

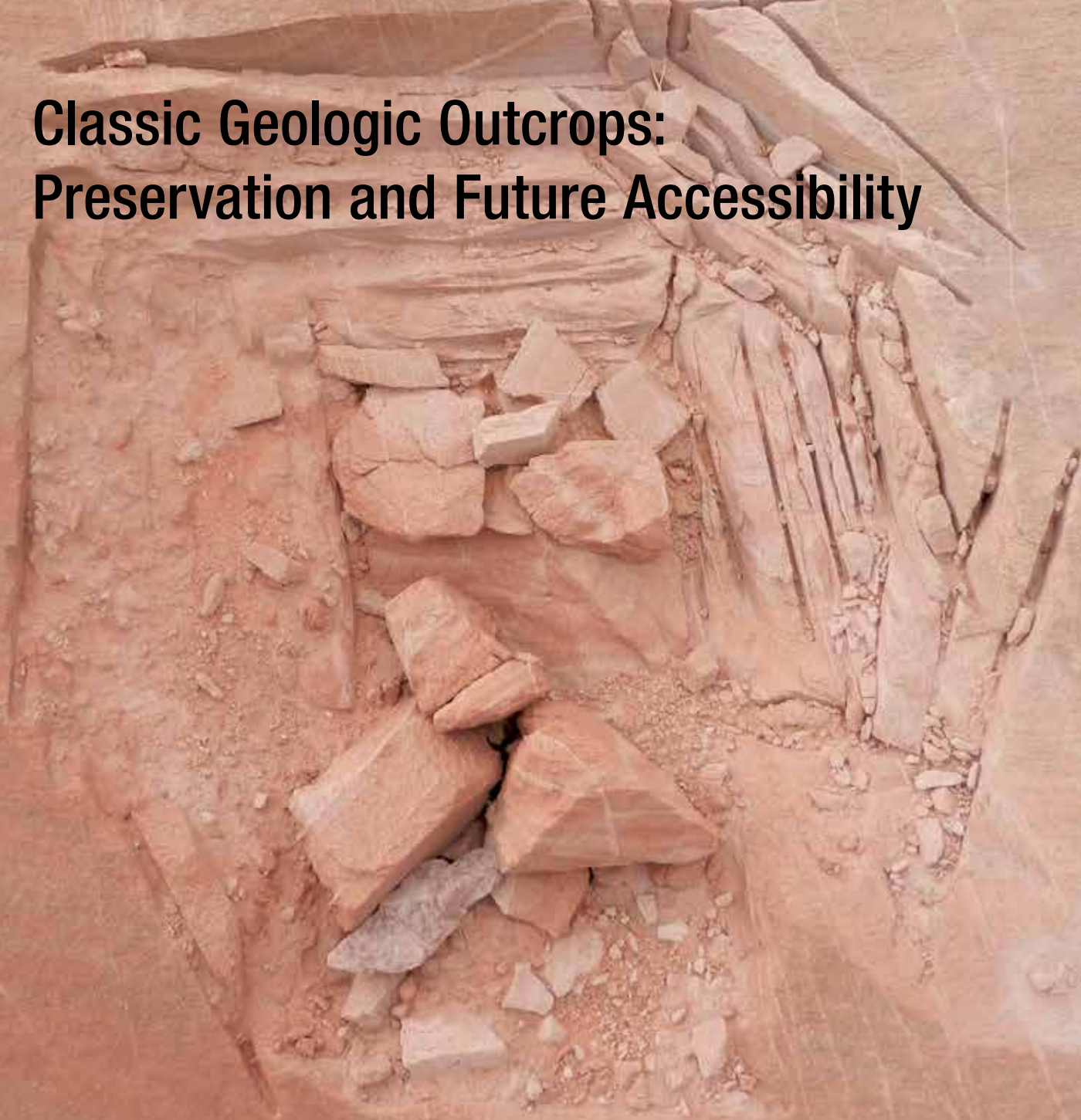
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A PUBLICATION OF THE GEOLOGICAL SOCIETY OF AMERICA®

## **Classic Geologic Outcrops: Preservation and Future Accessibility**

NOVEMBER 2017 | VOL. 27, NO. 11





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# Classic Geologic Outcrops: Preservation and Future Accessibility

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## INTRODUCTION

Geologists are privileged to work in some of the most remarkable, beautiful, and remote areas on the Earth. As professionals, we must care for important outcrops so they can continue to enlighten and educate earth scientists well into the future. Rock archives of valuable information, and access to these outcrops, can be destroyed by a few thoughtless actions. Accessible, exemplary geologic sites are visited by numerous individuals and field-trip groups each year. The consequences of unauthorized access, and the impact of rock hammers, painted section numbers, drill plug holes, and other evidence of increasing visits to these classic sites has serious consequences. In order to protect continued access for students and researchers, we, as a geologic community, must act responsibly by getting proper permits where required, conserving and protecting classic localities, and respecting land-use rules. In the following, we discuss a few examples of the preservation and accessibility of classic outcrops we have studied for years, recognizing that similar issues are prevalent globally.

## GEOCONSERVATION, ETHICAL ISSUES, AND CHALLENGES

Geoconservation focuses on recognizing and preserving unique sites and landscapes that have important scientific value and add to our quality of life. Some efforts have resulted in global designations for UNESCO Geoparks and World Heritage sites (e.g., O'Halloran et al., 1994; Burek and Prosser, 2008). The U.S. National Park Service protects many beloved landscapes, but other public-owned lands with remote sites are difficult to manage with limited resources. Vandalism of outcrops on public land has occurred on classic sites, such as the exposure of the Moab fault in Bartlett Wash near Moab, Utah, USA (B. Trudgill, 2017, pers. comm.). In this instance, people without required permits from the U.S. Bureau of Land Management (BLM) cut a chunk of rock with deformation bands from a pristine outcrop exposure adjacent to the fault, leaving a gaping hole (Fig. 1).

At another highly visited locality (Tuscher Canyon) in the Book Cliffs, numerous drill holes were cut into world-class exposures of hummocky cross-stratified sandstone of the Cretaceous

Blackhawk Formation (Fig. 2). The scarring is permanent, despite later efforts to fill the drill holes.

Sadly, these are not isolated incidents. Great outcrops deserve respect. We must protect Earth's library of information; a photo is never the same as seeing a geologic feature in outcrop. While modest and discreet sampling of some outcrops is critical to advancing our science, there is no legitimate reason to deface a classic outcrop.

Numerous classic outcrops on private land have been accessed by geology groups for decades, and are important for teaching basic concepts and skills to the geologic community (Mogk, 2004). A prime example is the Cretaceous of the northern Book Cliffs, near Helper, Utah, USA. Numerous field trips routinely stop at Gentile Wash (Fig. 3) to observe classic fluvial-dominated delta front and shelf turbidites in the Panther Tongue (Newman and Chan, 1991; Van Wagoner et al., 1990; Olariu et al., 2010), or to see classic wave-dominated parasequences of the Blackhawk Formation (Van Wagoner et al., 1990; Kamola and Van Wagoner, 1995). The number of groups at times makes it seem like you



**Figure 1.** A well-visited exposure of a splay off the Moab fault near Moab, Utah, USA. (A) The eolian Jurassic Slickrock Member of the Entrada Sandstone (Je) is juxtaposed against the Cretaceous Cedar Mountain Formation (Kcm). Credit: M. Chan. (B) A ~60 cm chunk of slickrock sandstone was cut and removed in 2011 without proper permission and BLM permits. Credit: B. Trudgill.



**Figure 2.** Unsightly drill holes mar a classic exposure of hummocky cross-stratified sandstone in the Cretaceous Blackhawk Formation of Tuscher Canyon, near Green River, Utah. Credit: D. Stolz.



**Figure 3.** Many students enjoy the Cretaceous outcrop exposures at the mouth of Gentile Wash, near Helper, Utah, USA. The current property owner has procedures to accommodate field trips with advance written permission.

have to take a number and wait your turn to see these outcrops!

These Cretaceous outcrops are on private property; access now requires a request submitted 30 days in advance and subsequent written permission. Recently, a group with students parked unauthorized vehicles on the property. When asked by an agent of the owner if they had permission to be on the property, the group said that they were associated with a local state university (an unverifiable claim that later put some local universities under scrutiny) and falsely claimed permission to access the outcrops. Although many visitors are well-intended educational groups, continued unauthorized access could jeopardize access for all of us in the future.

## LOOKING FORWARD

As GSA continues to look at issues of both geoh heritage and ethics, it is important that our society helps educate the membership on field conduct that is in the best interest of our whole community. We make three specific recommendations:

1. Act responsibly, remediate sites, and whenever possible leave no trace. Teach outcrop etiquette to students, assistants, or volunteers who participate in fieldwork. Ethical behavior is paramount, because field-trip leaders, faculty, and professional scientists are role models. Unethical behavior could have serious repercussions, such as limiting private land access and, in severe cases, even criminal prosecution (Foss and Liggett, 2016).

2. Understand and follow land-use rules and policies; obtain permission to access outcrops on private land. Specialized details of land ownership can be hard to find. Ways to ascertain property access include (a) contact local or published experts who have previously worked in the area; (b) query state geological surveys; (c) check land ownership plat maps; and (d) consult with government land managers or local law enforcement groups. If in doubt, always ask for permission, because government and private land owners frequently welcome the communication.
3. Uphold high ethical standards for yourself, and encourage your colleagues to do the same. As a community, our good field conduct helps ensure safety, communication, and continued access to classic outcrops. There are many rich localities that we want future generations to be able to visit for an enjoyable learning experience.

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## Is the coast toast? Exploring Cascadia earthquake probabilities

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The earthquake hazard in the Pacific Northwest due to subduction of the Juan de Fuca plate beneath North America (Fig. 1A) is drawing much media attention. A *The New Yorker* article (Schulz, 2015) begins, “An earthquake will destroy a sizable portion of the coastal Northwest. The question is when.” The article quotes a FEMA official saying “everything west of Interstate 5 will be toast.” CBS stated, “Northwest in fear of massive earthquake, tsunami.” NPR reported “Sleeping giant overdue.” Stories include statements like, “In the next 50 years, there is a 1-in-10 chance a ‘really big one’ will erupt,” or, “the odds of the big Cascadia earthquake in the next fifty years are roughly one in three.”

These stories lead students to ask where these probabilities come from and what they mean, which offers an educational opportunity. Although earthquake probabilities are typically addressed in upper-level classes (Stein and Wyssession, 2003; Stein and Stein, 2014), they can be discussed at an introductory level.

Earthquake probability estimates involve two primary choices: which data are used to describe when past earthquakes happened and which models are used to forecast when future earthquakes will happen. These choices’ effects can be illustrated with simple examples.

### PAST EARTHQUAKE DATA

Although no large earthquakes occurred along the plate interface for hundreds of years, a record of large paleoearthquakes has been compiled from subsidence data on land and turbidites, offshore deposits recording slope failure. The most recent

earthquake occurred in 1700 CE. This record (Fig. 1B) spans 10,000 years, among the world’s longest (Goldfinger et al., 2012, 2013).

The recurrence intervals, differences between the dates of successive paleoearthquakes, are key to estimating when the next may occur. The 18 intervals have a mean of 530 years and a standard deviation of 271 years. However, earthquakes seem to have happened in clusters of events, separated by 700–1000-year gaps. The recent cluster covering 1500 years has a mean of 326 years and standard deviation of 88 years. Earthquakes within a cluster occur more frequently and regularly than in the full record. Hence, when to expect the next earthquake depends on whether we assume that we are in the recent cluster, or that the cluster is over.

### EARTHQUAKE PROBABILITY MODELS

Most students have learned about probability models from games of chance—the chance of a flipped coin coming up heads is 50%. However, earthquake probabilities are more complicated. Despite years of effort, seismologists have not found a good way to describe them. Although many methods are used, all fall into two basic classes.

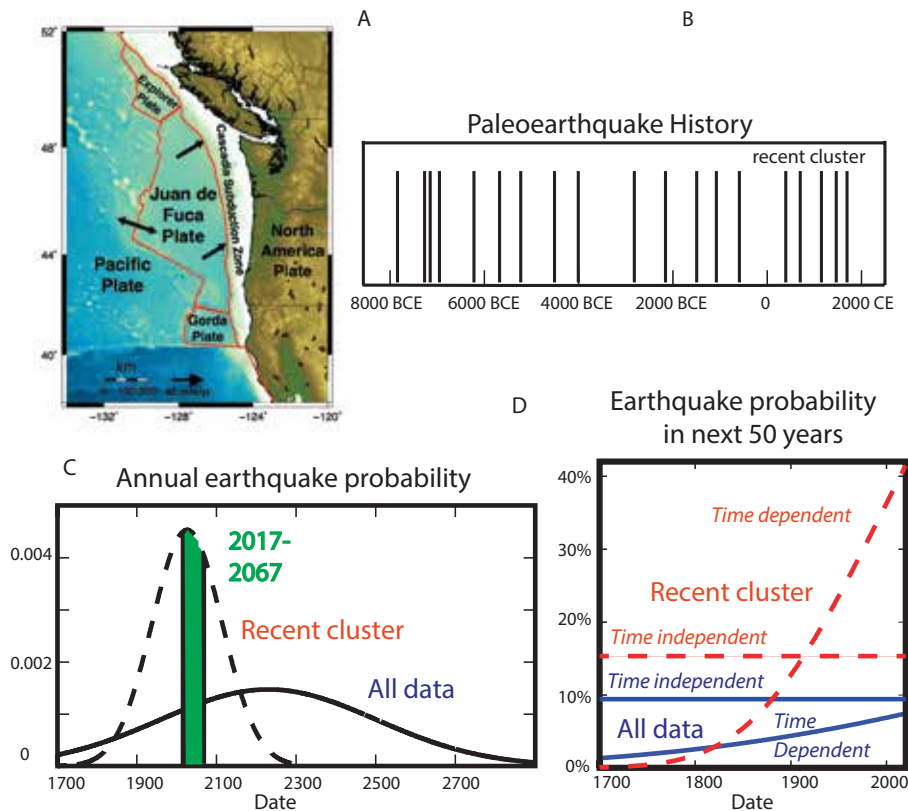
In one, large earthquakes’ recurrence is described by a *time-independent* (Poisson) process. This has no “memory,” so a future earthquake is equally likely immediately after the past one and much later. The probability of an earthquake in the next  $t$  years is approximately  $t/\tau$ , where  $\tau$  is the assumed mean recurrence time. Because this probability is constant, an earthquake

cannot be “overdue.” Using the entire paleoearthquake record, the chance of an earthquake in the next 50 years is  $50/530 = 0.094$  or 9.4%. Alternatively, assuming that we are still in the recent cluster gives a probability about twice as large:  $50/326 = 0.15$  or 15%.

Time-independent models are used in forecasting floods or hurricanes and in many earthquake hazard studies. However, seismological instincts favor earthquake cycle models, in which strain builds up slowly after an earthquake to produce the next one. In this case, the probability of a large earthquake is small immediately after one occurs and grows with time. In such *time-dependent* models, the recurrence interval is described by a probability density function. The simplest uses the familiar Gaussian distribution. The “bell curves” in Figure 1C show probabilities of an earthquake in the next year, which peak at dates corresponding to the assumed mean recurrence. Assuming we are in the recent cluster, the probability is high, because the 317 years since 1700 CE is about the mean recurrence of 326 years. The probability is lower assuming that we are not in the cluster, because the mean recurrence for the entire record is 530 years, so we are not as far into the cycle.

To find the probability of an earthquake in 50 years, we integrate under a bell curve from a start time to 50 years in the future, and include the fact that the earthquake hasn’t happened by the start time. The resulting curves (Fig. 1D), called conditional probabilities, are small shortly after 1700 CE and increase with time. Using the entire record, the chance of an earthquake in 50 years after 2017 is 0.074 or 7.4%.





**Figure 1.** (A) Geometry of the Cascadia subduction zone. (B) Paleoseismicity history from turbidite deposits. (C) Probabilities of an earthquake in the next year as a function of time assuming a Gaussian distribution of recurrence times with mean and standard deviation corresponding to the recent cluster (red/dashed lines) or the entire paleoseismicity record (blue/solid lines). Shaded area under the curves corresponds to the probability in next 50 years. (D) Conditional probability of an earthquake in next 50 years, given that last was in 1700, for the four cases discussed.

However, assuming that we are still in the recent cluster gives a probability ~6 times larger: 0.41 or 41%. The higher probability results from the smaller mean recurrence time and standard deviation.

Figure 1D also shows flat lines starting at 1700 CE, corresponding to time-independent models. If the time-dependent model predicts higher probability than the time-independent model, an earthquake can be considered “overdue,” which occurs if we are in the cluster.

