
Lincoln, Nebraska, USA
24–25 April 2014
Cornhusker Marriott
Local Committee chair: Matt Joeckel
Early registration deadline: 24 Mar. 2014

ROCKY MOUNTAIN/CORDILLERAN SECTIONS
Bozeman, Montana, USA
19–21 May 2014
Montana State University, Strand Union Building
Local Committee chair: Dave Lageson and Jeff Vervoort
Abstracts deadline: 11 Feb. 2014
Early registration deadline: 14 Apr. 2014
Planetary geology

Baerbel K. Lucchitta, U.S. Geological Survey, Flagstaff, Arizona 86001, USA

Ten years ago it was a time of change, the end of manned space exploration and the beginning of spectacular unmanned successes, the end of mission-oriented research and the emergence of planetary geology, the end of lavish spending and the start of fiscal restraint. The public had become blasé about space exploration, but enthusiasm among scientists was on the rise. The space program was in full swing. Six manned lunar landings had taken place; unmanned spacecraft showed close-up views of the surface of Mars; probes were on the way to Jupiter, Saturn, Mercury, and Venus; and the first Earth resources satellite was launched. Scientific results were pouring in: accretion of planetary bodies, we realized, left densely cratered early surfaces; anorthosites may have formed primeval crusts. A picture of the interior of the Moon took shape. Mars emerged as a body with a dynamic geologic history of volcanism, tectonism, and surface processes involving wind, water, and ice. Scientists saw the potential for a decade of fruitful analysis and synthesis—a virtual revolution in planetary exploration was foreseen for the late 70s and early 80s, and a vigorous program was planned, centered mostly on unmanned exploration with an added dimension, the search for life. Whereas spacecraft from several other countries will intercept Halley’s Comet, the United States elected to stay home. In the meantime, the Soviets have landed successfully on Venus several times, and a Soviet Venus Orbiter with radar capabilities and entry probes is now en route.

However, hope is high for a new start. A unified plan setting firm goals was recently proposed by a committee of scientists throughout the nation. The plan envisions frequent modest missions of high scientific priority; their number, beginning in 1984, may be as high as in the 1960s and 70s, but at far reduced cost. Inherited hardware and software are to be used on missions that we know how to do well, such as planetary orbiters, flybys, and atmospheric probes. The first mission in the plan, the Venus Radar Mapper, is clearing the last hurdles for approval. Other high priorities are a comet rendezvous, a geochemically instrumented spacecraft to Mars, and a probe to explore the atmosphere and surface of Titan.

The new missions are designed to address well-established scientific goals: to shed light on the present state, origin, and evolution of the Solar System; to understand Earth better; to improve our knowledge of the origin of life; and (a newly emerging goal) to provide a scientific basis for future utilization of resources in near-Earth space.

In the past decade our understanding of the Solar System and the Universe has vastly improved. Models for planetary origins and compositions became refined. Theories which we previously used for the shaping of other worlds were largely based on our terrestrial experiences: size of the planetary body and abundance of radio nucleides were considered major determinants in planetary evolution. We now know that heat engines driving evolution may be tidal or perhaps even electromagnetic forces, that surface compositions may be silicates, sulfur, or ices.
We have also learned about Earth. Ten years ago the news was that accretionary bombardment probably left scars on the early Earth similar to those on the Moon. Today the news is that throughout Earth’s history, impact events may have interrupted the evolutionary sequences of life. We have improved our understanding of early crusts and atmospheres and contributed to the knowledge of astronomical influences on climate. Above all, we have come to realize that Earth is unique, its environment fragile, and that it must be protected from adverse and unwise human intervention.

Uniformitarianism under scrutiny

Kenneth J. Hsü, Federal Institute of Technology, Zurich, Switzerland

I met Steve Gould 10 years ago; I knew him by name because he coined the phrase “substantive uniformitarianism,” which was applicable to the hot debate over our hypothesis that the Mediterranean was a desiccated deep basin during the late Miocene. No desert of comparable dimensions exists today, so it was difficult for substantive uniformitarianists to envision a Miocene desert 2,000–3,000 m below sea level. Finally, the JOIDES project scheduled a second cruise to the Mediterranean to test our unorthodox idea, but the results confirmed the earlier postulate.

What I did not know 10 years ago was that Gould also coauthored an article on punctuated evolution. The whole issue of tempo and mode of evolution has received increasing attention from the professionals and lay alike during the past decade. In a talk in 1978, Nick Shackleton told how he and his associates, using stable-isotope technique, found an oxygen-isotope perturbation across the Cretaceous-Tertiary boundary, which signifies a 5 °C rise in ocean temperatures. Recalling a speculative paper by M.W. de Laubenfels in 1956 on dinosaur extinction, which I read as a youth, I suggested in 1980 a connection between the sudden temperature rise and an impact event.

Also in 1980, Walter Alvarez and his associates reported unusual concentrations of iridium in the Cretaceous-Tertiary boundary clay, but they had related the anomaly to a nearby supernova explosion. New data on plutonium isotopes led them, however, to conclude that the iridium came from the ejecta fallout after an impact event. Their discovery is undoubtedly one of the greatest contributions in geology during the past decade. Having been encouraged that my speculations might be upgraded into a working hypothesis, I managed to persuade my shipboard colleagues and the JOIDES Planning Committee to drill in 1980 a South Atlantic site to explore the C-T boundary event. We obtained a good suite of cores, and our analyses indicated (1) mass mortality after an impact event, (2) drastic environmental changes and (3) mass extinction during the ensuing 50,000 yr.

GSA Special Paper 190, Geological Implications of Impacts of Large Asteroids and Comets on the Earth, contains statistical evidence that meteorites capable of causing catastrophic environmental changes must have fallen repeatedly during Phanerozoic time. In my International Association of Sedimentologists presidential address, on actualistic catastrophism, I pointed out that it is the magnitude and catastrophic consequences of certain events which make them rare. The effects of steady state are in many cases far overshadowed by these rare events of great magnitude. This concept may be a philosophical basis for interpreting the record of punctuated evolution.

The Darwinian theory of evolution has two essential components: (1) derivation from common descent, and (2) natural selection. No scientists today question the first premise. However, as M.J. Benton recently pointed out, the possibility of chance selections is real. Instead of adaptation for survival, the general pattern seems to be one of mass extinctions caused by catastrophic events, followed by rapid replacement by surviving opportunists, as advocated by Digby McLaren. At a recent Dahlem Conference on Patterns of Evolution in Earth History, the consensus developed that the biological effects of sudden catastrophic events can no longer be ignored. During the next decade, I envision, therefore, a marked increase in investigations on epoch, period, or era boundaries in the geologic time scale, to explore especially the possible consequences of large-body impacts on biologic evolution.
GeoCorps™ America
Thank You 2013 Participants, Partners, and Donors!

Thank you 2013 Participants, Partners, and Donors!

GeoCorps™ America places geoscientists of all levels—university students, teachers, professionals, and retirees—in short-term geoscience projects on public lands throughout the United States. The program also includes “Guest Scientist” positions, GeoCorps Diversity Internships, and GeoCorps American Indian Internships. GeoCorps projects are hosted by three major federal partners—the National Park Service (NPS), the U.S. Department of Agriculture (USDA) Forest Service, and the Bureau of Land Management (BLM). In 2012–2013, the State of California Department of Conservation's Abandoned Mine Lands (AML) Unit also hosted GeoCorps participants. These projects cover a wide variety of subjects related to the geosciences, including geology, hydrology, paleontology, soils, geohazards, mapping, GIS, education, and interpretation. This GSA Education & Outreach program is sponsored by individual donors and the organizations listed below.

GeoCorps is also funded by the following organizations that support public lands:

- Badlands Natural History Association
- Capitol Reef Natural History Association
- Colorado National Monument Association
- Discover Your Northwest

Friends of the Florissant Fossil Beds
- Grand Canyon Association
- Lake Fork Valley Conservancy
- Rocky Mountain Nature Association
- Western National Parks Association
- Zion Natural History Association

PARTICIPANTS—FALL/WINTER 2012–2013

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- Royal Gorge Field Office: Sarah Doyle

National Park Service
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- Big Thicket National Preserve: Nicole Thomas
- Catoctin Mountain Park: Thomas Schenck
- Chesapeake and Ohio Canal National Historical Park: Emily Long
- Congaree National Park: Kate Baustian
- Conservation and Outdoor Recreation Division, Washington Office: Peter Bonsall
- Geologic Resources Division: Maria Caffrey
- Geologic Resources Division: Lynn Moore
- Geologic Resources Division: Steven Park
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- Mojave National Preserve: Franklin Dekker
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- Yosemite National Park: Jessica Thompson
- Zion National Park: David Tarailo

USDA Forest Service
- Klamath National Forest: Griffin Heard

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<td>Ms. Sally Newcomb</td>
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<td>Bureau of Land Management (BLM)</td>
<td>Association for Women Geoscientists (AWG)</td>
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<td>California Dept. of Conservation AML Unit</td>
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Bureau of Land Management
Arizona Strip District: William Thompson
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San Juan Public Lands Center: Gregory Welter
Upper Missouri River Breaks National Monument: David Kambhu

California Department of Conservation
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National Park Service
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John Day Fossil Beds National Monument: Elizabeth Baker
John Day Fossil Beds National Monument: Steven Lundblad
Mammoth Cave National Park: Courtney Van Stolk

Sean McCartney, Mojave National Preserve (California Department of Conservation Abandoned Mine Lands Unit).