## IMPLICATIONS AND OPPORTUNITIES

Comparing these cases shows how earthquake probability estimates depend on the probability model chosen and the data used to choose the model parameters. Other plausible choices are possible. Various probability density functions can be used. The data can be treated in more complex ways: considering different subsets, assigning different magnitudes to different paleoevents, and assuming that different events broke different parts of the

subduction zone. Each choice yields a different probability estimate.

A baseball analogy illustrates these ideas. Whether to assume that we are in the cluster is like whether to assume that a hitter’s performance in the next game is better described by his lifetime batting average or by the past few games, because he may be hitting unusually well or in a slump. Choosing between time-independent or time-dependent models is like assuming either that the player’s hitting is the same from year to year or that it changes systematically over his career. The probability of a hit in the next game depends on the assumptions.

There are many opportunities for delving further. Students can explore different assumptions using the data and spreadsheet at <http://www.earth.northwestern.edu/people/seth/Educational/eqprob.html> or write spreadsheets or programs using formulations in Stein and Wysession (2003) or Stein and Stein (2014). Instructors or students interested in Cascadia paleoseismology and probabilities can consult

Goldfinger et al. (2012). Earthquake probability issues can be explored from discussions in Stark and Freedman (2003), Parsons (2008), Matthews et al. (2002), and Kagan et al. (2012).

The take-home message for students is that saying “the probability of an earthquake is  $N\%$ ” involves specifying the assumptions made. Different plausible assumptions yield different probabilities. This situation may seem frustrating, but it lets instructors explain how limitations in our knowledge give young scientists opportunities for major advances.

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# The Great Acceleration and the Disappearing Surficial Geologic Record

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The surficial geologic record is the relatively thin veneer of young (<~1 Ma) and mostly unconsolidated sediments that cover portions of Earth's terrestrial surface (Fig. 1). Once largely ignored as "overburden" by geologists, surficial deposits are now studied to address a wide range of issues related to the sustainability of human societies. Geologists use surficial deposits to determine the frequency and severity of past climatic changes, quantify natural and anthropogenic erosion rates, identify hazards, and calculate recurrence intervals associated with earthquakes, landslides, tsunamis, and volcanic eruptions. Increasingly, however, humans are eradicating the surficial geologic record in many key areas through progressive modification of Earth's surface.

## IMPORTANCE OF THE SURFICIAL GEOLOGIC RECORD

Do we as a society really need to study high-resolution climate and environmental records that are preserved in the surficial geologic record? The short answer is a resounding "yes!" Most highly resolved records of past environmental change come from marine sediments and ice cores, or from specific localities on land, such as lake sediments, loess (dust deposits), speleothems (cave deposits), and recently, desert wetlands (springs in arid environments). These archives have provided detailed accounts of how Earth's systems responded to past changes in climate and help us understand how they may change in the future.

Planning for long-term sustainability also requires an understanding of potential geologic hazards. Surficial geologic records



**Figure 1. Surficial geologic deposits (late Pleistocene wetland deposits) in Wadi Hasa, Jordan, being described and sampled. These deposits are being lost rapidly to agriculture and disturbance from animal husbandry and human dwellings.**

contain evidence of past geohazards, such as earthquakes and volcanic eruptions, which allow scientists to quantify the magnitude and locations of the most recent events for a given area. This information is a critical component of geologic hazard assessments, and the quality of such assessments is a direct reflection of the quality of the surficial record available for study.

## THE GREAT ACCELERATION

The term *Great Acceleration* is used to describe a group of data that documents the increasing pressure that human society has had on Earth systems (Steffen et al., 2015).

The original Great Acceleration graphs, developed by the International Geosphere-Biosphere Programme (IGBP), displayed changes in socio-economic data (population, gross domestic product [GDP], telecommunications) relative to changes in Earth systems (atmospheric gas concentrations, surface temperature, tropical forest loss, domesticated land, etc.) from 1750 until 2000 A.D. (Steffen et al., 2004). The increase ca. 1950 in most of the parameters has been attributed to the growing impact of human societies on Earth's systems, and has been used to demark the initiation of the Anthropocene (Zalasiewicz et al.,



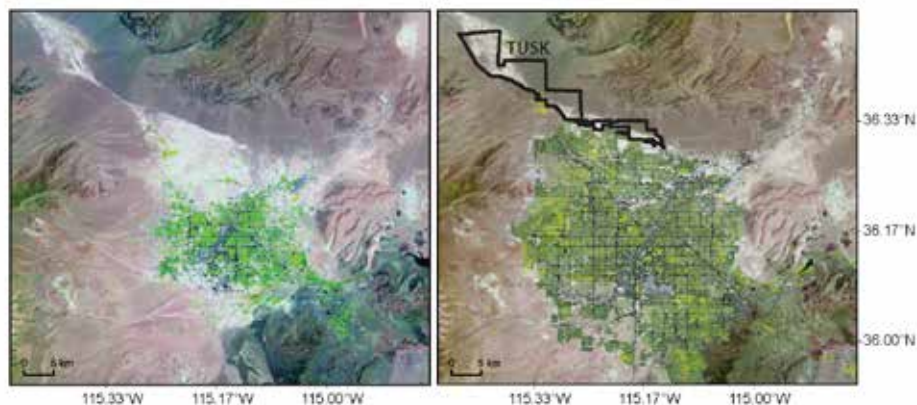
2012). Although some aspects of the Great Acceleration are predicted to plateau (population), other factors such as primary energy use (energy consumption) show no sign of slowing down. In other words, even though global population is predicted to level off perhaps around 10 billion by the end of this century, increases in the extraction and utilization of Earth's resources are predicted to continue (Steffen et al., 2015).

Humans are now the dominant geomorphic agent on Earth, transporting more sediment with heavy equipment than the combined actions of water, wind, and ice (Hooke et al., 2012; Hooke, 1994). But it is not just bulldozers that are affecting the surficial geologic record. Topsoil and surficial sediments are being disturbed and eroded at unprecedented scales by conventional agriculture, increasing rates of erosion by orders of magnitude over background levels (Montgomery, 2007). Alteration of Earth's surface is also occurring at a rapid pace in urban and suburban areas, as well as coastal regions, in step with increases in global population, GDP, and primary energy use, leading to the widespread loss of the surficial geologic record.

### IDENTIFYING AND STUDYING AT-RISK DEPOSITS

It is imperative that geoscientists identify areas containing surficial deposits that are most at risk. A new tool, the Timelapse feature in Google Earth Engine<sup>1</sup>, vividly shows the remarkable impact that humans are having on the landscape. Combining multiple sources of satellite imagery, Timelapse allows users to track changes, determine or follow trends, and quantify differences in land use that have occurred during a 32-year period (1984–2016). It is an especially timely and effective tool for geologists that are interested in studying surficial deposits.

A particularly striking example of the visual power of this new tool is the Las Vegas Valley of southern Nevada. Since 1980, Clark County (Las Vegas metropolitan area) has experienced a nearly fivefold increase in population to over two million people. As the cities of Las Vegas, North Las Vegas, and Henderson burgeoned, fossil-rich deposits associated with springs and wetlands that once covered most of the



**Figure 2.** Landsat images of Las Vegas, Nevada, USA, in 1984 (left) and 2016 (right) showing the loss of light-colored Quaternary wetland deposits to urban expansion. The boundaries of Tule Springs Fossil Beds National Monument (TUSK), which preserve nearly 23,000 acres of the wetland deposits, are shown in the righthand image. Images are courtesy of the Earth Resources Observation and Science (EROS) Center.

valley were paved over or otherwise destroyed during the urban expansion (Fig. 2). Hundreds of square kilometers of the deposits were wiped out in just three decades. Fortunately, the last contiguous vestiges of the Las Vegas deposits, spanning nearly 23,000 acres, were protected in 2014 as Tule Springs Fossil Beds National Monument. Owing to their preservation and subsequent study, we now know that these deposits provide some of the most detailed records for understanding how desert wetland ecosystems responded to abrupt climate change during the late Quaternary (Springer et al., 2015). Had the monument not been established, such studies would not have been possible.

The preservation of the Las Vegas deposits is an exception rather than the rule as the Great Acceleration marches on. Even in the most remote areas on Earth, from the high Arctic to the driest deserts, we are seeing massive alterations of the landscape due to the extraction of resources to meet human demands. We suggest that Google's Timelapse feature can be used in concert with surficial geologic maps to identify locations where deposits are threatened, allowing scientists to study them before it is too late.

A key concern and question is "How much time do we have?" The answer depends upon the prioritization of research questions, the availability of funding and resources, and the measures taken to preserve the deposits in select cases. Clearly, for those interested in studying the surficial geologic record, the time to do so is

now. Now is also the time to focus on training the next generation of geologists because it can take years to hone the skills required to interpret and decipher these complex records.

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MANUSCRIPT ACCEPTED 24 JULY 2017

<sup>1</sup> The Timelapse feature can be accessed online at <https://earthengine.google.com/timelapse/>. (Note that any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. government.)

# 2017–2018 Richard H. Jahns Distinguished Lecturer



## **John Wakabayashi**

has been named the 2017–2018 Richard H. Jahns Distinguished Lecturer. The lectureship, established in 1988, is sponsored by the Association of Environmental and Engineering Geologists and the GSA Environmental and Engineering Geology Division. Its purpose is to provide funding for distinguished engineering geologists to present lec-

tures at colleges and universities in order to increase awareness of students about careers in engineering geology. The lectureship is named in honor of Richard H. Jahns (1915–1983), an engineering geologist who had a diverse and distinguished career in academia, consulting, and government.

Wakabayashi is a San Francisco Bay Area native who moved to Fresno, California, USA, in 2005 to begin his academic career as a geology professor at California State University, Fresno. He received his B.A. in geology in 1980 from the University of California at Berkeley and his Ph.D. in geology in 1989 from the University of California at Davis. He is a professional geologist (California) and a Fellow of the Geological Society of America.

After graduating from Davis, Wakabayashi worked as an engineering and environmental geologist for 16 years, the last 13 as an independent consultant in Hayward, California, before becoming an academic. He worked on a variety of projects, including seismic hazard evaluation/paleoseismology, slope stability, engineering and forensic petrography, naturally occurring asbestos, and two Superfund projects on which his primary specialty was evaluation of ambient concentrations of metals of environmental concern in soils and rock. He was a member of the Working Group on California Earthquake Probabilities.

Wakabayashi also conducted independent research, some of which derived from his project work, but most of which dealt with more esoteric research issues such as subduction initiation processes, metamorphic  $P$ - $t$  paths and metamorphic contrasts as tectonic indicators, emplacement of ophiolites, subduction interface processes and development of subduction complexes, evolution of orogenic belts, development of strike-slip fault systems, and long time and length-scale geomorphology. He incorporated academic research of his own and others into all of his project work, trying to bridge the academic-applied geology gap from the standpoint of a practitioner. After becoming an academic, he continued his efforts to bridge this gap, realizing that the majority of geology professors have never been employed in the engineering and environmental geology profession that most geology graduates will work in. He incorporates both his professional and research experience into his teaching so as to better prepare students for professional careers, as well as providing a foundation for students who wish to undertake graduate study.

Wakabayashi's research has resulted in 82 published papers and more than 100 abstracts tied to presentations at major geoscience

meetings. The breadth of his research has broadened rather than narrowed over time, but the geology of that beguiling train wreck of rocks known as the Franciscan Complex of coastal California remains his chief interest, and the many aspects of mélanges have been his main focus since 2009. At Fresno State, he teaches non-major introductory geology, geology major undergraduate courses in petrology, geomorphology, and structural geology, graduate courses on active tectonics/seismic hazard analysis and orogenic belt tectonics, and his bread-and-butter undergraduate course in advanced geologic field mapping. He has supervised or is supervising a large number of graduate and undergraduate student researchers, including a number of students from outside of Fresno State.

Outside of geology and beer (an amateur brewer since 1994), Wakabayashi is probably best known for his experience trout fishing in the backcountry (must be hiked to) of California, having launched casts into over 750 different lakes, about 700 of these in the Sierra Nevada. His strength and fitness routine that prepares him for his fieldwork and recreational hiking (and burns off some of the beer), as well as holding his body together for his return to playing basketball, has also gained some notoriety. This routine includes excessively long plank sessions and multiple repetitions of muscle-ups.

Interested institutions can contact Wakabayashi at [jwakabayashi@csufresno.edu](mailto:jwakabayashi@csufresno.edu) to give one or more of the following lectures. (Complete descriptions are posted to [www.aegweb.org/page/JahnsLecturer2017](http://www.aegweb.org/page/JahnsLecturer2017).)

### **Insight into Geologic Mapping of Mélanges from Structural Geologic Research: Implications for Engineering Geologic Analysis and Illustration of the Value of Field Geologic Training**

#### **A Field-Based Alternative to Subduction Channel Models: Insight from Mélange Studies**

(This is the more purely academic focused look at mélanges.)

#### **Attempting to Bridge the Growing Gap between Academic and Applied Geology: A Personal Odyssey**

(Here, Wakabayashi will tell a few stories from his days as an engineering and environmental geologist as well as some other stories from the academic world.)

#### **Evolution of Step-Overs and Bends along Strike-Slip Faults: Implications for Seismic Hazards Assessment**

#### **Geomorphic Evolution and Cenozoic Tectonics of the Sierra Nevada, California, and Alternative Interpretations of Palealtimetry Data**

(This work began with seismic hazard studies Wakabayashi did as a consultant in the northern Sierra Nevada in the early 1990s.)



# 2018 Birdsall-Dreiss Distinguished Lecturer



## David Boutt

is an associate professor in the Department of Geosciences at the University of Massachusetts–Amherst. He received B.S. and M.S. degrees from the Department of Geological Sciences at Michigan State University in 1997 and 1999. His M.S. work focused on understanding the impacts of land-use change on groundwater quantity and

quality at the watershed scale. He earned his Ph.D. from the New Mexico Institute of Mining and Technology in 2004 and held a postdoctoral position at Sandia National Laboratories before joining the faculty at Amherst in 2005.

During his Ph.D. research, Boutt was awarded an American Geophysical Union Horton Research Grant. His dissertation work focused on the coupling of fluid flow and deformation in fractured and faulted media through the development of discretely coupled fluid-solid models.

Boutt's current research focuses on understanding the role of groundwater in catchment-scale hydrologic processes. He maintains an active and dynamic research laboratory with dedicated undergraduate and Ph.D. students. His research has taken him on board the Japanese Drilling Vessel *Chikyu* during Integrated Ocean Drilling Program (IODP) Expedition 319—the first riser drilling operation in IODP history—and to the wilds of the Atacama desert in Chile. His work includes the origin of lithium-rich continental brines in northern Chile and in the Great Basin of the western United States. Boutt has also contributed extensively to understanding the hydrogeology of a former cranberry bog that is part of the largest freshwater restoration project in New England ([www.livingobservatory.org](http://www.livingobservatory.org)). He has served the hydrogeologic and broader geoscience communities on proposal review panels and volunteer boards. He is currently an editor for *Hydrological Processes* and was previously an associate editor for *Hydrogeology*. A list of his publications can be found at <https://blogs.umass.edu/dboutt/>.

Institutions can schedule a visit by completing the request form at [community.geosociety.org/hydrodivision/birdsall/about2018](http://community.geosociety.org/hydrodivision/birdsall/about2018). Boutt will present one lecture on one of the topics described below. The GSA Hydrogeology Division is particularly interested in including liberal arts colleges in the itinerary. The Division pays transportation expenses, and the host institution is expected to provide local accommodations.

## Groundwater as a Buffer to Climatic Change: Dynamic Subsurface Storage of Glaciated Landscapes

The northeastern U.S. is experiencing rapid changes in its hydrology due to intense land-use change, urbanization, and climate change. It also possesses some of the highest density, longest term observations of hydrologic variables in the U.S. and the world. The focus of this presentation is on how small, unconfined

aquifer systems respond to hydroclimatic and land-use changes. Physical and geochemical information is used to understand how different subsurface environments and surface-water–groundwater interactions impact the sensitivity of groundwater storage to climate variability. Analysis of groundwater levels and streamflows reveals a heterogeneous response of aquifers to climate variability. This highlights the role of subsurface hydrogeologic heterogeneity to aquifer response. Long-term rise in water levels, observed from analysis of water-level trends, is associated with an increase in precipitation and land-use change, which has ultimately led to an increase in nuisance flooding. Integrating isotopic tracers into this work has improved our understanding of the role of extreme precipitation events on groundwater storage. Isotope data also shed light on the fundamental importance of groundwater discharge to streamflow. This work highlights the importance of understanding groundwater processes in generating in streamflow, with implications for water supply, baseflow generation, climate refugia, and assessing flood risk in a changing world.