GeoCorps participants continued on p. 26
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Mount Rainier National Park: Amishi Kumar
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Huron-Manistee National Forests: Trevor Hobbs
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Tongass National Forest: Daniel Pawlak
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Willamette National Forest: Kelli Parsons

Positions for spring/summer 2014
will be posted 1 Dec. 2013.

Positions for fall/winter 2014
will be posted 1 May 2014.

www.geosociety.org/geocorps/
The new U.S. National Park Service and Geological Society of America Mosaics in Science program provides youth who are typically underrepresented in science career fields with on-the-ground, science-based work experiences with the National Park Service (NPS). Established in 2013, this multidisciplinary program provides opportunities for youth to work on inventory and monitoring, research, GIS, and interpretation and education projects. After these jobs are completed, participants attend a career workshop in Washington D.C., where they present the results of their work. They are also introduced to different science career paths and gain skills in order to apply for and obtain a federal job.

Program Objectives

• Encourage diverse youth (17–25 years old) to pursue studies in geoscience and other STEM fields;
• Introduce youth to geoscience and other STEM careers in the NPS;
• Provide meaningful and relevant STEM-based internships in parks; and
• Increase relevance, diversity, and inclusion in the NPS workplace.

Participants—Summer 2013

Catoctin Mountain Park: Kristan Culbert
Chesapeake and Ohio Canal National Historical Park: Ivan Carabajal
Florissant Fossil Beds National Monument: Selva Marroquin
Gateway National Recreation Area: Carlos Carvajal
Grand Canyon National Park (South Rim): Kaytan Kelkar
Mammoth Cave National Park: Jay Kim
Mount Rainier National Park: Marissa Reis
National Capital Parks—East: Juana Aguilar
National Capital Parks—East: Rebecca Fraker
Prince William Forest Park: Leyla Farshidpour
Prince William Forest Park: Javar Henry
Rock Creek Park: Zenovia Mitchell

The Mosaics in Science program is administered by GSA in close collaboration with the NPS Geologic Resources Division and the NPS Youth Program Office. Positions for spring/summer 2014 will be posted 1 Dec. 2013.

www.geosociety.org/mosaic/
The recent success of the inaugural GSA Distinguished International Lecture tour is an excellent example of two enduring strengths of our Society: a commitment to advancing the geosciences and the generosity of GSA’s members. In 2012, GSA Fellow Robbie Gries contacted the GSA Foundation regarding her interest in providing financial support for a new program. Consistent with GSA’s strategic priority of expanding the Society’s global outreach, and with the enthusiastic support of the International Section, a new international lecture tour program was launched. With Gries’ commitment of US$10,000, Vic Baker, Regents Professor of planetary sciences and geosciences at the University of Arizona, was selected to be the first speaker for the GSA Distinguished International Lecture tour.

Thanks to in-kind support from hosting institutions, Baker delivered 24 lectures in nine countries to a total of 1,500 people! Also, as a result of the lectures in Israel, the Israel Geological Society became a GSA Associated Society. Based on the success of this pilot program, Gries agreed to fund the lecture tour a second year, this time focusing on speaking engagements in Asia.

Marjorie Chan, professor of geology and geophysics at the University of Utah, will bring the Distinguished International Lecture tour to Asia in 2013–2014 (see p. 13). Within weeks of her selection, Chan obtained matching support (equivalent to Gries’ initial gift) from the University of Utah Office for Academic Affairs and Office for Global Engagement. Michael Hardman, the University of Utah’s chief global officer, writes, “The university congratulates Professor Chan on this well-deserved honor, and is pleased to play a role in partnership with GSA to support this prestigious international lecture tour.” This collaboration with the University of Utah will greatly expand the outreach achieved by the lecture tour.

This is only the beginning of the story. Based on the impact of the international lecture tour, a portion of the transformative bequest to the Foundation from the estate of James B. Thompson Jr. will fund and expand the lecture series on an ongoing basis. The James B. Thompson Jr. Distinguished International Lecturers tour will support one North American geoscientist to travel abroad and bring one non–North American geoscientist to lecture across North America each year.

“I am delighted with the broad scope and amazing commitment Vic Baker dedicated to making our first International DL Tour a profound success. He made a great start and I am sure that Margie Chan will match the effort … what pleasure it gives me!” says Gries.

This incredible step forward for GSA, initiated and then sustained by the support of dedicated GSA members, is an example for us all. Gifts in any amount, through an estate provision, donation, or membership renewal, includes you among a community of students, academics, and professionals who strengthen GSA by creating new opportunities to advance our science. These truly are the characteristics of a dynamic scientific society with generous members.

Thank you for your support!

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**DR. VIC BAKER—2012 DISTINGUISHED INTERNATIONAL LECTURE TOUR**

“Megafloods on Earth, Mars, and Beyond”

“Geological History of Water on an Earth-like Planet”

24 lectures • 1,500 attendees • Nine countries:

- Finland
- Israel
- Scotland
- Turkey
- France
- Italy
- Spain
- Germany
- Netherlands
- Sweden

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**Test your GSA knowledge!**

What is the northernmost, easternmost, southernmost, and westernmost city in which GSA has held an annual meeting?

Name the city where GSA held its 25th, 50th, 75th, 100th annual meetings.

**Please submit answers by the end of the month to gsaf@geosociety.org**

One winner will be selected each month to receive a copy of GeoTales V: A Collection of Stories & Memories Written by GSA Members.
Positions Open

TENURE TRACK ASSISTANT PROFESSOR
PALEOBIOLOGY AND/OR GEOLGY
UNIVERSITY OF NEW MEXICO

The Dept. of Earth and Planetary Sciences at the University of New Mexico invites applications for a tenure track faculty position at the rank of Assistant Professor in Paleobiology and/or Geobiology. We seek candidates who use field, laboratory, and/or quantitative methods to reconstruct the evolutionary history of the Earth and its biosphere. Candidates with demonstrated research expertise that complement existing departmental strengths (epswww.unm.edu) are especially encouraged to apply. Minimum qualifications are a Ph.D. in Geosciences or a related field at the time of appointment, targeted for August 2014.

The application package, containing a letter of interest, CV, a statement of teaching and research interests, and the names of three references with contact information, should be submitted electronically to UNM Jobs: http://unmjobs.unm.edu/applicants/Central1quickFind=74723.

For best consideration, all materials must be received by 6 Jan. 2014. However, the position will remain open until filled.

For questions regarding the application process please contact Paula Pascetti, pascetti@unm.edu, Search Coordinator, Dept. of Earth and Planetary Sciences, 1-1-505 277-1633.

Women and under-represented minorities are strongly encouraged to apply.

The University of New Mexico is an equal employment/affirmative action employer and educator.

GEOLGY, TERM POSITION, HOPE COLLEGE

The Dept. of Geological & Environmental Sciences at Hope College seeks applicants for a one-year term position, beginning in the fall of 2014, with a possibility of renewal for an additional year. This non-tenure track position will be at the assistant professor level. A Ph.D. is required. The exact teaching responsibilities will depend on the background of the candidate but will entail 12 contact hours per semester (combination of lab and lecture) in some subset of introductory Earth science, mineralogy, petrology, and an introductory level plate tectonics course. The ability to teach geomorphology or structural geology and the ability to integrate undergraduates into summer scholarly research are desirable for candidates interested in renewing the position for a possible second year. The appointee to this position will also be encouraged to collaborate in research with Hope College faculty.

Hope College is a distinctive and distinguished four-year, liberal arts, undergraduate institution, affiliated with the Reformed Church in America, and known and respected for excellence in science and mathematics. The mission of Hope College is to educate students for lives of leadership and service in a global society through academic and co-curricular programs of recognized excellence in the liberal arts and in the context of the historic Christian faith. The Division of Natural and Applied Sciences at Hope includes the departments of Biology, Chemistry, Computer Science, Geological and Environmental Sciences, Engineering, Mathematics, Nursing, and Physics and totals over 60 FTE faculty.

Hope College places a high priority on sustaining a supportive environment that recognizes the important role of a diverse faculty and staff in preparing students for successful careers in our multicultural nation and global community. Applications from persons with diverse backgrounds and cultures, including women and persons of color, are therefore especially welcomed. Hope College complies with federal and state requirements for nondiscrimination in employment. All new Hope College employees undergo a background check before employment.

Interested applicants should apply online at www.hope.edu/employment by uploading a letter of application, curriculum vitae, transcripts (unofficial accepted for the initial application), a statement of teaching philosophy and competencies, and a description of scholarly research. Applicants should also provide contact information for three potential references. Application deadline is 15 Dec. 2013. Preliminary inquiries may be sent by e-mail to bodenbender@hope.edu.

PETROLOGIST/MINERALOGIST/
GEOCHEMIST, LAFAYETTE COLLEGE

The University of Oklahoma invites applications for a tenure track position in Geophysics at the Assistant or Associate Professor level. Departmental interests range from the deep lithosphere, through hydrocarbon exploration, to near surface geophysics. We search for a dynamic candidate to supervise students at all levels, and to conduct independent, externally funded research program in his/her field of expertise.

The candidate should hold a Ph.D. in Geophysics; have a demonstrated research record, and an interest in teaching undergraduate and mentoring graduate students in lithospheric and exploration geophysics. Salary, benefits, and start-up funds will be competitive and commensurate with experience. The ConocoPhillips School of Geology and Geophysics is a large, vibrant faculty with a broad range of research activities and strong ties to the petroleum industry. The student body includes about 150 undergraduates and 100 M.S. and Ph.D. students. The Mewbourne College of Earth & Energy possesses extensive software and computing labs of PC and Linux platforms networked to our own Brownfield cluster and to the OU supercomputer center (OSCER). It hosts numerous industrial consortia, a research institute focused on seismic monitoring, and a new field campus in Colorado for field courses in geology and geophysics. The geophysics group conducts active research projects on several continents that are funded by NSF, industry, and foreign national institutes. The College maintains a comprehensive pool of geophysical equipment including GPR, seismic (active and passive), magnetic, and gravity instruments as well as extensive rock physics characterization laboratories. Through collaboration with industry, we have a suite of 3D seismic and microseismic data volumes that are used for teaching, algorithm calibration, seismic:geomorphological analysis, crustal imaging, and a range of open source software for lithospheric-scale research. Information about the School and College, the facilities and the entities that it houses can be found at http://geology.ou.edu.

Review of applications will begin December 1, 2013, and on-campus interviews will start early 2014. The search will continue until the position is filled. The anticipated starting date is August 16, 2014. Applicants are requested to submit a complete vita/resume, statement of research and teaching interests, and a list of five references who can be contacted, including phone numbers, e-mail addresses, and mailing addresses. Questions or information requests may be addressed to Chair of the Geophysics Search Committee, at (405) 325-3252, or geophysicssearch@ou.edu. Applications and nominations should be addressed to: Geophysics Search Committee, The University of Oklahoma, Sarkeys Energy Center, 100 E. Boyd Street, Room 710, Norman, OK, 73019-1008.

The University of Oklahoma is an Affirmative Action, Equal Opportunity Employer. Women and minorities are encouraged to apply.
at http://geology.lafayette.edu/job-opportunities and candidate should arrange to have three letters of reference submitted by their referees to the reference form at http://geology.lafayette.edu/job-opportunities. We will interview at the Geological Society of America meeting in Denver, CO; however, applications will be accepted through 15 Jan. 2014 or until position is filled

HYDROGEOCHEMIST, GEOHYDROLOGY
SECTION KANSAS GEOLOGICAL SURVEY
THE UNIVERSITY OF KANSAS–LAWRENCE
Full-time position to lead KGS hydrogeochemical investigations. Faculty-equivalent, sabbatical-eligible position at the rank of Assistant or entry-level Associate Scientist. Requires Ph.D. with an emphasis on aqueous geochemistry related to groundwater resources and scientific leadership potential. Background in hydrogeochemistry applied to regional-scale groundwater investigations is desired. The Geochemistry Section has 7 full-time professionals with additional support personnel. Emphasis on state-of-the-science field studies and complementary theoretical research. Complete announcement/application info at http://www.kgs.ku.edu/General/jobs.html. First consideration deadline: 7 Feb. 2014. Apply online at http://jobs.brassring.com/1033/ASP/TG/cim_jobdetail.asp?partnerid=25752&siteid=5447&Req=44BR. For further information contact Geoff Bohling (geoff@kgs.ku.edu) or Don Whittemore (downtown@kgs.ku.edu), Equal Opportunity Employer M/F/D/V.

TENURE-TRACK ASSISTANT PROFESSOR
APPOINTMENT IN STRATIGRAPHY AND SEDIMENTATION
NORTHERN ARIZONA UNIVERSITY
We seek applicants for a tenure-track, Assistant Professor position in Stratigraphy and Sedimentology for August 2014. Minimum qualifications are a doctorate in a field related to stratigraphy by the start date, teaching experience at the college level, and field-based research experience in sedimentary rocks. Preferred candidates will show an ability to teach undergraduate (GLG 324) and graduate-level courses in stratigraphy and sedimentology; broad interest in stratigraphy across the time scale; experience in theory and applications of seismic stratigraphy; strong research productivity commensurate with experience; ability to connect with and build upon on-going research within SESEs; expertise in modern techniques addressing stratigraphic and/or sedimentologic problems; experience in process or numerical modeling and geospatial analysis; expertise in ESRI-based GIS; and a demonstrated experience in, or commitment to, working with students, colleagues, and community members from diverse cultures. Applicants should send a pdf that contains a letter of application describing their professional goals and how they meet the minimum and preferred qualifications, including evidence for preparedness to teach an undergraduate- and graduate-level courses in stratigraphy and sedimentology, a curriculum vita, and contact information for three references to SESEs_Admin_Support@nau.edu. For questions regarding the position, contact the Chair of the search committee, Nancy.Riggs@nau.edu; see the full announcement at www.nau.edu/hr. Northern Arizona University is a committed Equal Opportunity/Affirmative Action Institution. Women, minorities, veterans and individuals with disabilities are encouraged to apply.

STRUCTURAL GEOLOGY
TENURE TRACK FACULTY POSITION
DEPT. OF GEOLOGY
UNIVERSITY OF GEORGIA
The Dept. of Geology, University of Georgia (UGA), invites applications for a tenure-track Assistant Professor position in the broad area of structural geology starting 1 Aug. 2014. The preferred applicant will be an innovative geologist who combines field observations with analytical data to examine large-scale tectonic processes. Although the specific area of technical expertise is open, we seek a creative scientist who will complement our existing programs in tectonics, petrology, and solid-earth geophysics. Preference will be given to candidates whose research includes a strong field-based component. The successful candidate will be encouraged to participate in the UGA Dept. of Geology Summer Field School in Colorado.

The successful candidate will be expected to establish an externally funded research program, direct graduate and undergraduate student research, and teach undergraduate structural geology, introductory geology, and graduate-level courses in his/her specialty. A Ph.D. in geology is required at the time of appointment.

Candidates should submit a cover letter, a CV, a statement of research and teaching interests, and contact information for three referees to http://recruitment.franklin.uga.edu. Review of applications will begin 2 Dec. 2013, and the position will remain open until filled.

The Franklin College of Arts and Sciences, its many units, and the University of Georgia are committed to increasing the diversity of its faculty and students, and sustaining a work and learning environment that is inclusive. Women, minorities and people with disabilities are encouraged to apply. The University is an EEO/AA institution. Georgia is well known for its quality of life in regard to both outdoor and urban activities (www.georgia.gov). UGA is a land and sea grant institution located in Athens, 90 miles northeast of Atlanta, the state capital (www.visithargensa.com; www.uga.edu).

HYDROLOGICAL MODELING ASSISTANT PROFESSOR
BAYLOR UNIVERSITY
The Baylor University Dept. of Geology seeks a dynamic scholar to fill this position beginning August 2014. Candidates should have a Ph.D. in Geology, Hydrogeology, Hydrology, Hydraulics or a closely related discipline with a strong emphasis on numerical modeling of surface and/or groundwater systems. Integration of measurements from Earth and space-based sensors and geophysics and other ground based measurements is encouraged. Research areas may range in scope from the critical zone to global hydrologic cycles and sustainability. Regardless of research focus area, enthusiasm for interdisciplinary research and cultivation of new collaborations is essential to this position. The successful candidate will teach courses in hydrologic/hydrogeologic systems modeling, establish and participate in externally-funded research, and successfully mentor M.S. and Ph.D. candidates to graduation.

Applications for the position will be accepted until the position is filled. Please submit a letter of application, current curriculum vitae, transcripts, and a description of your research plan and teaching philosophy. Include names, addresses, and phone numbers of three individuals from whom you have requested letters of recommendation to Dr. Joe C. Yelderman, Jr., Search Committee Chair, Baylor University, One Bear Place #97354, Waco, Texas 76798-7354, +1-254-710-2361.

Materials may be submitted electronically to joe_yelderman@baylor.edu with a cc: to stacy_atchley@baylor.edu.

Baylor is a Baptist university affiliated with the Baptist General Convention of Texas. As an AA/EEO employer, Baylor encourages minorities, women, veterans, & persons with disabilities to apply.

THE ROY J. SHLEMON CHAIR IN APPLIED GEOSCIENCES
DEPT. OF EARTH AND PLANETARY SCIENCES
UNIVERSITY OF CALIFORNIA AT DAVIS
The Dept. of Earth and Planetary Sciences at the University of California at Davis seeks an outstanding scholar for The Roy J. Shlemon Chair in Applied Geosciences in the College of Letters and Science. We seek an individual with a well-established, highly visible and interdisciplinary research program in Quaternary geomorphology with a strong quantitative background and an active interest in understanding the dynamics of Earth’s surface through studies of the physics of surficial processes and the broad-scale interactions among tectonics, topography, and climate. Areas of interest include, but are not limited to, the dynamics of river and delta systems in response to tectonism, climate change and sea level change, the geomorphic evolution of mountain ranges and their local and regional impact on and feedback with climate dynamics, and theoretical modeling of fluid mechanics and sediment transport as applied to problems of geomorphology.