## Do You Know Where Your Catchment Ends? The Role of Inter-Basin Groundwater Flow and Hydrogeologic Transience in Hydrologic Processes

A fundamental concept in the hydrologic analysis of watersheds is that the water draining to the outlet of the basin originates within the basin itself. Groundwater hydrologists have long understood the role and impact of inter-basin groundwater flow, defined here as the subsurface transfer of water across topographic boundaries. This inter-basin transfer of water leaves a distinct impact on the hydrologic and solute budgets of the catchments. This talk addresses when and where topographic catchment divides correspond to groundwater divides and how this is affected by climatic variability and geologic heterogeneity. Examples from a range of climates and geologic environments will highlight the relevance of inter-basin flow on hydrologic and geologic processes. The coupling of hydrologic transience and changes in groundwater storage is also discussed, as are suggestions for new approaches to conceptualization of hydrogeologic watershed boundaries that take into consideration both geologic uncertainty and climate variability.

## Water and Lithium—The Nexus of Hydrogeosciences and Green Energy in the Transition from Fossil Fuels

Earth is warming at an unprecedented pace due to the release of carbon dioxide from the burning of fossil fuels. Development of portable and powerful energy storage mechanisms (such as lithium-ion batteries) is essential to replace our dependence on the high-energy density fossil fuels. Lithium is abundant and plentiful on the planet but is rarely found in high enough concentrations to be of economical use. Economic deposits of lithium are found in pegmatites and closed-basin continental brines. The origin of the lithium brines and their distribution worldwide is fundamentally tied to the hydrology and hydrogeology of the host basins. This

talk focuses on the multifaceted role of (ground) water in transporting, accumulating, and extracting lithium in continental brines. This discipline represents an important interface between hydrogeology, economic geology, and our green energy supplies. Field examples from Northern Chile and the Great Basin of the U.S. highlight the interdisciplinary nature of the origin and evolution of continental lithium brine deposits (an exciting example of the importance of earth sciences to future energy supplies). The environmental impacts of lithium brine pumping are explored and discussed in the context of balancing the sustainability of lithium-ion batteries.

## Call for Applications

### 2018–2019 GSA-USGS Congressional Science Fellowship

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Upcoming

## Award Deadlines



For details, see the October *GSA Today* or go to [www.geosociety.org/awards/aboutawards.htm](http://www.geosociety.org/awards/aboutawards.htm).

Award nominations: Go to [www.geosociety.org/awardnoms](http://www.geosociety.org/awardnoms).

You can also email GSA Grants and Awards at [awards@geosociety.org](mailto:awards@geosociety.org).

### 2018 GSA Medals and Awards

**Nomination deadline:** 1 Feb. 2018

- Penrose Medal
- Day Medal
- Young Scientist Award (Donath Medal)
- GSA Public Service Award
- Randolph W. “Bill” and Cecile T. Bromery Award for Minorities
- GSA Distinguished Service Award
- Doris M. Curtis Outstanding Woman in Science Award
- Geologic Mapping Award in Honor of Florence Bascom
- Honorary Fellow

### John C. Frye Environmental Geology Award

**Nomination deadline:** 31 Mar. 2018

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. Learn more at [www.geosociety.org/GSA/Awards/Frye.aspx](http://www.geosociety.org/GSA/Awards/Frye.aspx).

### 2018 Post-Doctoral Research Awards

**Application deadline:** 1 Feb. 2018

- 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.

Learn more about these post-doc research awards at [www.geosociety.org/GSA/grants/postdoc.aspx](http://www.geosociety.org/GSA/grants/postdoc.aspx).

### OTHER AWARDS

**Nomination deadline:** 1 Feb. 2018.

Submit nominations for the following awards at [www.agiweb.org/direct/awards.html](http://www.agiweb.org/direct/awards.html).

- **AGI Medal in Memory of Ian Campbell** recognizes singular performance in and contribution to the profession of geology.
- **The AGI Marcus Milling Legendary Geoscientist 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.

For a listing of other national awards and links information and nomination forms, visit [www.geosociety.org/awards/national.htm](http://www.geosociety.org/awards/national.htm). If you know of an award not listed, please send the details to [gsatoday@geosociety.org](mailto:gsatoday@geosociety.org).

# DIVISION AWARDS

Congratulations to All 2017 GSA Division Award Recipients

GSA's primary Division awards and the other Division awards presented at this year's annual meeting are listed below.  
Learn more about GSA's specialty Divisions at [www.geosociety.org/divisions](http://www.geosociety.org/divisions).

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## ARCHAEOLOGICAL GEOLOGY DIVISION

*Rip Rapp Archaeological Geology Award*

**Panagiotis (Takis) Karkanias**, Malcolm H. Wiener Laboratory  
for Archaeological Science

*Claude C. Albritton, Jr., Memorial Student Research Award*

**Leila Donn**, University of Texas at Austin

*Richard Hay Student Paper/Poster Award*

(to be named)

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## ENERGY GEOLOGY DIVISION

*Gilbert H. Cady Award*

**Cortland F. Eble**, University of Kentucky, Kentucky  
Geological Survey

*Antoinette Lierman Medlin Research Award*

**Matt Costa**, University of Texas at El Paso

**Kuo Li**, Southern Illinois University

*Best Paper Award* (for papers presented at the 2016 GSA  
Annual Meeting)

**Eltom Hassan**, University of Kansas

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## ENGINEERING AND ENVIRONMENTAL GEOLOGY DIVISION

*E.B. Burwell, Jr., Award*

**Johnson, P.L., Shires, P.O., and Sneddon, T.P.**, 2016, "Geologic  
and Geotechnical Factors Controlling Incipient Slope Instability at  
a Gravel Quarry, Livermore Basin, California": *Environmental &  
Engineering Geoscience*, v. XXII, no. 2, p. 141–155.

*Distinguished Practice Award*

**Jeffrey A. Coe**, U.S. Geological Survey

*Meritorious Service Award*

**Matthew M. Crawford**, Kentucky Geological Survey

**Norman S. Levine**, College of Charleston

*Richard H. Jahns Distinguished Lecturer (2016–2017)*

**Scott Anderson**, BGC Engineering Inc.

*Roy J. Shlemon Scholarship Awards*

**Hannah Chapella**, Kent State University

**Jory Chapin Lerback**, University of Utah

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## GEOBIOLOGY & GEOMICROBIOLOGY DIVISION

*Outstanding Contributions in Geobiosciences*

*Award—Pre-Tenure*

**Chris Reinhard**, Georgia Institute of Technology

*Outstanding Contributions in Geobiosciences*

*Award—Post-Tenure*

**Susannah M. Porter**, University of California at Santa Barbara

*Outstanding Contributions in Geobiosciences Award—*

*Distinguished Career*

**Marilyn L. Fogel**, Carnegie Institution of Washington

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## GEOINFORMATICS DIVISION

*Outstanding Contributions Award*

**Kerstin Lehnert**, System for Earth Sample Registration (SESAR)

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## GEOLOGY AND SOCIETY DIVISION

*Best Student Paper Award*

**Logan Frederick**, University of Utah

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## GEOPHYSICS DIVISION

*George P. Woollard Award*

**Susan L. Beck**, University of Arizona

*Allan V. Cox Student Research Award*

**Zongbo Xu**, Boise State University

*Geophysics Division Student Research Award*

**Zheng Gong**, Yale University

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## GEOSCIENCE EDUCATION DIVISION

*Biggs Award for Excellence in Earth Science Teaching*

**Laura Lukes**, George Mason University

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## HISTORY AND PHILOSOPHY OF GEOLOGY DIVISION

*Mary C. Rabbitt History of Geology Award*

**A.M. Celâl Şengör**, ITU Maden Fakültesi

*Gerry and Sue Friedman Award for Distinguished Service*

**Renee M. Clary**, Mississippi State University



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HYDROGEOLOGY DIVISION

*O.E. Meinzer Award*

**Donald O. Rosenberry**, U.S. Geological Survey

*Birdsall-Dreiss Distinguished Lecturer (2017)*

**F. Edwin Harvey**, Hydrogeologist, Fort Collins, Colorado

*George Burke Maxey Distinguished Service Award*

**Carol M. Wicks**, Louisiana State University

*Kohout Early Career Award*

**Martin A. Briggs**, U.S. Geological Survey

*Hydrogeology Division Student Research Grant Awards and Travel Grants*

**Tyler King**, Utah State University

**Kayla Lockmiller**, Saint Louis University

**Inoka Peiris**, University of Texas at Dallas

**Christina Richardson**, University of California Santa Cruz

**Kaitlin Salley**, University of Kansas

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LIMNOGEOLOGY DIVISION

*Israel C. Russell Award*

(no award in 2017)

*Kerry Kelts Student Research Awards*

**Sabrina Brown**, University of Nebraska–Lincoln

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MINERALOGY, GEOCHEMISTRY, PETROLOGY, AND VOLCANOLOGY DIVISION

*Distinguished Geologic Career Award*

**Jon P. Davidson**, Durham University (deceased)

*Early Career Award*

**Thomas Shea**, University of Hawai'i at Mānoa

*MGPV Student Research Grant Award*

**Miguel Cisneros**, University of Texas at Austin

**Emily First**, University of Hawai'i at Mānoa

**Kyle Makovsky**, Syracuse University

**Michael Mohr**, Boise State University

**Alexandra Nagurney**, Virginia Tech

**Jonathan Rivas**, University of North Carolina–Wilmington

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PLANETARY GEOLOGY DIVISION

*G.K. Gilbert Award*

**John A. Grant III**, Smithsonian Institution Center for Earth and Planetary Studies

*Ronald Greeley Award for Distinguished Service*

**David Williams**, Arizona State University

*Stephen E. Dwornik Research Awards*

*Best Graduate Oral*: **Terik Daly**, Brown University

*Honorable Mention Graduate Oral*: **Kevin M. Cannon**, Brown University

*Best Undergraduate Oral*: **Allison McGraw**

*Honorable Mention Undergraduate Oral*: **Carol B. Hundal**

*Best Graduate Poster*: **Tess E. Caswell**, Brown University

*Honorable Mention Graduate Poster*: **Hannah H. Kaplan**, Brown University

*Best Undergraduate Poster*: **Emma Sosa**, Lafayette University

*Honorable Mention Undergraduate Poster*: **Isabel R. King**

*Pellas-Ryder Award*

**Gerrit Budde**, Wilhelms-Universität Münster

**James Keane**, University of Arizona

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QUATERNARY GEOLOGY AND GEOMORPHOLOGY DIVISION

*Kirk Bryan Award for Research Excellence*

**Leslie D. McFadden**, University of New Mexico

*Distinguished Career Award*

**David Dethier**, Williams College

*Farouk El-Baz Award for Desert Research*

**Haim Tsoar**, Ben-Gurion University of the Negev

*J. Hoover Mackin Student Research Grant*

**Sarah Crump**, University of Colorado–Boulder

*Arthur D. Howard Student Research Grant*

**Alexandra Balter**, University of Maine

*Marie Morisawa Student Research Award*

**Elizabeth Olson**, Northern Illinois University

*Peter Birkeland Research Award*

**Catherine Opalka**, University of North Carolina–Charlotte

*Robert K. Fahnestock Memorial Award*

**Hima Hassenruck-Gudipati**, University of Texas at Austin

*John A. Black Award*

**Paul Russell**, The Ohio State University

*Gladys W. Cole Research Award*

(no award in 2017)

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## SEDIMENTARY GEOLOGY DIVISION

*Laurence L. Sloss Award*

**Isabel P. Montañez**, University of California at Davis

*Sedimentary Geology Division Student Research Award*

**Edward Matheson**, University of Nebraska–Lincoln

*Stephen E. Laubach Structural Diagenesis Research Award*

*(Joint with Structural Geology and Tectonics Division)*

**Victoria Igoe**, University of Wisconsin–Madison

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## STRUCTURAL GEOLOGY AND TECTONICS DIVISION

*Career Contribution Award*

**Arthur W. Snoke**, University of Wyoming

*Outstanding Publication Award*

**W. Adolph Yonkee and Arlo Brandon Weil**, “Tectonic evolution of the Sevier and Laramide belts within the North American Cordillera orogenic system,” *Earth Science Reviews*, v. 150, p. 531–593.

*Structural Geology & Tectonics Student Research Travel Grant Award*

**Mark Ahenda**, Queen’s University

**Cassandra Brigham**, University of Washington

**Suoya Fan**, University of Houston

**Nadine Reitman**, University of Colorado Boulder

**Brandt Scott**, Utah State University

Other awards presented at the annual meeting include:

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## GSA INTERNATIONAL

*James B. Thompson, Jr., Distinguished International Lecturer Award*

**Ross Stein**, Temblor Inc.

**Iain Simpson Stewart**, University of Plymouth

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## CUSHMAN FOUNDATION

*W. Storrs Cole Memorial Research Award*

**Jessica E. Pilarczyk**, University of Southern Mississippi

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## AMERICAN GEOSCIENCES INSTITUTE

*AGI Medal in Memory of Ian Campbell*

**Russell G. Slayback**, Leggette, Brashears & Graham

## GSA Fellowship

Fellowship is an honor that is bestowed on the best of our profession once per year at the spring GSA Council meeting and is recognized at GSA’s Annual Meeting. GSA members are elected to Fellowship in recognition of distinguished contributions to the geosciences. A member can be nominated for Fellowship only by a Fellow of the Society who initiates the process by completing the nominating sponsor’s form and identifying two other Fellows, or one Fellow and one member, who agree to support the nomination. A GSA Fellow may only support two nominees per election cycle, only one of which as a primary nominator. Questions? Email [awards@geosociety.org](mailto:awards@geosociety.org).

### How to Make a Nomination

#### Deadline: 1 Feb.

Primary nominator:

1. Completes online nomination form at [www.geosociety.org/FellowNoms](http://www.geosociety.org/FellowNoms);
2. Writes a letter of support;
3. Collects two (2) additional letters of support (one must be from a Fellow; both must be GSA members);
4. Obtains nominee’s current CV or résumé; and
5. Submits all documents in one packet to [awards@geosociety.org](mailto:awards@geosociety.org).

## 2018 Student Research Grants

GSA is proud to offer research grants to its highly qualified student members. Students may receive a total of two GSA graduate student grants in their entire academic career, regardless of what program they are currently enrolled in. **The maximum award per grant is US\$2,500.** Students may be eligible for specialized awards, in which case the total funding awarded could be greater than US\$2,500.

The GSA student research grant application process is available online only; no paper applications or letters will be accepted. Apply online at [www.geosociety.org/grants](http://www.geosociety.org/grants) starting December 2017. Online submissions must be completed by Thursday, **1 February 2018**, at 5 p.m. MST.

For further information on the 2018 Research Grants Program, go to [www.geosociety.org/grants](http://www.geosociety.org/grants), call +1-303-357-1025, or e-mail [researchgrants@geosociety.org](mailto:researchgrants@geosociety.org).





## Students: The Future Geosciences Job Market

As a student getting ready to graduate in the near future with your geoscience degree, you might be wondering what type of job market you are going to enter into. What sectors will be most promising to recent graduates? Are there sectors that you have not considered that you should?

At the GSA South-Central Section Meeting held 13 March 2017, the career-focused session, “The Future of the Geosciences Job Market: A Faculty and K–12 Mentor Lunch,” aimed to answer these questions. Organized by GSA’s Academic and Applied Geoscience Relations Committee past chair, Robert Finkleman, the event featured a panel of professionals from a variety of sectors to discuss these issues. Featured panelists included Ches Blevins, Executive Director, Texas Mining and Reclamation Association; Tonya Brami, Global Geoscience Recruiting Supervisor, ExxonMobil; Sharon Mosher, Dean, Jackson School of Geosciences at The University of Texas at Austin; Douglas Schnoebelen, Supervisory Hydrologist, USGS; Lowell White, Geological Specialist, Pioneer Natural Resources; and Michael Young, Associate Director, Environmental Division, the Texas Bureau of Economic Geology.

According to Mosher, the Bureau of Labor Statistics predicts that in the next decade there will be 32,000 new geoscience jobs added to the workforce. In addition, 150,000 geoscience professionals will retire. Combined with the number of students currently pursuing geoscience degrees, there is an expected gap in trained geoscientists of 90,000. This number is slightly lower than earlier predictions as a result of the decline in the oil and gas industry, which has seen a drop in the number of new hires.

Despite the downturn in oil and gas hiring, large and small companies are still recruiting, though they may be hiring in smaller numbers. Other sectors have seen an increase in hiring, including environmental consulting, government laboratories, insurance agencies, and mining. Brami at ExxonMobil emphasized that if your end goal is to work in oil and gas, remember that there is a cycle to the industry and that the outlook is promising.

White at Pioneer Natural Resources suggested that the unconventional resources development industry is doing well.

Working at a state geologic survey can be a worthy alternative, according to Young. With a survey in almost every state, and if you seek an employer that is mission-based and focused on outreach to stakeholders and legislators, with an emphasis on geologic hazards, you may enjoy a state geologic survey. Housed partly at universities and partly at government institutions, state surveys employ nationally 1,900 full-time staff, with many being solely government funded. The five largest state surveys include Kansas, Oregon, California, Illinois, and Texas.

At the federal level, the U.S. Geological Survey is a service-oriented pathway that involves geohazards, mapping, geospatial, and hydrogeological fields, according to Schnoebelen. There is job potential as a result of an age gap that the agency is trying to fill; however, finding a job with the USGS can be a slow and frustrating process.

The mining sector may be another alternative to research. Blevins suggested that mining is progressive in that they understand they are a competing energy source and look toward ways to make mining cleaner and more efficient than other options in order to be competitive. While there have been some cutbacks in retaining geoscientists on staff, some companies have turned to hiring consulting firms to provide expertise for short-term help, which has opened up more opportunities in consulting.

As sectors evolve in the future, the panelists had some advice to give to students, including (1) keep up good grades; (2) make meaningful contacts at conferences and meetings; (3) talk with your professors and advisors about careers; (4) learn how to communicate complex subjects to non-scientists; (5) be a good presenter; (6) learn how to work on a team and be comfortable in different roles in a team; and (7) always be passionate about your career.

—This summary was compiled through notes taken by Ryan O’Connell of The University of Texas at Dallas.



# JOINT MEETING

70th Annual Meeting of the Rocky Mountain Section, GSA

114th Annual Meeting of the Cordilleran Section, GSA

Flagstaff, Arizona, USA

15–17 May 2018

[www.geosociety.org/Sections/rm/2018mtg/](http://www.geosociety.org/Sections/rm/2018mtg/)



Scenic Oak Creek Canyon is a short drive from Flagstaff, on the road to Sedona.

## LOCATION

Flagstaff lies at 7000 feet (~2100 m) elevation on the southern edge of the geologically world-class Colorado Plateau, near the southern margin of the young and active San Francisco volcanic field. The city is located just north of the Transition Zone and Basin and Range provinces, including the tourist destination of Sedona, one hour away. The Grand Canyon is a 1.5-hour drive north of Flagstaff, and numerous geologically significant national parks and monuments are scattered across the region. We have devised a diverse technical program and field trips that explore the geology of the Southwest and span from modern to ancient processes, and from environmental problems to tectonics, geophysics, paleontology, climate, education, and more. We include sessions on planetary geology and Southwest rivers that build on the strong legacy and current expertise of the local U.S. Geological Survey.

## CALL FOR PAPERS

**Abstract deadline:** 20 February 2018

Submit online at [www.geosociety.org/Sections/rm/2018mtg/](http://www.geosociety.org/Sections/rm/2018mtg/).

**Abstract submission fee:** US\$15 for students and US\$30 for all others.

If you cannot submit an abstract online, please contact Heather Clark, +1-303-357-1018, [hclark@geosociety.org](mailto:hclark@geosociety.org).

## TECHNICAL SESSIONS

### Symposia

- S1. **Tectonics of the Death Valley Region: A Tribute to Bennie Troxel and Lauren Wright.** Terry Pavlis, Univ. of Texas–El Paso, [tlpavlis@utep.edu](mailto:tlpavlis@utep.edu); Laura Serpa, Univ. of Texas–El Paso, [lserpa@utep.edu](mailto:lserpa@utep.edu); James Calzia, USGS, [jcalzia@usgs.gov](mailto:jcalzia@usgs.gov); Darrel Cowan, Univ. of Washington, [darrel@u.washington.edu](mailto:darrel@u.washington.edu); Marli Miller, Univ. of Oregon, [millerm@uoregon.edu](mailto:millerm@uoregon.edu).
- S2. **Cordilleran Tectonics, Metamorphic Core Complexes, Geologic Mapping, and Arizona Geology: A Celebration of Jon Spencer's Career.** John Singleton, Colorado State University, [john.singleton@colostate.edu](mailto:john.singleton@colostate.edu); Stephen Reynolds, Arizona State Univ., [sreynolds@asu.edu](mailto:sreynolds@asu.edu); Kurt Constenius, Univ. of Arizona, [kconstenius@comcast.net](mailto:kconstenius@comcast.net).
- S3. **Recent Advances in Basin-and-Range and Proterozoic Geology of the Western U.S.: A Session Honoring Ernie Duebendorfer.** Chloe Bonamici, New Mexico Tech, [chloe.bonamici@nmt.edu](mailto:chloe.bonamici@nmt.edu); Kevin Chamberlin, Univ. of Wyoming, [kchamber@uwyo.edu](mailto:kchamber@uwyo.edu); Mike Williams, Univ. of Mass., [mlw@geo.umass.edu](mailto:mlw@geo.umass.edu).
- S4. **Jurassic to Cenozoic Geology of Southern California, Southwest Arizona, and Sonora: A Session Honoring Gordon Haxel and Carl Jacobson.** Jon Spencer, Univ. of Arizona, [spencer7@email.arizona.edu](mailto:spencer7@email.arizona.edu); Sue Beard, USGS, [sbeard@usgs.gov](mailto:sbeard@usgs.gov).

### THEME SESSIONS

- T1. **Miocene to Recent Evolution of the Lower Colorado River Corridor and the Northern Gulf of California.** Ryan Crow, USGS, [rcrow@usgs.gov](mailto:rcrow@usgs.gov); Kris McDougall, USGS, [kris@usgs.gov](mailto:kris@usgs.gov); Scott Bennett, USGS, [sekbennett@usgs.gov](mailto:sekbennett@usgs.gov); Mike Darin, Northern Arizona Univ., [michael.darin@nau.edu](mailto:michael.darin@nau.edu).
- T2. **Earth Surface Processes in the Critical Zone.** Tim White, Penn State Univ., [tsw113@psu.edu](mailto:tsw113@psu.edu); Jon Pelletier, Univ. of Arizona, [jon@geo.arizona.edu](mailto:jon@geo.arizona.edu).
- T3. **Advances in River Science in the Intermountain West.** Erich Mueller, USGS, [emueller@usgs.gov](mailto:emueller@usgs.gov); Paul Grams, USGS, [pgrams@usgs.gov](mailto:pgrams@usgs.gov); Daniel Buscombe, Northern Arizona Univ., [daniel.buscombe@nau.edu](mailto:daniel.buscombe@nau.edu); Dave Dean, USGS, [djdean@usgs.gov](mailto:djdean@usgs.gov).
- T4. **New Insights into the Development and Evolution of the Colorado River System from Geologic Mapping (POSTERS).** Kyle House, USGS, [khouse@usgs.gov](mailto:khouse@usgs.gov); Phil Pearthree, Arizona Geological Survey, [pearthree@email.arizona.edu](mailto:pearthree@email.arizona.edu).
- T5. **Post-Wildfire Hazards: From New Research to Assessments, Prediction, and Mitigation.** Ann Youberg, Arizona Geological Survey, [ayouberg@email.arizona.edu](mailto:ayouberg@email.arizona.edu); Luke McGuire, Univ. of Arizona, [lmcguire@email.arizona.edu](mailto:lmcguire@email.arizona.edu).
- T6. **Colorado Plateau Landscape Evolution—Grand Canyon and Upper Basin—Focused Colorado River Evolution.** Sue Beard, USGS, [sbeard@usgs.gov](mailto:sbeard@usgs.gov); Andres Aslan, Colorado Mesa University, [aaslan@coloradomesa.edu](mailto:aaslan@coloradomesa.edu); Richard Young, SUNY Geneseo, [young@geneseo.edu](mailto:young@geneseo.edu); Karl Karlstrom, Univ. of New Mexico, [kek1@unm.edu](mailto:kek1@unm.edu).

- T7. **Seismic and Geophysical Perspectives: New Insights into the Structure of the Shallow Crust of the Rocky Mountains and Cordillera.** Joshua Coyan, USGS, jcoyan@usgs.gov; Geoff Phelps, USGS, gphelps@usgs.gov.
- T8. **Laramide Tectonics in the Southwest North American Cordilleran Interior.** Jay Chapman, Univ. of Arizona, jaychapman@email.arizona.edu; Ryan Porter, Northern Arizona Univ., ryan.porter@nau.edu; Chris Clinkscales, Univ. of Arizona, clinkscales@email.arizona.edu.
- T9. **Cenozoic Extension in Western North America.** Lisa Lamb, St. Thomas Univ., malamb@stthomas.edu; John Singleton, Colorado State Univ., john.singleton@colostate.edu; Gary Axen, New Mexico Tech, gary.axen@nmt.edu; Jolante Van Wijk, New Mexico Tech, jolante.vanwijk@nmt.edu; Jason Ricketts, Univ. of Texas–El Paso, jricketts@utep.edu.
- T10. **Geologic and Structural Evolution of the Transition Zone.** Alan Chapman, Macalester College, chapman@macalester.edu; Nancy Riggs, Northern Arizona Univ., nancy.riggs@nau.edu; Tim Schroeder, Bennington College, tschroeder@bennington.edu; Jessie Shields, California State Univ.–Fresno, jessieshields9@mail.fresnostate.edu.
- T11. **Pennsylvanian to Early Triassic Tectonics of Southwest Laurentia.** Nancy Riggs, Northern Arizona Univ., nancy.riggs@nau.edu; Andy Barth, Indiana Univ., ibsz100@iupui.edu; Robinson Cecil, California State Univ.–Northridge, robinson.cecil@csun.edu.
- T12. **Plate Margin Processes and Tectonics during the Cretaceous, Western North America.** Bernie Housen, Western Washington Univ., bernard.housen@wwu.edu; Basil Tikoff, Univ. of Wisconsin, basil@geology.wisc.edu.
- T13. **Emerging Ideas on the Ancestral Rocky Mountain System.** Ryan Leary, Northern Arizona Univ., ryan.leary@nau.edu; Paul Umhoefer, Northern Arizona Univ., paul.umhoefer@nau.edu; Mike Smith, Northern Arizona Univ., michael.e.smith@nau.edu
- T14. **Paleomagnetic, Structural, and Geophysical Data Applied to Intrusive and Extrusive Igneous Systems, Tectonic Applications, and Paleoclimate Studies.** Michael S. Petronis, New Mexico Highlands Univ., mspetro@nmhu.edu; Filip Tomek, Charles Univ. & Institute of Geology, filip.tomek@gmail.com; Jennifer Lindline, New Mexico Highlands Univ., lindlinej@nmhu.edu.
- T15. **Genetic Links between the Magmatism, Tectonism, and Metallogeny of the Southwestern USA and Northern Mexico.** Simon Jowitt, Univ. of Nevada–Las Vegas, simon.jowitt@unlv.edu; Graham Andrews, West Virginia Univ., gda0005@mail.wvu.edu.
- T16. **Understanding Water Resources Related to Mineralized Uranium Deposits in the Southwestern United States.** Johanna Blake, USGS, jmtblake@usgs.gov; Kim Beisner, USGS, kbeisner@usgs.gov; Jose Cerrato, Univ. of New Mexico, jcerrato@unm.edu; Andrew Robertson, USGS, ajrobert@usgs.gov.
- T17. **Chemical and Isotopic Tracers of Water Sources in Semiarid Regions: From the Mantle to the Atmosphere.** Kimberly Samuels–Crow, Northern Arizona Univ., kimberly.samuels@nau.edu; Laura Crossey, Univ. of New Mexico, lcrossey@unm.edu; Abe Springer, Northern Arizona Univ., abe.springer@nau.edu.
- T18. **Paleoclimate Records and Future Climate Trends in the American Southwest.** Tammy Rittenour, Utah State Univ., tammy.rittenour@usu.edu; Andrea Brunelle, Univ. of Utah, andrea.brunelle@geog.utah.edu.
- T19. **Paleontology of the Colorado Plateau and Environs.** Dave Elliott, Northern Arizona Univ., david.elliott@nau.edu; Bill Parker, Petrified Forest National Park, william\_parker@nps.gov.
- T20. **Biostratigraphy and Paleoenvironments of Western North America: Correlations across the International Border.** Pilar Navas-Parejo, UNAM–Hermosillo, petalo@gmail.com.
- T21. **Recent Advances in Planetary Geoscience.** Nadine Barlow, Northern Arizona Univ., nadine.barlow@nau.edu; Jim Skinner, USGS, jskinner@usgs.gov; Mark Salvatore, USGS, mark.salvatore@nau.edu.
- T22. **Earth as a Stepping Stone for Planetary Exploration.** Lauren Edgar, USGS, ledgar@usgs.gov; Christopher Edwards, Northern Arizona Univ., christopher.edwards@nau.edu; Jim Skinner, USGS, jskinner@usgs.gov; Kelsey Young, NASA, kelsey.e.young@nasa.gov.
- T23. **Integrating Composition and Morphology: Keys to Constraining Planetary Surface Processes from Spacecraft Data.** Kristen Bennett, Northern Arizona Univ., kristen.bennett@nau.edu; Christopher Edwards, Northern Arizona Univ., christopher.edwards@nau.edu; Nadine Barlow, Northern Arizona Univ., nadine.barlow@nau.edu; Will Grundy, Lowell Observatory, grundy@lowell.edu.
- T24. **Understanding Basin Environments and Evolution Beyond Earth.** Jim Skinner, USGS, jskinner@usgs.gov; Lauren Edgar, USGS, ledgar@usgs.gov; Kristen Bennett, Northern Arizona Univ., kristen.bennett@nau.edu; Chris Okubo, USGS, cokubo@usgs.gov.
- T25. **Geologic Applications of Unmanned Aerial Systems.** Art Sylvester, Univ. of California–Santa Barbara, sylvester@ucsb.edu; Ramon Arrowsmith, Arizona State Univ., ramon.arrowsmith@asu.edu; Nicholas Barth, Univ. of California–Riverside, nic.barth@ucr.edu; Chris Crosby, UNAVCO, crosby@unavco.org.
- T26. **Recent Advances in Understanding the Geology of Northwestern Mexico.** Carlos Gonzalez-Leon, UNAM–Hermosillo, cmgleon@unam.mx; Luca Ferarri, UNAM–Mexico City, luca@unam.mx.
- T27. **Geoscience and Environmental Science Education in the Cordillera and Rockies: Research and Practice (POSTERS).** Steven Semken, Arizona State Univ., semken@asu.edu; Callan Bentley, Northern Virginia Community College, cbentley@nvcc.edu.
- T28. **The Happy Marriage of Geology and Art (POSTERS).** Steven Emerman, Utah Valley Univ., stevene@uvu.edu; Lori Santos, Wichita State, lorisantosarted@gmail.com.
- T29. **Undergraduate Research Session (POSTERS).** Jeff Marshall, Cal Poly Pomona, marshall@capp.edu.

## FIELD TRIPS

Trip registration opens in Feb. 2018. For additional information, please contact the Field Trip Chairs Michael Smith, michael.e.smith@nau.edu, and Steve Semken, semken@asu.edu.

**Geomorphology and Pedology of Cinder Cones in the Vicinity of Flagstaff, Arizona.** Jon Pelletier, Univ. of Arizona, jdpellet@email.arizona.edu; Luke McGuire, Univ. of Arizona, lmcguire@email.arizona.edu; Craig Rasmussen, Univ. of Arizona, crasmuss@cals.arizona.edu.

**Oligocene Incision of Grand Canyon, Grandview Trail to Horseshoe Mesa.** Jim Sears, Univ. of Montana, james.sears@mso.umt.edu.

**Tectonic and Magmatic Evolution of the Snake Range Metamorphic Core Complex, East-Central Nevada.** Phillip Gans, Univ. of California–Santa Barbara, gans@geol.ucsb.edu.

**Tectonic Development of the Colorado Plateau Transition Zone, Central Arizona: Insights from Lower Crustal and Mantle Xenoliths and Volcanic Host Rocks.** Alan Chapman, Macalester College, chapman@macalester.edu; Nancy Riggs, Northern Arizona Univ., nancy.riggs@nau.edu.

**Informal Geoscience Education on the Trail of Time at Grand Canyon National Park.** Steven Semken, Arizona State Univ., semken@asu.edu; Karl Karlstrom, Univ. of New Mexico, kek1@unm.edu; Laura Crossey, Univ. of New Mexico, lcrossey@unm.edu; Ryan Crow, USGS Flagstaff, rcrow@usgs.gov.