We anticipate an appointment at the Associate or Full Professor level to begin 1 July 2014. The successful candidate is expected to hold the academic distinction for appointment to an endowed Chair at the post-tenure level. The candidate is further expected to create a focal point for Quaternary Science research on the UC Davis campus as well as to explore links to the Center for Watershed Sciences (http://watershed.ucdavis.edu) of the John Muir Institute of the Environment. An interest in policy development of water resource issues in California and/or the western United States is desirable.

For more information about the UC Davis Dept. of Earth and Planetary Sciences, see http://geology.ucdavis.edu.

To apply, please go to https://recurruc.ucdavis.edu/apply/PPF00159.

Review of applications will begin on 20 Dec. and will continue until the position is filled. UC Davis
is an affirmative action/equal employment opportunity employer and is dedicated to recruiting a diverse faculty community. We welcome all qualified applicants to apply, including women, minorities, individuals with disabilities and veterans.

**FACULTY POSITION IN TECTONICS**  
**BOSTON UNIVERSITY**

The Dept. of Earth & Environment at Boston University invites applications for an Assistant Professor (tenure-track) in Tectonics, beginning in Fall 2014 (subject to budgetary approval). We seek applicants whose research encompasses broad field-based investigations aimed at understanding the evolution and dynamics of the continental lithosphere at regional to global scale. We especially welcome applicants whose research emphasizes interactions between tectonics and other aspects of the evolving Earth system such as Earth history, mantle dynamics, climate & sea level change, landscape evolution, natural resources, hazards, and more. Candidates’ research might span such disciplines as structural geology, geochemistry, geothermochronology, sedimentology, stratigraphy, tectonic-geomorphology, and paleomagnetism.

The successful applicant will be expected to supervise graduate research in M.A. and Ph.D. programs, maintain an externally funded research program, and teach at all levels in the Earth & Environment curriculum. We seek an applicant whose research complements departmental expertise in solid Earth geosciences and integrates well with other departmental themes. Interaction is encouraged with other departments including Chemistry, Physics, Astronomy, and the B.U. Marine Program. For more information about the Department, see www.bu.edu/earth. A Ph.D. at the time of appointment is required. Please apply online at https://academicjobsonline.org, including a curriculum vitae, a statement of research and teaching interests, and the names and addresses of at least three references.

**ASSISTANT PROFESSOR**  
**EARTH & ATMOSPHERIC SCIENCES** (EXPLORATION GEOPHYSICS)  
**UNIVERSITY OF NEBRASKA–LINCOLN**

Applications are invited for a tenure track position as Assistant Professor in the Dept. of Earth & Atmospheric Sciences at the University of Nebraska-Lincoln. This hire would become part of vibrant and growing geology program.

Strong potential for research and teaching and must hold a Ph.D. in geology or a related field at the time of appointment. The successful candidate will be expected to teach courses in the undergraduate and graduate core curricula and develop courses in their area of expertise. The successful candidate will also be expected to advise and direct graduate students and to develop a rigorous research program that is supported by external funding. We seek applicants with research and teaching interests that complement departmental strengths. Female and ethnic minority candidates are particularly encouraged to apply.

Additional information on the geology program can be found on the department’s website: http://eas.unl.edu.

To apply, go to http://employment.unl.edu requisition E_130184 and click on “apply to this job,” complete this form and attach a cover letter, curriculum vitae, statement of research and teaching interests, and names of at least three references via the above website. Review of applications will begin on 1 Jan. 2014 but the position will remain open until it is filled.

The University of Nebraska is committed to a pluralistic campus community through affirmative action, equal opportunity, work-life balance and dual careers. More information is available at www.unl.edu/svcaar/facility/policies/work_life_balance.shtml. Lincoln is a highly livable city with affordable housing and excellent schools (www.unl.edu/comm/lincoln/). For further information, contact Dr. Christopher Fielding, Search Committee Chair by e-mail, phone, or mail at cfielding@unl.edu, -402-472-9801; Dept. of Earth and Atmospheric Sciences, University of Nebraska, 214 Bessey Hall, Lincoln, NE 68588-0340.

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**KARST HYDROGEOLOGIST**  
**MIDDLE TENNESSEE STATE UNIVERSITY**

The Geosciences Dept. of Middle Tennessee State University seeks a karst hydrogeologist with a broad background in surficial processes. Teaching responsibilities include undergraduate and graduate courses in hydrogeology and environmental geology. Other teaching responsibilities may include introductory courses such as Earth Science and Physical Geology. The selected candidate is expected to have a background in geomorphology, geological applications of GIS, and geology of soils. Research, university/community service, and cooperative work with department faculty and staff are expected. Excellence in teaching, research/creative activity and service is expected for all positions. MTSU seeks candidates committed to using integrative technologies in teaching. A Ph.D. in Geology or related field is required.

To apply for this position, go to http://metsjobs.mtsu.edu and follow the instructions on how to complete an application, attach documents, and submit online. Review of applications begins 10-28-2013 and continues until position is filled. Rank and salary are commensurate with education and experience. Proof of U.S. citizenship or eligibility for U.S. employment will be required prior to employment (Immigration Control Act of 1986). Cleary Act crime statistics for MTSU available at http://police.mtsu.edu/crime_statistics.htm or by contacting MTSU Public Safety at 1-615-898-2424. EO/AA employer.

**ASSISTANT PROFESSOR**  
**EARTH & ATMOSPHERIC SCIENCES** (EXPLORATION GEOPHYSICS)  
**KARST HYDROGEOLOGIST**  
**MIDDLE TENNESSEE STATE UNIVERSITY**

The Geosciences Dept. of Middle Tennessee State University seeks a karst hydrogeologist with a broad background in surficial processes. Teaching responsibilities include undergraduate and graduate courses in hydrogeology and environmental geology. Other teaching responsibilities may include introductory courses such as Earth Science and Physical Geology. The selected candidate is expected to have a background in geomorphology, geological applications of GIS, and geology of soils. Research, university/community service, and cooperative work with department faculty and staff are expected. Excellence in teaching, research/creative activity and service is expected for all positions. MTSU seeks candidates committed to using integrative technologies in teaching. A Ph.D. in Geology or related field is required.

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**ASSISTANT PROFESSOR**  
**EARTHL & ATMOSPHERIC SCIENCES** (EXPLORATION GEOPHYSICS)  
**UNIVERSITY OF NEBRASKA–LINCOLN**

Applications are invited for a tenure track position as Assistant Professor in the Dept. of Earth & Atmospheric Sciences at the University of Nebraska-Lincoln. This hire would become part of vibrant and growing geology program.

Strong potential for research and teaching and must hold a Ph.D. in geology or a related field at the time of appointment. The successful candidate will be expected to teach courses in the undergraduate and graduate core curricula and develop courses in their area of expertise. The successful candidate will also be expected to advise and direct graduate students and to develop a rigorous research program that is supported by external funding. We seek applicants with research and teaching interests that complement departmental strengths. Female and ethnic minority candidates are particularly encouraged to apply.

Additional information on the geology program can be found on the department’s website: http://eas.unl.edu.

To apply, go to http://employment.unl.edu requisition E_130184 and click on "apply to this job," complete this form and attach a cover letter, curriculum vitae, statement of research and teaching interests, and names of at least three references via the above website. Review of applications will begin on 1 Jan. 2014 but the position will remain open until it is filled.

The University of Nebraska is committed to a pluralistic campus community through affirmative action, equal opportunity, work-life balance and dual careers. More information is available at www.unl.edu/svcaar/faculty/policies/work_life_balance.shtml. Lincoln is a highly livable city with affordable housing and excellent schools (www.unl.edu/comm/lincoln/). For further information, contact Dr. Christopher Fielding, Search Committee Chair by e-mail, phone, or mail at cfielding@unl.edu, -402-472-9801; Dept. of Earth and Atmospheric Sciences, University of Nebraska, 214 Bessey Hall, Lincoln, NE 68588-0340.

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**TENURE-TRACK FACULTY POSITION IN LANDFORM EVOLUTION AND SURFICIAL PROCESSES, DEPT. OF GEOSCIENCE, UNIVERSITY OF WISCONSIN–MADISON**

The Dept. of Geoscience at the University of Wisconsin–Madison seeks a geoscientist for an assistant professor, tenure-track position in Landform Evolution and Surficial Processes beginning August 2014. We are particularly interested in a quantitative and field-oriented geoscientist. Specialties may include, but are not limited to, glacial geomorphology, fluvial geomorphology, paleoclimate, environmental/climatic interactions, Quaternary geology, tectonic geomorphology, submarine geomorphology, and geologic hazards.

A Ph.D. in Geoscience or related field is required at the time of the appointment. Responsibilities include conducting scientific research, advising graduate students, teaching undergraduate and graduate courses, and performing appropriate university and professional service.

Potential collaborative interactions exist within the department, with other departments and programs on campus (e.g., Atmospheric and Oceanic Sciences, Geological Engineering, Geography, Nelson Institute for the Environment), with the Wisconsin Geological and Natural History Survey, and with state and federal agency researchers in the Madison area (USGS, WI Dept. of Natural Resources, USDA).

Applicants should submit a curriculum vitae, statement of research and teaching interests, and the names and addresses of at least three references to lsepsearch@geology.wisc.edu. If necessary, you can contact Dr. Basil Tikoff, Landform Evolution and Paleomagnetism.
For additional information, please visit http://geoscience.wisc.edu/geoscience/. UW-Madison is an equal opportunity/affirmative action employer and encourages applications from women and minorities. A background check will be required prior to employment. Unless confidentiality is requested in writing, information regarding applicants must be released upon request. Finalists cannot be guaranteed confidentiality.

TENURE-TRACK ASSISTANT PROFESSOR OF HYDROLOGY GEORGIA STATE UNIVERSITY
The Dept. of Geosciences at Georgia State University anticipates hiring a tenure-track faculty member at the Assistant Professor level pending budgetary approval in the area of Hydrology with research interests in surface-water hydrology or fluvial geomorphology. The candidate should have a willingness to participate in interdisciplinary collaborations centered on urban issues, in line with one of GSU’s strategic goals of understanding the complex challenges of cities and developing effective solutions. The successful candidate will have an active, funded/able research agenda in his or her area, and will be expected to teach both lower- and upper-division courses, and direct graduate students. A Ph.D. in geography, geology, or a closely related discipline is required by the time of appointment. The position will begin in August 2014.

Georgia State University is a growing research university in the dynamic heart of downtown Atlanta with a diverse student body of over 32,000 students. The Dept. of Geosciences (http://geosciences.gsu.edu/) offers bachelors and masters degrees in Geosciences, with concentrations in geography and geology, and a Ph.D. in Chemistry with a geology specialization. Extensive geochronal facilites are available in the department and many others through core facilities in Biology and Chemistry. Candidates should provide a cover letter, statements of research and teaching interests and goals, names and email addresses of at least three references, and curriculum vitae to Dr. Larry Kage, Chair, Hydrology Search Committee, Dept. of Geosciences, Georgia State University, P.O. Box 4105, Atlanta, GA 30302-4105. To ensure full consideration, applications should send their materials by 30 Nov. 2013. Electronic submissions are welcomed, please send submissions to geosjobsearch@gsu.edu. This position is open until filled. An offer of employment will be conditional upon background verification. Georgia State University is a Research University of the University System of Georgia and is an EEO/AA employer.

ASSISTANT PROFESSOR DIVISION OF GEOLOGICAL AND PLANETARY SCIENCES CALIFORNIA INSTITUTE OF TECHNOLOGY
The Division of Geological and Planetary Sciences at the California Institute of Technology (Caltech) is seeking applicants for a tenure-track position at the assistant professor level. We seek applicants for a position in any area within the purview of the Division of Geological and Planetary Sciences, with a strong commitment to high quality teaching. We solicit applicants from the broad range of disciplines within Earth and planetary science, including geology, geochemistry, geobiology, and planetary science, and who are interested in all aspects of earth and planetary dynamics, interiors, surfaces, atmospheres, oceans, and cryospheres.

The term of the initial appointment at the assistant professor level is normally four years, with appointment contingent upon completion of a Ph.D. in a relevant field. Exceptionally well-qualified candidates may also be considered at the tenured professor level. Interested applicants should submit an electronic application at www.gps.caltech.edu/employment. Applications will be accepted until the position is filled. If there are any questions during the search process, please contact us at gps-search@caltech.edu.

The California Institute of Technology is an Equal-Opportunity/Affirmative-Action Employer. Women, minorities, veterans, and disabled persons are encouraged to apply.

TWO ASSISTANT PROFESSOR POSITIONS GEOCHEMISTRY AND HYDROGEOLOGY/GEOFLOUIDS BOONE PICKENS SCHOOL OF GEOLOGY OKLAHOMA STATE UNIVERSITY
The Boone Pickens School of Geology at Oklahoma State University seeks two tenure track assistant professors: one in sedimentary geochemistry and another in hydrogeology/geofluids. These positions will be effective August 2014 contingent on funding. The applicant should have a Ph.D. degree in geosciences or a related field at the time of appointment.

For the sedimentary geochemistry position, we are seeking candidates with strengths in one or more of the following areas: organic geochemistry, low temperature metals geochemistry, biomarkers as applied to petroleum systems, environmental systems, and paleo/climate change.

For the hydrogeology/geofluids position, we are seeking candidates with strengths in one or more of the following: simulation of subsurface flow and solute transport, variable-density or multiphase fluid modeling, reactive transport modeling in porous/fractured media, and hydrogeophysics as applied to sedimentary basins, biogeochemistry, petroleum, hydrodynamic systems, and environmental change.

The successful candidates will complement School strengths in stable isotope geochemistry, petroleum geology (conventional and unconventional), paleoenvironment, biochemistry, and biogeochemistry. We seek candidates who will develop vigorous and innovative research programs and who will contribute to School teaching at both undergraduate and graduate levels. The candidates will be expected to supervise M.S. and Ph.D. students and develop courses in their areas of expertise.

The successful candidates will join a faculty of fourteen geoscientists in a department that has close ties to the petroleum and water resource industries. The School’s teaching and research facilities include state of the art geochemistry laboratory facilities and equipment, geophysical field and laboratory equipment and software, the Devon Visualization Laboratory, and a wide range of petrographic and hydrogeochemical instrumentation and field equipment. The School operates a field camp facility near Canion City, Colorado.

Candidates should submit an application package that includes a cover letter; curriculum vitae; reprints of three published papers; contact information for three referees; and separate statements of research and teaching vision. Candidates should include in their research vision a brief description of how their research will interface with that of existing faculty. All application materials should be submitted to Assistant Professor Search, Boone Pickens School of Geology, 105 Noble Research Center, Oklahoma State University, Stillwater, Oklahoma 74078-3031. Screening of candidates will begin on 15 Nov. 2013 and continue until the position is filled. More information about the Boone Pickens School of Geology can be found on the web at http://geology.okstate.edu. Inquiries may be directed to Dr. Todd Halihan (todd.halihan at okstate.edu) or Dr. Jason Gregg (jay.gregg at okstate.edu). Committed to health and safety, Oklahoma State University maintains a tobacco-free work environment. Oklahoma State University is an Affirmative Action/Equal Opportunity/E-Verify employer committed to diversity.

ENVIRONMENTAL BIOGEOCHEMISTRY/ GEOBIOLOGY, DARTMOUTH COLLEGE
The Dept. of Earth Sciences at Dartmouth College invites applications for a junior rank tenure-track position in the general areas of biogeochemistry and geobiology. We especially welcome applications from candidates with research interests that include microbially-mediated biogeochemical interactions in processes of mineralization, weathering, and sequestration of contaminants; hydrocarbon formation and degradation; biogeochemical cycling in fluvial and/or cold environments, including river-channel, floodplain, and lacustrine ecosystem response to environmental change. Particular attention will be given to candidates who combine a focus on understanding fundamental processes with state-of-the-art laboratory and/or field research programs that complement and contribute to ongoing research activities in the department as well as in Dartmouth’s Geisel School of Medicine and Thayer School of Engineering. The successful candidate will continue Dartmouth’s strong traditions in graduate and undergraduate research and teaching. Teaching responsibilities consist of three courses spread over three of four ten-week terms.

The Dept. of Earth Sciences is home to 11 tenure- and tenure-track faculty members in the School of Arts and Sciences, and enjoys strong Ph.D. and M.S. programs and outstanding undergraduate majors. To create an atmosphere supportive of research, Dartmouth College offers new faculty members grants for research-related expenses, a quarter of sabbatical leave for each three academic years in residence, and flexible scheduling of teaching responsibilities.

Dartmouth College, a member of the Ivy League, is located in Hanover, New Hampshire (on the Vermont border). Dartmouth has a beautiful, historic campus located in a scenic area on the Connecticut River. Recreational opportunities abound.

View Classified and GeoMart ads online at www.geosociety.org/advertising.htm
in all four seasons. To learn more about Dartmouth College and the Dept. of Earth Sciences, please visit www.dartmouth.edu/~earthsci.

To submit an application, send curriculum vitae, statements of teaching and research interests and objectives, reprints or preprints of up to three of your most significant publications, and the name, address (including street address), e-mail address and fax/phone numbers of at least three references to Sedimentary Systems Search Committee, Dept. of Earth Sciences, Dartmouth College 6105 Fairchild Hall, Hanover, NH 03755, e-mail: earth.sciences@dartmouth.edu

Applications received by 8 Nov. 2013 will receive first consideration. The appointment will be effective 1 July 2014.

With an even distribution of male and female students and over a quarter of the undergraduate student population members of minority groups, Dartmouth is committed to diversity and encourages applications from women and minorities. Dartmouth College is an equal opportunity and affirmative action employer.

SEDIMENTARY SYSTEMS
DARTMOUTH COLLEGE

The Dept. of Earth Sciences at Dartmouth College invites applications for a junior-rank, tenure-track position in the area of environmental change in sedimentary systems. We welcome applications from candidates with specific research interests in biogeochemical interactions in processes of mineralization in sedimentary systems, and/or quantitative analysis of evolving sedimentary systems on local environmental to basin-wide to global scales. Particular attention will be given to candidates who combine a focus on fundamental processes with state-of-the-art field and/or laboratory research programs that complement and contribute to ongoing research activities at Dartmouth. The successful candidate will continue Dartmouth's strong traditions in graduate and undergraduate research and teaching. Teaching responsibilities consist of three courses, including sedimentary geology and sedimentary petrology, spread over three of four ten-week terms.