**Accessible Mesozoic Terrestrial Field Geology at Petrified Forest National Park.** Steven Semken, Arizona State Univ., semken@asu.edu; Christopher Atchison, Univ. of Cincinnati, atchiscl@ucmail.uc.edu.

**Silver Creek Caldera and Peach Spring Tuff.** Charles Ferguson, Arizona Geological Survey, caf@email.arizona.edu.

## SHORT COURSES

### Sunday, 13 May

1. **Morning: Digital Geology Teaching Tools.** Callan Bentley, Northern Virginia Community College, cbentley@nvcc.edu, Steve Whitmeyer, James Madison Univ., whitmesj@jmu.edu.
2. **Morning: Prospective UAV Users for Geologic Purposes.** Arthur G. Sylvester, Univ. of California–Santa Barbara; sylvester@geol.ucsb.edu.
3. **Afternoon: Digital Field Methods for Sed/Strat and Structural Geology: Use of Tablet-Based Apps for Mapping and Measurements in Undergraduate Courses.** Lawrence Malinconico, Lafayette College, malincol@lafayette.edu.
4. **Afternoon: UAV Geologic Applications.** Arthur G. Sylvester, Univ. of California–Santa Barbara; sylvester@geol.ucsb.edu.

### Monday, 14 May—Full-Day Courses

5. **Assessing Contaminant Sources and Aquifer Continuity in Soil/Groundwater Using Stable Isotopes of Strontium (Sr) and Lead (Pb).** Richard W. Hurst, California Lutheran Univ., rhurst@callutheran.edu.

6. **Collecting Geological Field Data Using the StraboSpot Data System.** Doug Walker, Univ. of Kansas, jdwalker@ku.edu; Emily Bunse, Univ. of Kansas; Basil Tikoff, Univ. of Wisconsin–Madison, basil@geology.wisc.edu.

## REGISTRATION

**Early registration deadline:** 9 Apr. 2018

**Cancellation deadline:** 16 Apr. 2018

Registration opens early Feb. 2018. For further information or if you need special accommodations, please contact one of the conference chairs: Paul Umhoefer, paul.umhoefer@nau.edu; Dennis Newell, dennis.newell@usu.edu.

## ACCOMMODATIONS

**Hotel registration deadline:** 26 Apr. 2018

A block of rooms has been reserved at the DoubleTree by Hilton at 1175 West Route 66, Flagstaff, Arizona 86001, USA, the site of the meeting. The meeting rate is US\$159 per night plus tax for single and double occupancy, US\$143 for government rate. Reservations should be made by calling the DoubleTree directly at +1-928-773-8888 (local). Attendees should reference the group code “Geological Society of America.”

## MENTOR PROGRAMS

For more information, visit the GSA mentors page at [www.geosociety.org/mentors](http://www.geosociety.org/mentors) or contact Jennifer Nocerino, jnocerino@geosociety.org.

### Roy J. Shlemon Mentor Program in Applied Geosciences.

Tues., 15 May, lunchtime. Designed to extend the mentoring reach of individual professionals from applied geology to undergraduate and graduate students. Students and mentors: Join us for a free lunch. Space is limited—first come, first served.

### Mann Mentors in Applied Hydrogeology Program.

Wed., 16 May, lunchtime. Presents mentoring opportunities for undergraduate, graduate, and recent graduate students with a declared interest in applied hydrogeology as a career. Lunch will be provided for students and mentors. Space is limited—first come, first served.

## ORGANIZING COMMITTEE

Meeting General Chair: Paul Umhoefer, paul.umhoefer@nau.edu, Northern Arizona Univ.

Rocky Mountain Co-Chair: Dennis Newell, dennis.newell@usu.edu, Utah State Univ.

Technical Program Chairs: Nancy Riggs, nancy.riggs@nau.edu, Northern Arizona Univ.; Ryan Crow, rcrow@usgs.gov, U.S. Geological Survey; Dave Elliott, david.elliott@nau.edu, Northern Arizona Univ.

Field Trip Chairs: Mike Smith, michael.e.smith@nau.edu, Northern Arizona Univ.; Steve Semken, semken@asu.edu, Arizona State Univ.

Exhibits, Sponsorships: Steve Reynolds, Arizona State Univ.

Short Courses: Lisa Skinner, Northern Arizona Univ.

Student Volunteers: Lisa Skinner, Northern Arizona Univ.



# GSA Section Meetings

2018



## **South-Central Section**

12–13 March

Little Rock, Arkansas, USA

Meeting Chair: Michael DeAngelis, [mtdeangelis@ualr.edu](mailto:mtdeangelis@ualr.edu)

[www.geosociety.org/sc-mtg](http://www.geosociety.org/sc-mtg)

Photo by Oliver Beland.



## **Northeastern Section**

18–20 March

Location: Burlington, Vermont, USA

Meeting Chairs: Charlotte Mehrten, [cmehrtens@uvm.edu](mailto:cmehrtens@uvm.edu);

Andrea Lini, [alini@uvm.edu](mailto:alini@uvm.edu)

[www.geosociety.org/ne-mtg](http://www.geosociety.org/ne-mtg)

Photo by Stephen Wright.



## **Southeastern Section**

12–13 April

Location: Knoxville, Tennessee, USA

Meeting Chair: Colin D. Sumrall, [csumrall@utk.edu](mailto:csumrall@utk.edu)

[www.geosociety.org/se-mtg](http://www.geosociety.org/se-mtg)

Photo by Bruce McCamish.



## **North-Central Section**

16–17 April

Ames, Iowa, USA

Meeting Chair: William Simpkins, [bsimp@iastate.edu](mailto:bsimp@iastate.edu)

[www.geosociety.org/nc-mtg](http://www.geosociety.org/nc-mtg)

Photo by Bri Gerke.



## **Rocky Mountain/Cordilleran Joint Section Meeting**

15–17 May

Flagstaff, Arizona, USA

Meeting Chair: Paul Umhoefer, [paul.umhoefer@nau.edu](mailto:paul.umhoefer@nau.edu)

Meeting Co-Chair: Dennis Newell, [dennis.newell@usu.edu](mailto:dennis.newell@usu.edu)

[www.geosociety.org/rm-mtg](http://www.geosociety.org/rm-mtg)

Photo credit: [findyourspot.com](http://findyourspot.com).

# In Memoriam

The Society notes with regret the deaths of the following members (notifications received between 1 May 2017 and 31 August 2017).

**Jon C. Avent**

Lopez Island, Washington, USA

Date notified: 14 July 2017

**Aaron Scott Beltzer**

Amherst, Massachusetts, USA

Date notified: 26 May 2017

**Joseph H. Birman**

Glendale, California, USA

Date notified: 5 June 2017

**Roy M. Breckenridge**

Moscow, Idaho, USA

Date notified: 9 May 2017

**Nathan T. Bridges**

Columbia, Maryland, USA

Date of death: 26 April 2017

**Steven E. Bushnell**

Pasadena, California, USA

Date notified: 20 June 2017

**Parker E. Calkin**

Boulder, Colorado, USA

Date of death: 10 June 2017

**Max F. Carman Jr.**

Pomona, California, USA

Date of death: 31 May 2017

**Maurice Deul**

Scituate, Massachusetts, USA

Date notified: 15 May 2017

**Paul D. Epstein**

Toledo, Ohio, USA

Date notified: 3 May 2017

**Russell C. Evarts**

Menlo Park, California, USA

Date of death: 11 July 2017

**Peter T. Flawn**

Austin, Texas, USA

Date of death: 6 May 2017

**Marc H. Grunfelder**

Zurich, Switzerland

Date of death: 21 January 2017

**Colin C. McAneny**

Vicksburg, Mississippi, USA

Date notified: 31 May 2017

**Clark Ernest McHuron**

Yountville, California, USA

Date of death: 1 May 2017

**Daniel F. Merriam**

Lawrence, Kansas, USA

Date of death: 26 April 2017

**William D. Romey**

East Orleans, Massachusetts, USA

Date of death: 1 June 2017

**Philip A. Sandberg**

Hammondsport, New York, USA

Date notified: 1 June 2017

**Cecil J. Schneer**

Exeter, New Hampshire, USA

Date of death: 9 February 2017

**Bruce W. Selleck**

Hamilton, New York

Date of death: 31 July 2017

**Alan G. Smith**

Cambridge, Cambridgeshire, UK

Date of death: 13 August 2017

**Carlton T. Sumsion**

Salt Lake City, Utah, USA

Date of death: 2 August 2017

**George A. Thompson**

Stanford, California, USA

Date of death: 12 May 2017

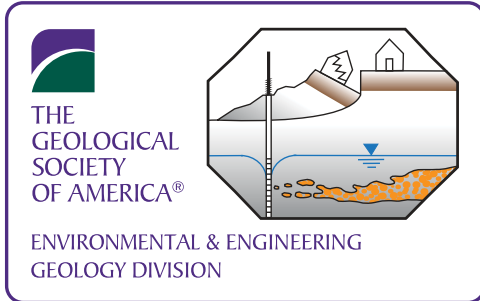
**James H. Trexler Jr.**

Reno, Nevada, USA

Date of death: 15 May 2017

# GSA Division Milestones

GSA acknowledges and congratulates these GSA Divisions for meeting these milestones:



The **Environmental and Engineering Geology Division** is 70 years old this year. Established in 1947, this Division seeks to advance the ability of geologists to identify, characterize, and mitigate adverse geological and environmental conditions and hazards affecting human safety and the built environment. To do so, the Division promotes research, education, and dissemination of information relevant to members.



The **Archaeological Geology Division** is 40 years old. Established in 1977, this division provides a forum for the presentation and discussion of papers on archaeological geology in order to stimulate and promote research and teaching within this field.



The **Limnogeology Division** is 15 years old. Established in 2002, the division encourages research on both ancient and modern lakes around the world, the collaboration of scientists from all disciplines on lake research, and the fostering of student research and careers in lake studies.

## Heavy Mineral Extractions

**Geochron and Indicator Minerals from Rocks and Sediments**

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Clean liberation of mineral grains by Electric-Pulse Disaggregation (EPD)

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Kirstin L. Neff

## Science Communication and the Era of “Fake News”

One of the things that has most surprised me about working on Capitol Hill has been the indispensable relationship between Congress and the press. It has been said that the press is the fourth branch of American government, and my time in a senator’s office has shown me the deep truth of that statement. You could have the most brilliant legislative idea, or the strongest conviction about a policy, but none of it matters unless you can communicate it to the public in such a way that they will hear, understand, and care about your message.

Throughout my fellowship year, I’ve often had the opportunity to work with our office’s communications staff to make sure that news of our legislative work reaches our constituents. I’ve contributed to and fact-checked press releases, statements, op-eds, and speeches, with a goal of not only getting the science and technical information right, but expressing it in a way that engages journalists and their audience, our constituents. I’ve been reminded that the basic tenets of journalism are not only who, what, when, and where, but also why it’s relevant to the lives of readers and viewers. I’ve learned from my communications colleagues how to frame an issue and avoid the kind of technical vocabulary that makes a reader turn the page or a viewer change the channel.

As scientists, we know it takes trial and error to find out what works to clearly communicate our work to a lay audience. Perhaps you’ve been interviewed by the local paper or a blog about your research, only to see the final article and grimace at an inaccuracy that arose from miscommunication. Perhaps you’ve appeared on a radio program or podcast and struggled to avoid using technical jargon. The events of the past year have led many scientists to turn their attention toward political debate, yet the first thing we often realize is how ill-equipped we are to engage with the public on scientific topics.

Just as scientists experience how easily their work can be misunderstood or misconstrued, so do politicians, whose statements and actions are held under a high-powered microscope, facilitating misinterpretation. Political communication involves not only explaining the why, often using stories from constituents to demonstrate the reasoning behind votes or co-sponsored legislation, but also about the how: Congressional procedure can be difficult to understand and counterintuitive, even for those who practice it daily. It is this difficulty that gave rise to former presidential candidate John Kerry’s infamous 2004 quote, “I actually did vote for [supplemental military spending in Iraq and Afghanistan], before I voted against it.” Kerry was alluding to a procedural vote before final passage of the bill, which was altered with amendments during floor debate. He failed to explain that to an audience that (justifiably) knows and cares little about Senate procedure. He struggled, like many scientists, to avoid jargon and meet his audience where they stood.

Thankfully, there are a growing number of avenues for scientists to practice and develop their public communication skills. The proliferation of podcasts offers an increasing number of opportunities for scientists to discuss their work before a lay audience. Across the world, science pub nights are increasing in popularity and offering scientists an informal venue in which to present short, often humorous talks highlighting the joy and wonder of their scientific endeavors. I was fortunate to have the chance to present at D.C.’s Nerd Nite event, hosted by professional science communicators who are eager to share their tips and tricks for making your science entertaining and meaningful. Blogging about your work is another quick entrée into communicating with lay audiences.

But at the same time that the scientific community is recognizing the need to engage with the press and tailor their work to lay audiences, the press itself is undergoing heightened external pressures and institutional changes. Traditional print media are struggling to find a functional business model in the digital age, resulting in a consolidation of print sources and fewer resources for in-depth reporting. Cable news outlets increasingly rely on commentators and less on investigative journalism. And newer online sources are bringing a greater diversity of perspectives and stories into our newsfeeds, expanding the conversation but sometimes serving as an echo chamber, reinforcing existing beliefs. In this era of change and uncertainty, leaders who would see the power of the press diminished have promoted the idea of “fake news,” threatening the credibility of our indispensable fourth branch of government.

Scientists currently have a wealth of opportunities to engage the public with their work, from highlighting the value of federal research and development funding to explaining the real-world applicability of their work. Just as politicians must justify their actions and decisions to their constituents, so must scientists now justify the value and relevance of their work. The necessity of applying scientific knowledge to policymaking has never been more clear as we face increasing natural hazards and big decisions about the energy, transportation, and technology sectors. The lessons I’ve learned in communication on Capitol Hill are relevant also to scientists: Use commonly understood vocabulary (even if you think it oversimplifies!), meet your audience where they already are (in the pub or on your local news), and lead with why your work matters to their lives. For scientists who want to engage, there is a wealth of opportunity to spread the word about the value of science to society.

*This manuscript is submitted for publication by Kirstin Neff, 2016–2017 GSA-USGS Congressional Science Fellow, with the understanding that the U.S. government is authorized to reproduce and distribute reprints for governmental use. The one-year fellowship is supported by GSA and the U.S. Geological Survey, Department of the Interior, under Assistance Award no. G16AP00179. The views and conclusions contained in this document are those of the author and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. government. Neff works in the office of Senator Martin Heinrich (D-NM) and can be contacted by e-mail at [Kirstin\\_Neff@heinrich.senate.gov](mailto:Kirstin_Neff@heinrich.senate.gov).*

## 2017–2018 GSA-USGS Congressional Science Fellow Announced



**Melanie R. Thornton**

Melanie R. Thornton is excited to serve as the 2017–2018 GSA-USGS Congressional Science Fellow. Thornton was raised in Houston, Texas, USA, and earned the Girl Scout's Gold Award, where she collaborated with a YMCA camp, serving underprivileged youth, to create an activity program focused on education and well-being. Thornton earned a B.S. cum laude from Texas A&M University in 2011 with an environmental geoscience major and geography minor. While at Texas A&M, she participated in the Research Experience for Undergraduates program and wrote her undergraduate thesis on the Southern Ocean and Antarctica's contribution to changing climatic conditions.

Thornton received an M.S. (2012) and Ph.D. (2017) in environmental and natural resource sciences from Washington State University (WSU). Her doctoral research was part of an interdisciplinary project, supported by a USDA-NIFA grant, which sought to address water resource sustainability in the Pacific Northwest. The focus of her research was on the Spokane River Basin, where she utilized collaborative modeling and worked with stakeholders and scientists to jointly solve regional watershed challenges. She

developed an integrated surface-groundwater hydrology model and facilitated workshops with stakeholders that guided the development of short-term recommendations for bi-state water management and education.

Thornton has extensive leadership expertise, having served as the graduate-professional student body president at WSU for two years and as director of communication for the National Association of Graduate-Professional Students. She has experience in collaboration and communicating scientific information, as her stakeholder engagement project required leading meetings and workshops with both scientific and non-scientific audiences.

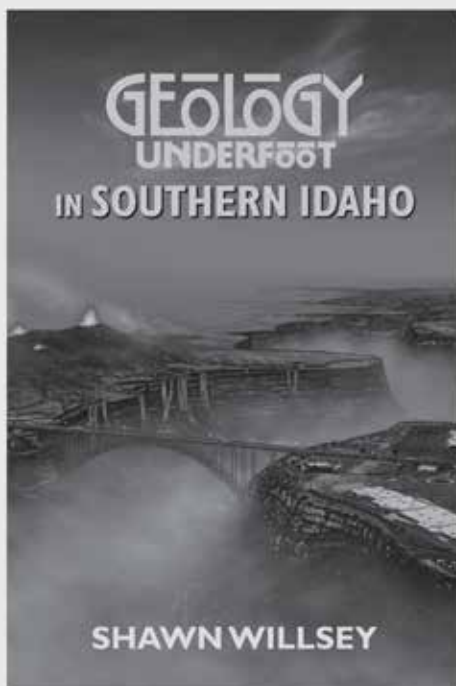
She is enthusiastic about collaborations between science, policy and public outreach, and developing strategies that use science to empower humanity for the betterment of our communities. In her fellowship year, she is looking forward to utilizing her communication and problem-solving skills and deepening her understanding of how Congress and federal agencies work together to draft public policies and prioritize funding.

Thornton will be working in the office of Senator Tom Udall (D-NM) on a range of science policy issues.

### SOME OF THE GEOLOGIC HIGHLIGHTS COVERED IN THIS BOOK

- Bruneau Sand Dunes State Park
- Hagerman Fossil Beds National Monument
- Box Canyon State Park
- Shoshone Falls and the Snake River Canyon
- Sculpted Rock at Black Magic Canyon
- Redfish Lake and the Sawtooth Range
- Malm Gulch's Fossilized Forests
- Beaverhead Meteor Impact at Leaton Gulch
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*Edited by Marion E. Bickford*

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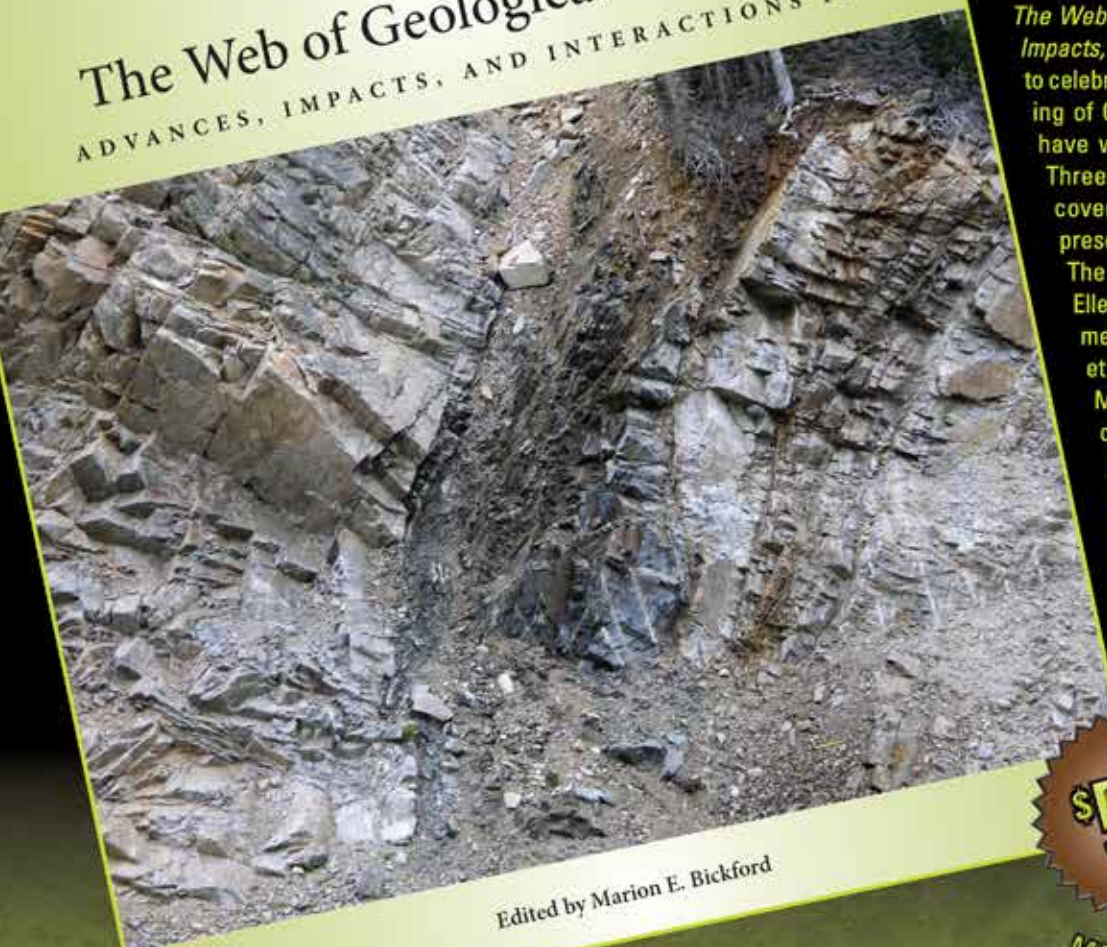
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# Position Statements

GSA Council adopted minor revisions to seven position statements at its May 2017 meeting: Data Access, Geoheritage, Supporting Planetary Exploration, Rewarding Professional Contributions in the Public Spheres, Water Resources, The Value of Geologic Mapping, and Teaching Evolution. Council also endorsed the “Freedom of Scientific Expression” statement by the American Meteorological Society. Summaries are below. Full versions of these and other position statements are online at [www.geosociety.org/PositionStatements](http://www.geosociety.org/PositionStatements).

## DATA ACCESS

The Geological Society of America (GSA) supports the preservation of geoscience samples and data sets for the public good and urges public and private sector organizations and individuals to routinely catalog and preserve their collections and make them widely accessible.

## GEOHERITAGE

The Geological Society of America (GSA) supports the conservation of geoheritage sites to meet present and future educational, scientific, aesthetic, cultural, and economic needs.

## SUPPORTING PLANETARY EXPLORATION

The Geological Society of America (GSA) supports planetary exploration to advance research concerning the evolution of Earth, our solar system, and beyond; to collect geologic and geophysical data on planets, moons, and other objects in the solar system; to explore Earth from space, like other planets, by remote sensing to detect processes and changes not easily observed on the ground; to deepen and expand human understanding of our place in the universe; to reinforce science, technology, engineering, and math (STEM) education and effective training of the next generation of scientists; to increase U.S. competitiveness in science and technology development; and to enhance the quality of life through technological innovation.

## REWARDING PROFESSIONAL CONTRIBUTIONS IN THE PUBLIC SPHERES

The Geological Society of America (GSA) encourages, affirms, and supports positive contributions to geoscience in the public spheres and enhancing the public perception of the geosciences. The time, effort, talent, and scholarly activity that are invested by geoscientists in public policy, education, and research on teaching and learning are critically important for educating and safeguarding local, regional, national, and global populations. As such, GSA recommends that geoscientists in academia, government service, and professional practice receive formal recognition and reward for such efforts through positive performance evaluations, reappointments, promotions, and tenure reviews. GSA also encourages support, by means of

appropriate reassigned time or travel assistance, to those individual geoscientists engaged in substantive scholarly and professional activity on issues of public policy, education, and research on teaching and learning.

## WATER RESOURCES

To ensure the availability of safe and reliable fresh water resources, The Geological Society of America (GSA) encourages partnerships that improve fundamental scientific understanding and analyses of water resources; enhance collection, management, and accessibility of water resource information; increase stakeholder involvement in all aspects of water resource education, assessment, and decision making; and broaden education and outreach to foster collaboration among government agencies, educational institutions, industrial and agricultural users, and the public.

## THE VALUE OF GEOLOGIC MAPPING

To improve the scientific basis for public and private natural resource and land-use decisions, The Geological Society of America (GSA) supports comprehensive geologic mapping on local, state, and national scales and advocates increased public investments for current state and national geologic mapping programs.

## TEACHING EVOLUTION

The Geological Society of America (GSA) strongly supports the teaching of evolution and the directly related concept of deep time as part of science curricula at all levels of education. The evolution of life on Earth stands as one of the central concepts of modern science. During the past two centuries, research in geology, paleontology, and biology has produced an increasingly detailed, consistent, and robust picture of how life on Earth has evolved. GSA opposes teaching creationism alongside evolution in any science classroom and rejects the characterization of evolution as scientifically controversial. Science, by definition, is a method of learning about the natural universe by asking questions in such a way that they can be answered empirically and verifiably. If a question cannot be framed so that the answer can be tested, and the test results can be reproduced by others, then it is not science. Creationism, whether presented as creation “science,” intelligent design, or hydroplate theory, attempts to explain complicated phenomena of the natural world by invoking a creator or designer. Creationism is not science because it invokes supernatural phenomena that cannot be tested. It therefore has no place in a science curriculum. Because science is limited to explaining natural phenomena through the use of empirical evidence, it cannot provide religious explanations. Science teachers should not advocate any religious interpretations of nature and should be nonjudgmental about the personal beliefs of students.



# Thank You

## 2017 GeoCorps™ America Participants, Partners, and Donors

GeoCorps provides paid geoscience opportunities in partnership with government agencies and other organizations committed to science and stewardship, including the Bureau of Land Management (BLM) and the USDA Forest Service. All levels of geoscientists—students, educators, professionals, retirees, and others—are encouraged to apply. Opportunities for spring/summer 2018 will be posted online and open for applications at the beginning of December 2017.

[www.geosociety.org/geocorps](http://www.geosociety.org/geocorps)



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## 2017 Geoscientists-in-the-Parks Participants, Partners, and Donors

The NPS Geoscientists-in-the-Parks (GIP) program places college students and early career professionals (18–35 years old) in National Park Service units for three months to one year to assist with geology and integrated science projects. This program is a partnership between the National Park Service, the Geological Society of America, and Stewards Individual Placement Program. Opportunities for spring/summer 2018 will be posted online and open for applications at the beginning of December 2017.

[www.geosociety.org/gip](http://www.geosociety.org/gip)

### Partners and Major Donors to the Geoscientists-in-the-Parks

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# Think Global, Act Local: GeoTeachers Field Workshops

GSA's state and regional summer GeoTeachers Field Workshops ([www.geosociety.org/geoteachers](http://www.geosociety.org/geoteachers)) will use several design models based on the specific objectives of the course and population in question. One successful model is designed to attract educators primarily from within a 4–5-hour radius to a university campus or similar venue for a week of classroom short courses and day field trips. Teachers will reside onsite to minimize travel and build a sense of camaraderie among the participants. Individual teachers will select classroom workshops that best meet their classroom needs from a variety of content and pedagogical topics taught by master teachers, geoscience educators, and content experts.

The primary focus will be on quality field trips led by experts from academia, government agencies, and industry addressing the geoscience of the region and how active geologic processes in the past and present create the existing landscape. The field trips will also explore how society interacts with the resulting geologic resources and hazards. Participants will investigate classic outcrops as well as tour industrial sites where mines, quarries, processing, and reclamation activities related to meeting human needs occur.

Teachers will be allowed to collect samples and pictures for classroom use, where appropriate. They will also have the opportunity to learn from working geologists regarding the diversity of people and skills on which the geosciences rely and who represent the career options K–12 students can consider pursuing both locally and in the wider world.

In the year following completion of the workshop, participants will be supported in integrating content and teaching strategies into their own classrooms with a webinar series. The series will bring together teachers from the various workshops to continue exploration of wider geoscientific principles across the workshop venues and for sharing successful curricular revisions in their classrooms. Follow-up sessions and field trips relevant to the workshops in each GSA region will be organized for the GSA Section Meetings in the spring before the next round of workshops. With workshop locations moving within each state/region each year, teachers who attend multiple workshops can gain an appreciation of how their local geology fits into the wider area of their state and region over time.

### ***We Need You!***

For GeoTeachers to be successful, we need all GSA members interested in education and outreach to lend us your skills. Given our focus on local teachers, our GeoTeachers Field Workshops will be organized and implemented primarily by local committees composed of GSA members and selected colleagues. No one person has the capacity to build a week-long workshop on their own. It may not take a village, but teamwork will be required. To be successful, we will need people from the K–12 education community, academia, government agencies, non-profit organizations, and industry. Skills and roles that each committee will need to access include:

- Earth Science Educators—Master teachers and science coordinators in K–12 schools/homeschools with practical lesson plans and activities to share;
- Geoscience Educators—Academic faculty with experience teaching geoscience to general education audiences as well as pre- and in-service teachers;
- Field Trips—Experience designing and leading field trips to key outcrops/sites in the local geology;
- Industry Contacts—Professional geologists with expertise and/or facilities to share;
- Fund-Raising—Good contacts with local industry/foundations with geoscience/environmental interest;
- Logistics Experience—Workshops need many helping hands to coordinate and facilitate success; and
- Local Contacts—Connections with individuals in the community who can fill various roles.

There is at least one item on this list that any GSA member can fulfill. This is a call for all hands, and rock hammers, on deck. Please help if you can, even if only to share the names and contact information of people who can assist in this initiative. Help your state be in the first-wave in hosting a GeoTeacher Field Workshop during the summer of 2018. Planning has already begun!

Please direct all ideas and inquiries by phone, email, or the online Member Community to Dean Moosavi, Education Programs Coordinator, [smoosavi@geosociety.org](mailto:smoosavi@geosociety.org), +1-303-357-1015.



Teachers receive an overview of local geology and its connection to the regional tectonic history. Photo by Sadredin (Dean) Moosavi, Ely, Minnesota, USA, 2017.



Teacher acquires sample of Jordan sandstone with glauconite layer. Photo by Dean Moosavi, Mankato, Minnesota, USA, June 2016.



Teachers conclude a field trip exploring prairie on post-glacially scoured Ordovician dolomite terrace of the glacial River Warren, Kasota, Minnesota, USA, June 2016. Dolomite exposed on the terraces is mined for dimension stone and aggregate. Photo by Dean Moosavi.





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With deepest appreciation, the Museum acknowledges Kathryn W. Davis for her generous founding support of the Master of Arts in Science Teaching (MAT) Program.

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# THOMPSON FIELD FORUM ANNOUNCEMENT



THE  
GEOLOGICAL  
SOCIETY  
OF AMERICA

## Processes Controlling the Growth and Evolution of Continental Batholiths, Coast Mountains, British Columbia, Canada

Terrace and Prince Rupert, British Columbia, Canada

12–17 August 2018

### CONVENERS

**Harold Stowell**, Geological Sciences, University of Alabama, Tuscaloosa, Alabama, USA

**Margaret Rusmore**, Department of Geology, Occidental College, Los Angeles, California, USA

**Glenn Woodsworth**, Vancouver, British Columbia, Canada

### DESCRIPTION AND OBJECTIVES

This five-day field forum will explore the growth and evolution of continental batholiths. Although comprehensive datasets are available for many batholiths (e.g., Sierra Nevada, California, USA; Peninsular Ranges, Baja California, Mexico; and Fiordland, New Zealand), the processes responsible for growth of large Cordilleran batholiths are still poorly understood. The Coast Mountains Batholith, British Columbia, is an ideal location for the field forum because it is the largest calc-alkaline plutonic complex on Earth. New data indicate that the batholith exhibits significant along-strike and cross-strike variations in structure, pluton compositions, and exhumation depths.

Magmatic arcs are the primary locations for production of continental crust; therefore, continental batholiths should reflect these processes. A growing body of data from upper and lower crustal exposure of batholiths around the globe indicate that most batholiths are comprised of plutons that are emplaced during relatively brief time periods (tens of millions of years) known as High Flux Events (HFE). These HFE punctuate the long history of magmatism in batholiths, resulting in HFE separated by low magmatic fluxes that may last up to 100 million years. HFE may be triggered by events external to the continental crust (e.g., subduction angle, age of subducting crust) or events internal to the continental crust (e.g., contraction or other crustal-scale rearrangement within the arc). HFE have been documented in the northern Coast Mountains batholith, and associated isotopic data suggest an increased signature from evolved continental crust during HFE. Recent research focuses on evaluating crustal contributions to batholith magmas in the central and southern Coast Mountains. One ongoing aspect of this research compares and contrasts the

sources of magmas emplaced during HFE with those emplaced during low flux periods.

This Thompson Field Forum will follow a transect across the Coast Mountains at the latitude of Prince Rupert, Canada. This transect provides a window into the architecture of the batholith and the country rock, which preserve a record of batholith formation and emplacement during terrane accretion, crustal contraction and thickening, and extensional collapse. The forum will introduce researchers to this spectacular geology and focus attention on areas where productive study can resolve outstanding questions, which begin with the origin of the batholith. Regional maps coupled with large geochronological datasets delineate the broad framework of the batholith. Continuously exposed for >1500 km from south of Vancouver to north of Juneau, Alaska, USA, the Coast Mountains Batholith consists of calc-alkaline, dioritic to granitic plutons ranging from early Jurassic to Eocene. Overall, plutons become younger toward the continent. Magmatic patterns define two arcs or a doubled arc prior to ca. 120–100 Ma. Built upon this broad framework, detailed investigations reveal a complex history of batholith growth that is not yet fully understood.