The Dept. of Earth Sciences is home to 11 tenured and tenure-track faculty members in the School of Arts and Sciences, and enjoys strong Ph.D. and M.S. programs and outstanding undergraduate majors. To create an atmosphere supportive of research, Dartmouth College offers new faculty members grants for research-related expenses, a quarter of sabbatical leave for each three academic years in residence, and flexible scheduling of teaching responsibilities.

Dartmouth College, a member of the Ivy League, is located in Hanover, New Hampshire (on the Vermont border). Dartmouth has a beautiful, historic campus located in a scenic area on the Connecticut River. Recreational opportunities abound in all four seasons. To learn more about Dartmouth College and the Dept. of Earth Sciences, please visit www.dartmouth.edu/~earthsci.

To submit an application, send curriculum vitae, statements of teaching and research interests and objectives, reprints or preprints of up to three of your most significant publications, and the name, address (including street address), e-mail address and fax/phone numbers of at least three references to Sedimentary Systems Search Committee, Dept. of Earth Sciences, Dartmouth College 6105 Fairchild Hall, Hanover, NH 03755, e-mail: earth.sciences@dartmouth.edu

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FACULTY POSITION
SOLID EARTH PROCESSES
UNIVERSITY OF ROCHESTER

The Dept. of Earth and Environmental Sciences at the University of Rochester will be hiring a tenure-track faculty in Solid Earth Processes, in disciplines that include, but are not limited to Petrology and/or Geochemistry. The rank of the position is open, with a start date of 1 July 2014. We are interested in a dynamic educator and researcher who uses geochemical and/or computational approaches in their research and can establish externally funded, internationally recognized research programs. Preference will be given to applicants who can build cross-disciplinary programs involving undergraduate and graduate students that complement the University of Rochester's strengths in tectonics, Earth and planetary evolution, geophysics, geochemistry, and climate science (see www.ees.rochester.edu for more information about programs in the department). We seek applicants who can teach Petrology. The University of Rochester is a highly ranked research university, and Rochester's cultural, educational, and recreational assets consistently place the city in the top 10 places to live within the U.S. Applicants should submit materials via: https://www.rochester.edu/fort/ees/. Materials include a curriculum vitae, select reprints, statements of research and teaching goals, and the names and contact information of four references. The review of applications will begin 15 Dec. 2013 and will continue until the position is filled. The University of Rochester has a strong commitment to principles of diversity and, in that spirit, actively encourages applications from groups under-represented in higher education.

ASSISTANT PROFESSOR
STRUCTURAL GEOLOGY AND TECTONICS
UNIVERSITY OF MISSOURI

The Dept. of Geological Sciences at the University of Missouri invites applications for a tenure-track, Assistant Professor position beginning in August 2014 in the broadly defined area of Structural Geology and Tectonics. The successful candidate's research will ideally complement and expand upon one or more of the areas of departmental expertise in solid-earth processes including geodynamics, igneous and metamorphic petrology, neotectonics, and seismology. Completion of the Ph.D. at the time of appointment is required. Applicants should be prepared to prove eligibility to work in the United States.

The successful applicant will be expected to teach across the curriculum, i.e., introductory classes, advanced undergraduate courses, and graduate courses in his/her area of expertise. The applicant will also be expected to develop an active, externally funded research program and to direct graduate student research at the M.S. and Ph.D. levels.

Please apply online at http://hrs.missouri.edu/ find-a-job/academic. In addition to a curriculum vitae (CV), applicants should include a letter describing their geologic interests and qualifications for the position, a teaching portfolio, and a list of three references (including contact information). Items other than the CV should be uploaded in the Attachments section of the application system. Initial screening of applicants will begin 6 Jan. 2014 and will continue until a suitable candidate is hired. Information about our department is available at http://geology.missouri.edu. The University of Missouri is an EO/AA/ADA employer.

GEOL OGY, P E TROLOGY
UNIVERSITY OF WISCONSIN OSHKOSH

University of Wisconsin Oshkosh, Dept. of Geology, seeks hard rock, field-oriented geologist for full-time, tenure-track assistant or associate professor position starting 1 Sept. 2014. Specialty area should complement existing faculty expertise. Ph.D. required; prior college/university teaching experience preferred. Successful candidate is expected to develop a vigorous research program, which includes publishing peer-reviewed papers. Teaching responsibilities include introductory courses, and courses in his/her area of expertise. Applicants must have credentials for appointment at the Ph.D. level, and should submit materials via: https://careers.sfasu.edu/ (posting 0602535). Also submit all official transcripts (original or photocopy) by 31 Dec. 2013 to Dr. William Mode, Chair, Dept. of Geology, University of Wisconsin Oshkosh, Oshkosh, WI 54901. Have three current letters of reference sent directly to the department by that date. For additional information see www.uwosh.edu/_departments/geology/. Employment requires criminal background check. AA/EOE

CHAIR, DEPT. OF GEOLOGY
STEPH En F. AUSTIN STATE UNIVERSITY

The Dept. of Geology at Stephen F. Austin State University (SFA) invites applications for the department chair position. We seek an individual with strong management, communication, and interpersonal skills to provide innovative and energetic leadership. Duties include managing curricula, budgets, student enrollment, personnel, program and unit assessment, and developing strong, mutually beneficial relationships with industry and alumni. The incumbent will teach a reduced load of courses and develop a research program in his/her area of expertise. Applicants must have credentials for appointment at the associate or professor rank.

Submit a letter of application, CV, and a list of three references online at https://careers.sfasu.edu (posting 0602535). Also submit all original transcripts by mail to Dr. Kenneth Farrish, Search Committee Chair, +1-936-468-3701, Dept. of Geology, Stephen F. Austin State University, Box 13011 SFA, 75992-13011.
Nacogdoches, TX 79362. Review of applications will begin on 1 Dec. 2013 and will continue until the position is filled. Equal Opportunity Employer; Security-sensitive position; this position will be subject to a criminal history check.

**FACULTY POSITION**

**EARTH SURFACE PROCESSES/ GEOMORPHOLOGY**

**NANYANG TECHNOLOGICAL UNIVERSITY**

The Division of Earth Sciences and the Earth Observatory of Singapore at Nanyang Technological University Singapore invites applications for a tenure-track position in geomorphology/Earth surface processes with emphasis on the geomorphic response to climate and/or anthropogenic change. Specific areas of interest include (but are not limited to) physical, chemical, and/or biological aspects of Earth-surface dynamics and evolution or changes in the Earth's surface as a result of human and natural impacts. Research approaches should encompass some combination of field, laboratory, and modeling. We seek an individual with research interests that augment our existing strengths in Earth systems science and surficial processes. This position is part of the continued expansion of the Division of Earth Sciences with the Earth Observatory of Singapore.

We invite candidates who have developed an internationally recognized, externally funded, multi-disciplinary research program to apply at the assistant, associate or full professor level. Successful candidates will also be required to actively participate in our core undergraduate and graduate teaching and in the administration of the Division of Earth Sciences.

To apply, please submit the following materials to eos_humanresources@ntu.edu.sg:

- Statement of research and teaching interests;
- Curriculum vitae;
- A copy of three relevant publications; and
- The names of three references who are familiar with your work.

Further information about the Division of Earth Sciences and the Earth Observatory of Singapore is available at www.earthobservatory.sg, and to contact cmrubin@ntu.edu.sg for job specific information. Review of applications will begin on 1 Feb. 2014 and will continue until the position is filled.

**RESEARCH POSITION**

**COASTAL PALEOSEISMOLOGY/QUATERNARY ENVIRONMENTAL CHANGE**

**NANYANG TECHNOLOGICAL UNIVERSITY**

The Earth Observatory of Singapore, Nanyang Technological University, invites applications for a Research Fellow (post-doctoral level) in Coastal Paleoseismology/Quaternary Environmental change.

This project is part of an ongoing program to recover stratigraphic records of past earthquakes and tsunamis and sea-level change in Indonesia. Skills in stratigraphic and/or field geology classes, introductory-level geosciences and upper-division/course graduates in the candidate's area of specialization. Preference will be given to candidates who also demonstrate the interest and ability to teach field geology. For a complete position description, see http://diversity.fullerton.edu/jobs/ft/geoology.asp.

**Coastal Sedimentology.** Research interests may include the study of coastal processes or modern coastal marine systems as analogs for ancient environments and/or petroleum geology, as they pertain to the environment, resources, and sustainability. The successful candidate must demonstrate interest and ability to teach marine geology and oceanography. Preference will be given to applicants who have the ability to teach sedimentology/stratigraphy and/or field geology classes, introductory-level geosciences courses, and upper-division/course courses in the candidate's area of specialization. For a complete position description, see http://diversity.fullerton.edu/jobs/ft/coastal_sedimentology.asp.

**Application Procedures.** For both searches, a Ph.D. in Geological Sciences or related field is required at the time of appointment. Send a single pdf document containing: (1) a detailed curriculum vita; (2) a letter of application; (3) a teaching statement that includes: a discussion of relevant course work and/or experience in preparation for teaching, a list of courses you are qualified to teach, and a statement of your teaching philosophy; and (4) a statement of your future research plans and goals. Letters of recommendation from at least three referees familiar with your teaching and research background should be sent separately. For the Coastal Sedimentology search, applicants and referees should email materials directly to Dr. Matthew Kirby at coastal_search@fullerton.edu. For the Resource Geology search, applicants and referees should email materials directly to Dr. David Bowman at resource_search@fullerton.edu.