U-Pb zircon with complementary Hf and O isotope data combined with whole rock chemical and isotopic data identify HFE and indicate that magmas had larger crustal components during some of these events documented for the Bella Coola to Ketchikan segment of the batholith. Preliminary datasets for the batholith south of Bella Coola indicate along-strike changes that likely reflect fundamental variation in the magmatic system. Future work will evaluate the roles of transpression and transtension during formation of the batholith.

High-quality seismic profiles from the area of the Forum Transect yield a precise location of the present Moho and average lithologies through the crust based on the ratio of compressional to shear wave velocities ( $V_p/V_s$ ). These data constrain crustal thickness to ~32 km beneath much of the batholith and clearly delineate a 5 km offset (shallower to the west) of the Moho at the Coast shear zone along the west side. Extensional collapse of the batholith, leading to formation of Hecate Strait and Queen Charlotte basin, is evident in marine geophysical transects.



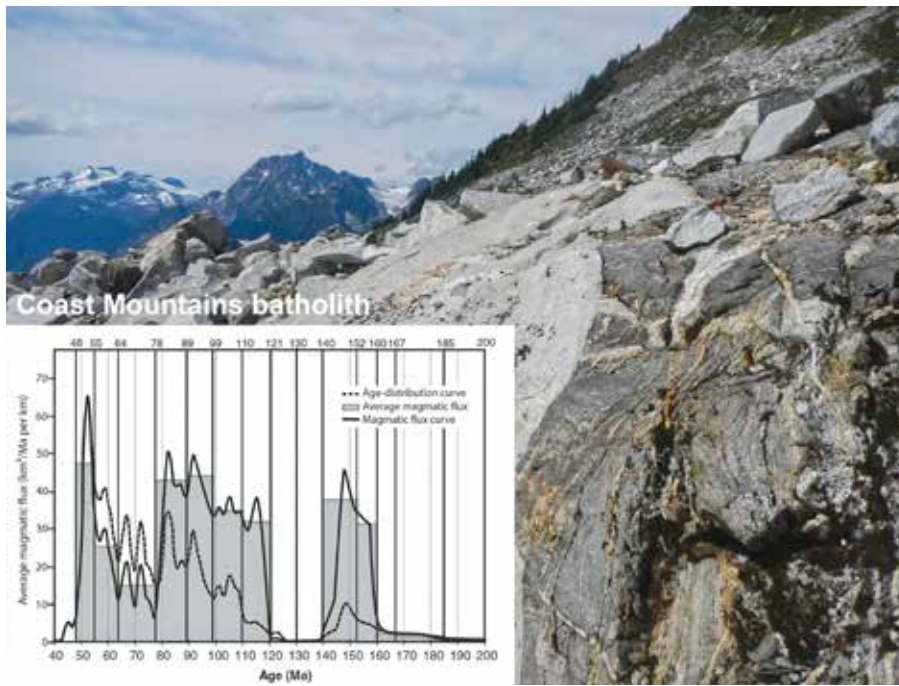


Figure 1. Magmatic flux rates for the northern Coast Mountains in British Columbia, Canada. Flux rates are from Gehrels et al. (2009). Photo by H. Stowell.

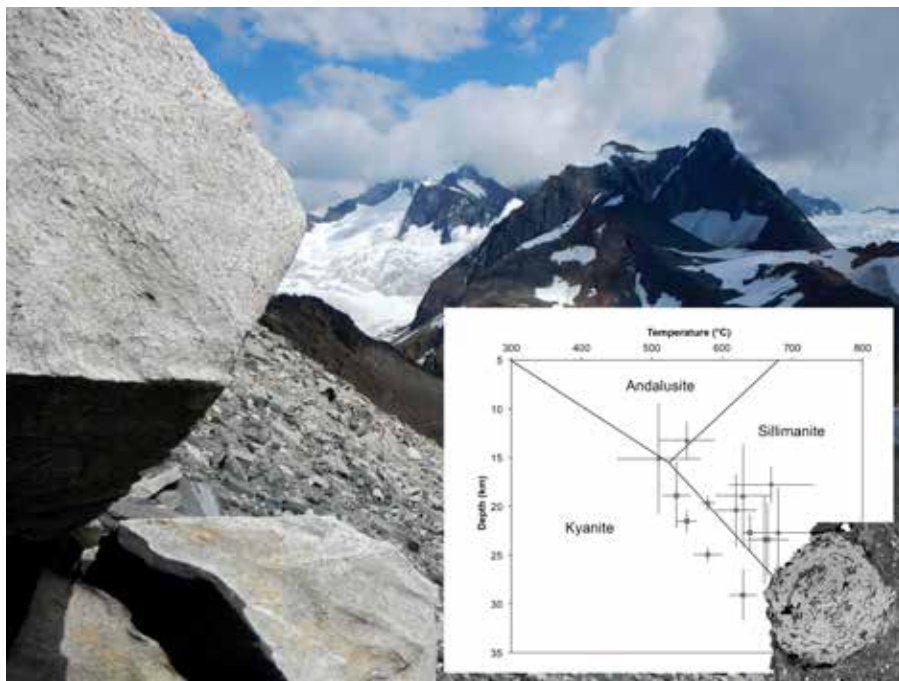


Figure 2. Pressure and temperature estimates for metamorphism during garnet growth in the Mount Waddington area of the Coast Mountains, British Columbia, Canada. Data are from Elizabeth Bollen (unpublished). Photo by H. Stowell.

The Moho is ~35 km deep near Vancouver, and significant orogenic collapse is not apparent there, also indicating along-strike variation in the batholith.

Structural and metamorphic studies show that the batholith formed in a dynamic and variable tectonic regime that differed along its length. Understanding of the tectonics is complicated by Early Cretaceous sinistral transpression that altered the Jurassic to Early Cretaceous magmatic patterns. Subsequently, a large pulse of Late Cretaceous magma intruded during doubly vergent thrust faulting and dextral transpression. Metamorphic pressure-temperature-time (*P-T-t*) data linked with structural analysis indicate significant crustal thickening and local partial

melting during the Late Cretaceous. Batholith growth continued during dextral transpression, potentially with large latitudinal translation. In the Prince Rupert area, crustal extension marked the end of batholith growth during the Eocene. Metamorphic *P-T-t* paths indicate rapid exhumation of granulite during this extension. Although this event was pronounced in the Prince Rupert and Ketchikan map-areas, it did not significantly affect the southern part of the batholith; it is not known if Eocene extension occurred north of Ketchikan.

In spite of the large datasets available for parts of the batholith, significant gaps in data limit understanding of the processes responsible for batholith growth. Most particularly, the apparent



along-strike changes in the batholith can serve to illuminate processes affecting batholith growth. The forum will highlight these gaps and facilitate discussion of productive avenues for further research. Specific questions that will be addressed during the forum include: What drove changes in crustal thickness and how did these changes influence magmatic processes? What is the kinematic history of crustal-scale shear zones; is transcurrent slip a significant factor in development of the orogen? How do crustal-scale shear zones influence batholith formation? Did crustal deformation result from formation and intrusion of melts? What were the contributions of mantle and crust to the melts? What was the role of sediments to the generation of melts? What were the roles of metamorphism, assimilation, and contamination in forming melts? Did lithosphere delamination occur? Was there ridge subduction? Existing age data for the plutons require high magma flux events; what triggered these?

#### **This Thompson Field Forum Will Emphasize:**

- Critical evaluation of data diagnostic of HFE, using the Coast Mountains batholith as an example;
- Cross-disciplinary assessment of batholith structure;
- Factors contributing to HFE in the batholith;
- The role of external and internal mechanisms on batholith growth;
- Structural controls on the growth and architecture of batholiths; and
- The nature of metamorphism and its role in magmatism.

The Coast Mountains batholith is an ideal location for the field forum because exceptional exposure provides a window into the relevant scale of batholithic process. Existing datasets help define key problems and productive study sites. Superb exposures, fresh rock, and road-based access make the Prince Rupert transect an attractive field area. Most critically, insights into batholith formation, terrane accretion, and orogenic evolution can be gained from studies ranging from large, multidisciplinary collaborations to student-scale projects. The field forum will set the stage for researchers interested in investigating batholith formation and related orogenic processes in the Coast Mountains or elsewhere.

#### **PRELIMINARY AGENDA**

The forum will be based in hotels in Terrace and Prince Rupert, British Columbia. A few of the outcrops will require hiking in steep and very slippery terrain. The weather is likely to be wet and cool during the trip.

12 Aug., Arrivals & evening ice breaker;

13 Aug., Day 1: Stikine terrane & sedimentary basins on the eastern flank of the batholith;

14 Aug., Day 2: Shames River Detachment and the Ponder Pluton;

15 Aug., Day 3: High-grade migmatite, Kwinitsa Quarry, and Central Gneiss by helicopter;

16 Aug., Day 4: The western metamorphic belt: low grade to high grade;

17 Aug., Day 5: Kasiks, Quottoon, and Ecstall plutons along the western flank; wrap-up discussions and plans for future research and collaboration;

18 Aug., Departures.

#### **ATTENDEES AND ESTIMATED COSTS**

The registration fee will cover hotel lodging for six nights (double occupancy), breakfast, lunch, and snacks for six days, handouts, and transportation for the field trip. Airfare is not included, and participants must make their own travel arrangements. Registration fees have not been finalized. Please check the GSA website for updates at [www.geosociety.org/fieldforums](http://www.geosociety.org/fieldforums).

#### **APPLICATION & REGISTRATION**

**Application deadline:** 31 Jan. 2018

**Registration deadline:** 31 Mar. 2018

Participants must commit to attending the full five days of the field conference. Group size will be limited to 30 participants. To apply, please contact the conveners through [hstowell@ua.edu](mailto:hstowell@ua.edu) with a letter of intent that includes a statement of interests, the relevance of your recent work to the themes of the field conference, the subject of a proposed presentation, and contact information. Interested graduate students and early career faculty are strongly encouraged to apply. Once you have been selected to participate, you will be sent registration information. Please check the conference website for updates.

#### **REFERENCE CITED**

Gehrels, G., Rusmore, M., Woodsworth, G., Crawford, M., Andronicos, C., Hollister, L., Patchett, J., Ducea, M., Butler, R., Klepeis, K., Davidson, C., Friedman, R., Haggart, J., Mahoney, B., Crawford, W., Pearson, D., and Girardi, J., 2009, U-Th-Pb geochronology of the Coast Mountains batholith in north-coastal British Columbia: Constraints on age and tectonic evolution: *Geological Society of America Bulletin*, v. 121, p. 1341–1361, doi: <https://doi.org/10.1130/B26404.1>.

# Geoscience Jobs & Opportunities

## Positions Open

### ASSISTANT PROFESSOR (TENURE-TRACK) GEOPHYSICS, UNIVERSITY OF FLORIDA

The Dept. of Geological Sciences at the University of Florida invites applications for a tenure track position in Geophysics at the Assistant Professor level. Applicants should be able to contribute to an existing internationally known program in observational and computational solid Earth geophysics. We have a preference for candidates with expertise in Earth or space-based sensor analyses of neotectonics, geodesy, seismology, natural hazards, remote sensing of planetary surfaces, water resources, basin analysis, and resource exploration. We seek scholars committed to teaching classes in their discipline at the undergraduate and graduate levels and who show evidence of strong research trajectories. The successful candidate will be expected to develop an active, externally funded research program that includes supporting and mentoring graduate students. Preference will be given to candidates whose research interests complement and enhance existing research programs in the department ([geology.ufl.edu](http://geology.ufl.edu)). Candidates who would utilize and benefit from University of Florida's high performance computing facilities are also encouraged to apply (<https://www.rc.ufl.edu/services/hipergator/>). Applicants must hold a Ph.D. and preferably have some post-doctoral experience. The salary is competitive and commensurate with qualifications and experience, and includes a full benefits package.

For full consideration, applications must be submitted online at <http://explore.jobs.ufl.edu/cw/en-us/listing/>. Applications should include a cover letter, curriculum vitae, a summary of current and future research plans, an overview of teaching experience and goals, and the names and contact information of three references. The Search Committee will begin reviewing applications on October 31, 2017; the position will remain open until filled. The start date is August 2018. Inquiries can be directed to the Search Committee Chair, Ray Russo, ([trusso@ufl.edu](mailto:trusso@ufl.edu)).

The successful candidate will be required to provide an official transcript to the hiring department upon hire. A transcript will not be considered "official" if a designation of "Issued to Student" is visible. Degrees earned from an educational institution outside of the United States require evaluation by a professional credentialing service provider approved by the National Association of Credential Evaluation Services (NACES), which can be found at [www.naces.org](http://www.naces.org).

The University of Florida is an equal opportunity institution dedicated to building a broadly diverse and inclusive faculty and staff. The successful candidate must be able to work with students, faculty and staff from a wide range of social and cultural backgrounds. We are especially interested in candidates who can contribute to the diversity and excellence of the academic community. Searches are conducted in accordance with Florida's Sunshine Law. If an accommodation due to disability is needed to apply for this position, please call (352) 392-2477 or the Florida Relay System at (800) 955-8771 (TDD).

### TENURE-TRACK POSITION SOLID EARTH PETROLOGY/GEOCHEMISTRY UNIVERSITY OF FLORIDA

The Dept. of Geological Sciences at the University of Florida (UF) invites applications for a tenure-track position in Solid Earth Petrology/Geochemistry at the Assistant Professor level. Applicants should be able to contribute to an existing internationally known program in analytical, observational and theoretical petrology, solid Earth geochemistry and geodynamics. We have a preference for candidates who have expertise in magmatic and chemical processes of the whole Earth (and planets), rock-fluid interactions, tectonics, geochronology and volcanic/hydrothermal systems. We seek scholars with the desire to teach classes in their discipline at the undergraduate and graduate levels and who show evidence of strong research trajectories. The successful candidate will be expected to develop an active, externally funded research program that includes supporting and mentoring graduate students. Preference will be given to candidates whose research interests complement and enhance existing research programs in the department ([geology.ufl.edu](http://geology.ufl.edu)). Researchers who would benefit from our established and new analytical facilities (field emission EMPA and MC-ICP-MS) are also encouraged to apply. Applicants must hold a Ph.D. in Earth Sciences and preferably have some post-doctoral experience. The salary is competitive and commensurate with qualifications and experience, and includes a full benefits package.

For full consideration, applications must be submitted online at <http://explore.jobs.ufl.edu/cw/en-us/listing/>. The application should include a cover letter, curriculum vitae, a summary of current and future research plans, an overview of teaching experience and goals, and the names and contact information of three references. The Search Committee will begin reviewing applications on October 31, 2017, and remain open until filled. The position will begin as early as August 2018. Inquiries can be directed to the Search Committee Chair, Michael Perfit, ([mperfit@ufl.edu](mailto:mperfit@ufl.edu)).

The final candidate will be required to provide an official transcript to the hiring department upon hire. A transcript will not be considered "official" if a designation of "Issued to Student" is visible. Degrees earned from an educational institution outside of the United States require evaluation by a professional credentialing service provider approved by the National Association of Credential Evaluation Services (NACES), which can be found at [www.naces.org](http://www.naces.org).

The University of Florida is an equal opportunity institution dedicated to building a broadly diverse and inclusive faculty and staff. The successful candidate must be able to work with students, faculty and staff from a wide range of social and cultural backgrounds. We are especially interested in candidates who can contribute to the diversity and excellence of the academic community. Searches are conducted in accordance with Florida's Sunshine Law. If an accommodation due to disability is needed to apply for this position, please call (352) 392-2477 or the Florida Relay System at (800) 955-8771 (TDD).

### FACULTY POSITION IN HYDROGEOLOGY UNIVERSITY OF GEORGIA

The Dept. of Geology at the University of Georgia seeks applications for a tenure-track faculty position at the Assistant Professor level in the general field of Hydrogeology with backgrounds in geochemical, quantitative, and/or geophysical methods starting August 2018. Expected areas of research and teaching interest include critical zone science, assessing water fluxes, surface and groundwater interactions, mineral weathering impacts on groundwater quality, determining aqueous geochemical mass balances, coastal aquifer dynamics, assessment of recharge and sustainable yields in complex hydrologic systems, simulation of flow and reaction transport processes, and contaminant fate and transport and source identification.