Applications will be accepted until the position is filled. To ensure full consideration, submit all application materials by 15 Nov. 2013. Cal State Fullerton is an Equal Opportunity/TItle IX/503/504/VEVRA/ADA Employer.

**FACULTY POSITION IN PETROLOGY DEPT. OF EARTH AND ENVIRONMENTAL SCIENCES**

**BOSTON COLLEGE**

The Dept. of Earth and Environmental Sciences at Boston College invites applications for a tenure-track position in the field of Petrology to start in Fall 2014. The successful candidate will be expected to develop an externally funded research program integrated with excellence in teaching within the geological sciences and environmental geoscience curriculum at both the undergraduate and graduate levels. Teaching responsibilities will include Mineralogy, Igneous and Metamorphic Petrology, and other courses in the candidate's area of research expertise. The successful candidate should have a commitment to integrate with existing department research expertise in structural geology, sedimentary geology, igneous and metamorphic terrane analysis, and geochronology/geochemistry. Candidates with a strong field emphasis in research and teaching are particularly desired. This is an open-rank position, and applications at all levels are invited. The department is equipped with a range of modern research instrumentation listed on our website (www.bc.edu/content/bcschools/cas/geo/instruments-and-facilities.html). Information on the department, its faculty and research strengths can be viewed on the department's web page at www.bc.edu/earthsci. Applicants should submit a curriculum vitae, statements of teaching and research interests, and at least three references online at https://secure.interfolio.com/apply/21996. Review of applications will begin on 1 Nov. 2013. Department faculty will be available at the GSA and AGU fall meetings to meet with applicants. Boston College is an academic community whose doors are open to all students and employees without regard to race, religion, age, sex, marital or parental status, national origin, veteran status, or handicap.

**STRUCTURAL OR SEDIMENTARY GEOLOGY BROOKLYN COLLEGE**

Brooklyn College seeks applicants for a full-time tenure-track Assistant Professorship in Structural or Sedimentary Geology in the Dept. of Earth and
Environmental Sciences. Preference will be given to candidates with a strong background in geographic information systems and field-based investigations. The department is part of the School of Natural and Behavioral Sciences and in addition to undergraduate programs, offers doctoral and masters level programs. For more information, please visit www.brooklyn.cuny.edu/faculty2014 and search for Job ID 9014. Brooklyn College is an AA/EO employer.

**PEVEHOUSE CHAIR IN GEOSCIENCES**
**TEXAS TECH UNIVERSITY**

The Dept. of Geosciences at Texas Tech University invites applications for the Pevehouse Chair in Geosciences. The purpose of this endowed position is to support innovative research and education that are broadly aligned with petroleum geosciences and may include geophysics, structural geology, geomechanics, sedimentology, petrophysics, and organic geochemistry. A Ph.D. in geosciences or closely allied field is required, as is a record of research as demonstrated by professional publications. The chair holder will conduct a vigorous, externally-funded research program, direct graduate student research, and teach undergraduate and graduate courses in his/her specialty. The position is expected to be filled at the tenured Full Professor level.

Texas Tech is a state-supported, graduate research-oriented university with over 32,000 students. The Dept. of Geosciences consists of twenty-four tenured/tenure-track faculty, with teaching and research emphases in solid earth geosciences, atmospheric science, and geography. It offers degree programs in solid earth geosciences at the BS, MS, and Ph.D. levels. The chairholder will join a dynamic, growing department with more than 200 undergraduate majors and more than 60 graduate students. Texas Tech is committed to growth in disciplines aligned with hydrocarbon geology through addition of at least one junior faculty position.

The department computer labs are equipped with GIS, geologic mapping/modeling, and seismic processing/interpretation software packages. Available experimental/analytical facilities include a stable isotope laboratory, XRD, XRF, analytical SEM, TEM, laser ablation ICP-MS, a heat flow lab, and remote sensing spectroradiometers. In addition, the Dept. of Petroleum Engineering maintains experimental and analytical facilities in petrophysics, drill fluids, cement, enhanced recovery, and reservoir simulation, as well as X-ray CT/nuclear magnetic resonance imaging lab.

Lubbock is located on the Southern High Plains in close proximity to the Permian Basin. The city has a population of over 225,000 and the semi-arid climate is conducive to outdoor activities. Cultural amenities include musical, theatrical, and sports events, and the city offers numerous options for shopping and dining. The city also offers the best healthcare facilities in the region, including the university’s Health Sciences Center. The cost of living is low compared to national norms.

Applicants must first go to the university employment website at http://jobs.texastech.edu. There, go to “Search Postings,” search for requisition number 87107, and fill out necessary forms in applying for the position online. Then, applicants should submit...
a letter of application, curriculum vitae, a statement of teaching and research interest, names and contact information (including e-mail addresses) of at least 3 professional references. These documents should be uploaded to the employment website and we request that copies be e-mailed or sent directly to Dr. Calvin Barnes, Pevehouse Chair Search Commit-tee, Dept. of Geosciences, Texas Tech University, MS 1053, Lubbock, TX 79409-1053.

Additional information on the department can be found at www.depts.ttu.edu/geosc/. E-mail questions regarding the position are received at cal.barnes@ttu.edu. Review of applicants will begin immediately and continue until the position is filled.

Texas Tech University is an affirmative action/equal opportunity employer, committed to excellence through diversity. Texas Tech welcomes applications from minorities, women, veterans and persons with disabilities.

TENURE-TRACK
COASTAL SYSTEMS GEOCHEMISTRY
UNIVERSITY OF MASSACHUSETTS BOSTON

The School for the Environment at the University of Massachusetts Boston invites applications for a junior rank tenure-track position in coastal systems geochemistry, to begin 1 Sept. 2014. We especially welcome candidates with research expertise across a breadth of temporal scales, modern and ancient systems, and spatial scales, freshwater to marine. Particular attention will be given to candidates who combine a focus on understanding fundamental processes with state-of-the-art laboratory and/ or field research programs that leverage the School’s Environmental Analytical Core Facility and Nantucket Field Station. For more information on the University and the School for the Environment visit www.umb.edu/environment.

Applications must be submitted online at http://umb.interviewexchange.com/candapply.jsp?JOBID=43079 and will include a letter of application, current CV, statement of research interest, statement of teaching philosophy, and up to 3 reprints/pre-prints. Three letters of recommendation should be emailed directly to paula.cameron@umb.edu.

UMass Boston is an Affirmative Action, Equal Opportunity, Title IX employer.

TENURE-TRACK POSITION
SEISMIC STRATIGRAPHY
SAN DIEGO STATE UNIVERSITY

The Dept. of Geological Sciences at San Diego State University (SDSU) invites applications for a tenure-track faculty position in seismic stratigraphy or a related field. Candidates who specialize in imaging techniques applied to sedimentary systems are of particular interest, but we seek applicants from any relevant area of focus who will complement our strengths in geological and geophysical modeling as well as remote sensing technologies, hydrology, and petroleum geology. The successful candidate will demonstrate the ability to develop an innovative and robust externally-funded research program, and to effectivly teach and mentor students at the undergraduate, master, and doctoral level through our Joint Doctoral Program (JDP) in Earthquake Science and Applied Geophysics with the University of California at San Diego (UCSD). He/she will be expected to teach an undergraduate sedimentology and stratigraphy course, general-education courses, as well as advanced graduate courses in his/her area of specialization. This position is expected to be filled at the Assistant Professor level. A Ph.D. in Earth Sciences or a related field is required at the time of appointment; post-doctoral experience is preferred.

Applications should be submitted to Search Committee, Dept. of Geological Sciences, San Diego State University, 5500 Campanile, San Diego CA 92182-1020, or alternatively to geosearch@mail.sdsu.edu; the materials should include curriculum vitae, descriptions of future research plans, teaching state-ments, and the names and contact information of three references. Review of applications will begin on 1 Nov. 2013, and will continue until the position is filled.

SDSU is a Title IX, equal opportunity employer and does not discriminate against persons on the basis of race, religion, national origin, sexual orienta-tion, gender, gender identity and expression, marital status, age, disability, pregnancy, medical condition, or covered veteran status.

TENURE-TRACK FACULTY POSITION
SEDIMENTOLOGY/STRATIGRAPHY
THE UNIVERSITY OF ALABAMA

The Dept. of Geological Sciences at The University of Alabama invites applications for a tenure-track faculty position in sedimentology and stratigraphy, beginning August 2014. The position will be filled at the Assistant Professor level. Candidates must have a strong record of research and teaching, and must have received their Ph.D. in Geology, or a related field, at the time of appointment. The successful candidate will be expected to teach introductory geology courses and undergraduate and graduate courses in sedimentology and stratigraphy, attract and supervise graduate students, and establish a vigorous externally-funded research program in sedimentology and/or stratigraphy. The department has a broad range of geophysical, modeling, isotope-pc and geochemical research facilities available, in addition to University shared facilities at CAF (www.cauf.uu.edu). Details regarding existing research programs, equipment and facilities, and departmental activities can be found at www.geo.ua.edu. Questions should be directed to Dr. Alberto Perez-Huerta (apruerta@ua.edu). Applicants should go to facultyjobs.ua.edu to electronically apply for this position. When submitting an application, candidates must provide a cover letter, CV, research and teaching statements, and a list with the contact information for at least three referees. Applications will be reviewed beginning 1 Jan. 2014, and will continue until the position is filled. The University of Alabama is an Equal Opportunity Affirmative Action Employer. Women and minorities are encouraged to apply.

Opportunities for Students

Graduate Fellowships at the University of Ken-ucky. Pioneer Natural Resources Fellowships are available at the Univ. of Kentucky. Pioneer Fellowships are open to M.S. and Ph.D. candidates with research interests in stratigraphy, sedimentology, and petroleum geology. These positions include salary, tuition, research support and health insurance. Field sites for research include the western United States and the East African Rift Valley. Students with interdisciplinary geoscience backgrounds (includ-ing coursework/research in sedimentary geology, exploration seismology, petroleum geochemistry, and micropaleontology) are particularly encouraged to apply. Experience in conducting remote field-work is a plus. Please contact Prof. Michael McClure (michael.mcclure@uky.edu) for more information. Further details on the Dept. of Earth and Environmental Sciences at the Univ. of Kentucky can be found at http://eas.as.uky.edu/. The depart-ment maintains world-class facilities and an active, student-centered research program. Review of applications for Fall 2014 admission will begin 1 Feb. 2014.

Lindahl Ph.D. Scholarships. The University of Alabama Dept. of Geological Sciences (DGS) seeks highly qualified Ph.D. students with specializations in topics that complement faculty research interests. Exceptional students will receive Research or Teach-ing Assistantships and a Lindahl Scholarship totaling $22,000 for a nine month appointment. The Univ. of Alabama covers the cost of non-resident tuition and fee waivers, and health insurance. Funding is renewable for at least 4 years if expectations are met. Other fellowships are available from the graduate school on a competitive basis. Further details on the DGS and the faculty members can be found at www. geo.ua.edu/. Applicants should contact Dr. Delores Robinson (dmr@ua.edu) to express interest. Review of applications for Fall 2014 admission will begin 15 Jan. 2014.

Graduate Student Opportunities, Case Western Reserve University. Students with backgrounds in geology, physics, chemistry, biology, engineering and related fields are encouraged to apply for our Ph.D. and MS programs in Earth environmental, and planetary sciences. Areas of active research in the department include planetary geology and geophysics, igneous geochemistry, mineral physics, sedi-ment transport, aqueous geochemistry and carbon sequestration. For more information, see http:// geology.case.edu or write to eeps-gradinfo@case .edu. Financial assistance is available. Application deadline: 1/15/2014.

Graduate Research Assistantship in Geoscience Education, North Carolina State University. A 12-month research assistantship (RA) is available for Ph.D. candidates in the Dept. of Marine, Earth and Atmospheric Sciences (MEAS) at North Caro-lina State Univ. (NCSU). The successful applicant will work on a funded-research project in geoscience education with a focus on the use of video to support learning in “flipped” classroom environments. The position includes a monthly stipend, tuition, fees and health insurance. NCSU has a successful geosci-ence education program that includes two full-time faculty and approximately a dozen student re-searchers and postdocs. Students have access to departmental and on-campus research laboratories.
dedicated to the collection of qualitative and quantitative data for discipline-based STEM education research. Additional support is available for potential graduate students interested in other aspects of geoscience education. Please contact Dr. David McConnell (david.mcconnell@ncsu.edu) for more information. Further details on MEAS can be found at www.meas.ncsu.edu. Review of applications for Fall 2014 admission will begin 1 Jan. 2014.

Presidential Doctoral Research Fellowship, Dept. of Geology, Utah State University. The Dept. of Geology at Utah State Univ. invites applications for a Presidential Doctoral Research Fellowship starting during the 2014–2015 academic year. This 4-year Ph.D. fellowship will pay all tuition and a stipend of ~$20,000/year. Collaborative research will integrate fieldwork and a variety of geochemical and geo- and thermochronologic techniques to understanding processes in brittle fault zones and continental tectonics. Advisors and committee will consist of some combination of Drs. Alexis Ault, James Evans, Susanne Janecke, and Dennis Newell. Potential projects include use of new and existing labs both at USU and other universities to date paleoearthquakes in iron-bearing fault zones. We seek a motivated student with an M.S., but will consider outstanding candidates with B.S. or B.A. degrees. The Dept. of Geology at USU is field oriented with a dynamic and growing faculty and graduate program. We are located in Logan, Utah, with close proximity to a wide variety of recreational and cultural opportunities. Interested candidates should contact the aforementioned faculty at james.evans@usu.edu; aault@email.arizona.edu; susanne.janecke@usu.edu, and dennis.newell@usu.edu. All faculty will be at the GSA Annual Meeting in Denver to talk with prospective applicants. Please visit http://geology.usu.edu for more information about our program, and www.usu.edu/graduateschool/apply/ to apply before 15 Jan. 2014.

NEW GSA BOOKS

Neogene Deformation between Central Utah and the Mojave Desert
Edited by R. Ernest Anderson
Rethinking the Fabric of Geology
Edited by Victor R. Baker
The Impact of the Geological Sciences on Society
Edited by Marion E. Bickford
The Web of Geological Sciences: Advances, Impacts, and Interactions
Edited Marion E. Bickford
The Columbia River Flood Basalt Province
Edited by Stephen P. Reidel, Victor E. Camp, Martin E. Ross, John A. Wolff, Barton S. Martin, Terry L. Tolan, and Ray E. Wells
http://rock.geosociety.org/store/

39th International Commission on the History of Geological Sciences (INHIGEO) Symposium
Asilomar Conference Grounds, Pacific Grove, California, USA
Sun.–Thurs., 6–10 July 2014
CONFERENCE THEMES
• Doing the History of the Earth Sciences: What, Why, and How?
• Plus: California’s Place in the History of the Earth Sciences
• Mid-week and Post-Meeting Field Trips are being planned.
http://community.geosociety.org/INHIGEO2014/Home/

Call for Applications

2014–2015 GSA–USGS Congressional Science Fellowship
Deadline: 1 Feb. 2014

Bring your science and technology expertise to Capitol Hill to work directly with national leaders at the interface between geoscience and public policy. The GSA-USGS Congressional Science Fellowship provides a rare opportunity for a geoscientist to spend a year working for a Member of Congress or congressional committee. If you are an earth scientist with a broad geologic background, experience applying scientific knowledge to societal challenges, and a passion for helping shape the future of the geoscience profession, GSA and the USGS invite your application. The fellowship is open to GSA members who are U.S. citizens or permanent residents, with a minimum requirement of a master’s degree with at least five years professional experience or a Ph.D. at the time of appointment. Learn more at www.geosociety.org/csf or by contacting Susan Lofton, +1-303-357-1040, slofton@geosociety.org.

Apply today!
GSA has launched a new online store. Similar to the old interface where you can purchase print books, Rite in the Rain products, education materials, photo time scales, and EarthCache coins, the new site gives you a number of options, including the ability to purchase and download e-books. The site also can suggest similar titles to those you view or purchase.

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Now Accepting Technical Session, Field Trip, and Short Course Proposals

The 2014 GSA Annual Meeting will take place in beautiful Vancouver, British Columbia, Canada. The primary host of the 2010 Winter Olympics, this green city is very walkable and offers many bike rentals and paths. A short train or bus/axi ride takes you from Vancouver International Airport into town. The convention center, on the edge of Coal Harbor, is an architectural masterpiece, with Canada's largest living roof. This geologically active area will make for some unique field trips. Venture outside the city to visit the mountain town of Whistler or Capilano Suspension Bridge Park, where you can hike around a West Coast rainforest. We hope you will join us 19-22 October 2014 for this first annual meeting outside the United States in sixteen years. And make sure your passport is up to date!

FIELD TRIPS
Deadline: 2 Dec. 2013
Know of a great geoscience excursion in the Vancouver, British Columbia, Canada, area? Teach your colleagues and peers about the wondrous scenery and ground-breaking research in this region. Trips can be a half-day to 5 days long. Questions? Please contact Beth Engle, bengle@geosociety.org, https://gsa.confex.com/gsa/2014AM/fieldtrip.htm

SHORT COURSES
Deadline: 1 Feb. 2014
Enjoy Teaching? Lead a Short Course at the GSA Annual Meeting in Vancouver in 2014! Extend your expertise to your peers and to the next generation. GSA Short Courses help develop professional, teaching, and research skills at all levels. Questions? Please contact Jennifer Nocerino, nocerino@geosociety.org, www.geosociety.org/meetings/2014/scProposals/

TECHNICAL SESSIONS
Proposals deadline: 14 Jan. 2014
Abstracts deadline: 29 July 2014
Help ensure that your area of research and expertise is represented in next year's technical program. Any individual or geoscience organization is welcome to suggest topics and submit proposals for both Topical Sessions and Pardee Keynote Symposia. Pardee Symposia are high-profile sessions on significant scientific developments, with invited speakers only. Topical Sessions are a combination of invited and volunteered papers. Unique formats are allowed, but they must be outlined in the proposal along with the technical support needs. Sessions that promote discussion are encouraged.
https://gsa.confex.com/gsa/2014AM/sessionproposals.cpl

www.geosociety.org/meetings/2014/
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Location

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

Hope you enjoyed Denver, see you @ 2014 GSA Meeting in Vancouver