The applicant must have a strong record of research and a Ph.D. in Geology or related discipline by the time of appointment. The successful candidate will be expected to teach introductory geology courses, and undergraduate and graduate courses in their research specialty, supervise student research projects at the masters and doctoral levels, and establish a vigorous externally-funded research program. The successful candidate will have opportunities to interact with the University-wide Water Resources Faculty that includes representatives from Forestry & Natural Resources, Crop and Soil Science, Ecology, Marine Science, Geology, Geography, and Engineering.

Find the full job posting at <https://facultyjobs.uga.edu/postings/2869>.

Please submit a cover letter, research and teaching statements, curriculum vitae, and contact information for at least three referees. Applications received by December 20, 2017 will be assured full consideration. For more information, please contact search committee chair, Dr. Adam Milewski: [milewski@uga.edu](mailto:milewski@uga.edu).

The University of Georgia is an EEO/AA institution, and does not discriminate based on race, color, religion, sex, sexual orientation, gender identity, national origin, disability, or protected veteran status.

### ASSISTANT PROFESSOR, ROCK PHYSICS UNIVERSITY OF COLORADO BOULDER

The Dept. of Geological Sciences at the University of Colorado Boulder invites applications for a tenure-track faculty position in the field of Rock Physics. We seek a scientist who will examine the relationship between stress and deformation in earth materials. The focus and research direction can include experimental, theoretical, applied, or field methods related to the mechanics of deformation in any part of the earth.

Candidates should describe their plans to build collaborations with our existing faculty, and complement one or more of our strengths in petroleum geology, seismology, geodesy, geomorphology, tectonics, hydrogeology, petrology, mineral physics, and structural geology. The successful candidate will need to develop an externally funded, innovative and impactful research program, and contribute to departmental teaching at both undergraduate and graduate levels.

Applications must include statements of research and teaching interests; a curriculum vitae; reprints of three papers; and names and contact information of three individuals who can provide letters of recommendation. Research statements should include a description of what applicants consider to be the important problems in their field, and how they will design a research program to address these problems. Teaching statements should address goals and approaches to instruction. Applications will receive full consideration if received by November 8, 2017 and must be received by November 22, 2017. For further information, contact the Chair of the search committee, Craig Jones (cjones@colorado.edu).

This 9-month tenure-track position is at the Assistant Professor level with a start date as early as July 1, 2018. A Ph.D. in Earth science or a related field must be conferred prior to the start of the appointment. The Dept. of Geological Sciences is affiliated with several research centers and institutes (EMARC, INSTAAR, CSDMS, CIRES, LASP) and offers a diverse set of resources for teaching and research. The department has an ongoing GeoEnergy initiative that the successful applicant can help shape. Visit [www.colorado.edu/GeolSci](http://www.colorado.edu/GeolSci) to learn more about the department, these affiliations and resources.

Applications are accepted at <https://cu.taleo.net/careersection/2/jobdetail.ft!?job=10145&lang=en> (job posting #00735505).

The University of Colorado is an Equal Opportunity/Affirmative Action Employer committed to building a diverse workforce. We encourage applications from women, racial and ethnic minorities, individuals with disabilities, and veterans. Alternative formats of this ad can be provided upon request for individuals with disabilities by contacting the ADA Coordinator at [adacoordinator@colorado.edu](mailto:adacoordinator@colorado.edu)

#### **SEDIMENTOLOGIST**

##### **UNIVERSITY OF BRITISH COLUMBIA**

The Dept. of Earth, Ocean and Atmospheric Sciences (EOAS) at the University of British Columbia invites outstanding applicants for a full-time, tenure-track faculty position in Sedimentology at the level of Assistant Professor. The successful candidate will integrate fieldwork with state of the art analytical and/or numerical methods to investigate sedimentological processes that have shaped Earth through time. S/he is expected to develop a strong, externally funded and internationally recognized research program, successfully supervise graduate students, effectively teach undergraduate and graduate courses, and actively participate in departmental activities.

Research and teaching interests in EOAS, the top-ranked and largest earth sciences department in Canada, span the history of the Earth and the evolution of its structure from core to stratosphere ([www.eoas.ubc.ca/](http://www.eoas.ubc.ca/)). We seek candidates who demonstrate potential in establishing a successful research program and have capacity and interest in interacting with other research groups both within and outside the department. Opportunities exist for the successful candidate to forge research ties with other parts of the UBC community that are

active in the Earth and Planetary Sciences, including the Departments and Faculties of Geography, Civil and Environmental Engineering, Forestry, Land and Food Systems, Chemical and Biological Engineering, Physics and Astronomy, Statistics, and Computer Science, as well as the Institute of Applied Mathematics and Institute for Resources, Environment and Sustainability. EOAS is also known for its dedication to teaching, and evidence of the potential for teaching excellence and interest in innovative teaching methods is required.

Applications should include a cover letter, a detailed curriculum vita, a summary of research interests including a one-page outline of a potential five-year research program, a statement of teaching philosophy, three recent publications (pdf format), and the names and contact details of three individuals from whom the search committee can request letters of reference. Submit your application online at <https://www.hr.ubc.ca/careers-postings/faculty.php> posting #27706. Review of applications will start November 14, 2017 and applications will be accepted until the position is filled. The anticipated start date is July 1, 2018 or upon a date of mutual agreement. This position is subject to final budgetary approval.

Equity and diversity are essential to academic excellence. An open and diverse community fosters the inclusion of voices that have been underrepresented or discouraged. We encourage applications from members of groups that have been marginalized on any grounds enumerated under the B.C. Human Rights Code, including sex, sexual orientation, gender identity or expression, racialization, disability, political belief, religion, marital or family status, age, and/or status as a First Nation, Metis, Inuit, or Indigenous person.

If you have questions, please contact the Search Committee Chair by email at the following address: Professor Lee Groat (email: [groat@mail.ubc.ca](mailto:groat@mail.ubc.ca)).

#### **CHIEF OF MINING, NUCLEAR WASTE PARTNERSHIP LLC (NWP)**

Nuclear Waste Partnership LLC (NWP) has an opportunity for a degreed Chief of Mining. The successful candidate will have a minimum of fifteen (15) years of mining experience with increasing levels of responsibility including mine management. Experience in mining geology (bedded salt) particularly in geology requiring stringent ground control monitoring and maintenance is preferred. Previous experience with Dept. of Energy projects or facilities is a plus. Prior experience working with the Mine Safety & Health Administration (MSHA) desired.

NWP is the Managing & Operating Contractor for the Dept. of Energy's (DOE's) Waste Isolation Pilot Plant (WIPP) located near Carlsbad, New Mexico. NWP is an AECOM led partnership, which includes BWXT Technical Services Group, Inc. and AREVA Federal Services LLC.

The WIPP underground facilities (MSHA Mine ID # 29-01857) comprise a mine constructed and maintained at a depth of 2,150 feet below the surface, within the Salado Formation found in southeastern New Mexico. This formation is primarily composed of evaporates to include halite (rock

salts) common to the Permian Basin region of the Southwestern United States. The formation also includes a number of clay seams (layers) at various depths throughout the formation. The underground facility (the mine) serves as a permanent storage facility for transuranic nuclear waste which is a by-product of the nation's nuclear weapons production programs.

See more details and apply at: Chief of Mining (<http://aecom.jobs/jobs/?location=Carlsbad%2C+NM&q=Chief+of+Mining>).

#### **FACULTY POSITION ECONOMIC GEOLOGY AUBURN UNIVERSITY**

The Dept. of Geosciences at Auburn University invites applications for a new nine month, tenure-track Assistant Professor Position in Economic Geology.

The economic geologist will be expected to teach courses at the undergraduate and graduate level, including (but not limited to) Economic Geology, Mineral Resources and the Environment, Introductory Geochemistry, and Aqueous and Environmental Geochemistry. The successful applicant will stimulate and promote departmental and interdisciplinary research in the environment, energy and mineral resources (strategic, precious, and industrial), and the application of isotopic and geochemical data in their research. We seek a dynamic individual who will play a leadership role in building cross-disciplinary collaborations within and beyond the Geosciences department and in launching our new interdisciplinary Ph.D. program in Earth System Science.

Auburn University is a Land Grant Institution and this faculty hire will support that mission as well as the University's new Strategic Plan that emphasizes research in areas of the environment, energy, and natural resources and their critical connectivity with public health.

Applicants must possess a Ph.D. in Geology or related fields. The successful candidate is expected to develop a vigorous, externally funded research program, publish scholarly work with international recognition, and advise graduate and undergraduate students. The Dept. of Geosciences is equipped with an array of analytical instruments (see [www.auburn.edu/cosam/departments/geosciences/Equipment/index.htm](http://www.auburn.edu/cosam/departments/geosciences/Equipment/index.htm)).

The candidate selected for this position must meet eligibility requirements to work in the United States and have completed requirements for their Ph.D. on the date the appointment is scheduled to begin (August 2018), and must be able to continue working legally for the proposed term of employment.

The candidate must possess excellent written and interpersonal communication skills.

Applications must include curriculum vitae, letter of application describing professional experience, research and teaching statements, copies of official transcripts, and the names and contact information for three professional references. To apply please go to: <http://aufacultypositions.peopleadmin.com/postings/2496>, complete the online form and upload the required application documents.



Applicants are encouraged to visit the AU website to learn more about Auburn University and Geosciences program [www.auburn.edu/academic/cosam/](http://www.auburn.edu/academic/cosam/). Review of applications will begin January 10, 2018, and will continue until the position is filled.

Auburn University is an EEO/Vet/Disability employer.

**TENURE-TRACK ASSISTANT  
PROFESSOR  
GEODYNAMICS/GEOPHYSICS  
FLORIDA STATE UNIVERSITY**

The Dept. of Earth, Ocean and Atmospheric Science (EOAS) at the Florida State University (FSU) invites applications for a tenure track Assistant Professor position in the field of Geodynamics/Geophysics. Candidates must hold a Ph.D. or its equivalent in Earth Science. The successful applicant will be expected to develop and maintain an internationally visible research program, mentor students and postdocs and teach at the graduate and undergraduate levels.

EOAS has over 40 faculty members, approximately 160 graduate students, a diverse undergraduate population and grants graduate degrees in Meteorology, Oceanography, Geology and Aquatic Environmental Sciences. FSU resources include the High Performance Computing at FSU's Research Computing Center, the Center for Ocean-Atmosphere Prediction Studies, the Geophysical Fluid Dynamics Institute and the National High Magnetic Field Laboratory.

Interested parties should submit a cover letter, curriculum vita, statement of teaching and research and contact information for three references using FSU's electronic submission system at <http://jobs.fsu.edu>, job opening# 42323.

Applications will be considered until the position is filled; review of applications will commence by November 1, 2017. Women and members of minority groups are especially encouraged to apply. Please direct questions to Prof. Vincent Salters ([vsalters@fsu.edu](mailto:vsalters@fsu.edu)).

FSU is an Equal Opportunity/Access/Affirmative Action Employer. FSU subscribes to Equal Opportunity and complies with the Americans with Disabilities Act. FSU is a public records agency pursuant to Chapter 119, Florida Statutes.

**TENURE-TRACK/TENURED FACULTY  
POSITIONS, ISOTOPE GEOCHEMISTRY  
UNIVERSITY OF WISCONSIN-MADISON**

The Dept. of Geoscience at The University of Wisconsin-Madison invites applications for two faculty positions in Isotope Geochemistry. Appointment will be at the assistant professor (tenure-track) or associate professor (tenured) level depending on qualifications. We seek colleagues who are innovative in using isotopes to address fundamental problems in any domain from the Earth's deep interior to its surface environments. Successful applicants will be expected to contribute to the research and teaching mission of the department through the development of a vibrant, internationally recognized and externally funded research program, and through teaching courses at the undergraduate and graduate levels in geoscience. Successful candidates will be

expected to perform university and professional service as appropriate for career stage. Appointment at the tenured level will require evidence of excellence in research and teaching. We are particularly interested in candidates who can contribute to an inclusive environment, bring new perspectives on mentoring and educating students from diverse backgrounds, and propel novel approaches to research. We aim to add new faculty who value collegiality and collaboration in both research and teaching. The Dept. of Geoscience comprises highly rated graduate programs and several state-of-the-art analytical facilities across the fields of Isotope Geochemistry, Mineralogy, Geochronology, Sedimentary Geology, Paleontology, Structural Geology & Tectonics, Glacial Geology, Geophysics, Hydrogeology, and Biogeochemistry (<http://geoscience.wisc.edu>).

Applicants must have a Ph.D. in Geoscience or a related field at the time of appointment. Applicants should submit a cover letter, curriculum vitae, a statement of professional interests (research and teaching), and the names and contact information of three references. These materials must be submitted online at: <https://jobs.wisc.edu>. Appointments may begin as early as August 20, 2018. Review of applications will begin on November 27, 2017, and continue until the positions are filled. For further information or questions, please contact Professor Brad Singer, Chair of the Search Committee at [bsinger@wisc.edu](mailto:bsinger@wisc.edu).

The University of Wisconsin-Madison is an equal opportunity, affirmative action employer, and is committed to providing employment opportunities to all qualified applicants without regard to race, color, religion, age, sex, sexual orientation, gender identity, national origin, disability or protected veteran status.

**ASSISTANT PROFESSOR  
EARTH SURFACE DYNAMICS  
UNIVERSITY OF NEVADA, RENO**

The Dept. of Geological Sciences and Engineering at the University of Nevada, Reno seeks an Earth Scientist for a tenure-track faculty position at the Assistant Professor level specializing in the general theme of Earth Surface Dynamics. This geoscience discipline includes the coevolution of landscapes, climate, tectonic systems, life, and the study of Earth's sedimentary record. We seek a new faculty member that uses some combination of fieldwork, petrology, controlled experiments, computational modeling, remote sensing, and theory to decipher the sedimentary record and quantify earth surface dynamics, and in doing so, will establish an innovative, world-class externally-funded research program. It is expected that, depending on the candidate hired, s/he will contribute to the geology curricula including introductory courses, field courses, undergraduate and graduate classes in sedimentology, Earth surface processes, and courses developed in their research focus area. The successful applicant will be expected to direct graduate student research at the M.S. and Ph.D. levels.

For more information about the position, and to apply, please visit <https://www.unrsearch.com/postings/25909>.

EEO/AA. Women, under-represented groups, individuals with disabilities, and veterans are encouraged to apply.

**ASSISTANT PROFESSOR  
OF HYDROGEOLOGY,  
CONOCOPHILLIPS SCHOOL OF  
GEOLOGY AND GEOPHYSICS  
UNIVERSITY OF OKLAHOMA**

The University of Oklahoma invites applications for a tenure-track hydrogeology faculty position at the Assistant Professor rank. We are seeking applications from a broad range of hydrogeology experiences, including hydrogeochemistry and hydrogeophysics. This new applied hydrology position will complement the ConocoPhillips School of Geology and Geophysics' existing strengths in petroleum, geophysical, and geochemical research while also diversifying research and career options for our students with non-petroleum interests. We seek an innovative colleague who will teach and mentor undergraduates and graduate students at the M.S. and Ph.D. level. We expect the successful applicant to develop a strong research and teaching program that includes a substantial field component and integrates local, regional, national, and international issues. The candidate should have an interest and ability to develop into an excellent teacher; the candidate will teach 3 courses a year, including a hydrogeology course and a graduate course in the applicant's area of expertise. The candidate may also participate in our summer field course. The successful candidate will hold a Ph.D. at the time of appointment, have a demonstrated research record, and strong potential to acquire externally derived funding.

Salary, benefits, and start-up funds will be competitive and commensurate with experience. The ConocoPhillips School of Geology and Geophysics has a large, vibrant faculty with a broad range of research activities from fundamental to applied science and strong ties to the petroleum industry. The student body currently includes 180 undergraduates and 95 M.S. and Ph.D. students. The University of Oklahoma employs many faculty with water research programs in different departments on campus as well as several active initiatives focused on water monitoring, conservation, remediation, and management (e.g., OU WaTER Center, Hydrometeorology and Remote Sensing Laboratory, Oklahoma Water Survey, Oklahoma Geological Survey Hydrogeology Lab, Water-Energy-Food Institute (WEFI), the Neeson Lab, and Center for Restoration of Ecosystems and Watersheds). This environment will provide the successful applicant with many opportunities for collaboration both within the College of Earth and Energy and the broader University community.

Review of applications will begin immediately, with on-campus interviews taking place in November 2017. The anticipated start date is August 2018. The position will remain open until filled. Members of the search committee will be available for in-person meetings during the 2017 GSA Annual Meeting in Seattle, WA. Please contact Dr. Shannon Dulin to schedule a meeting. Applicants are encouraged to apply at <http://apply>

.interfolio.com/44170 and submit their cover letter, vitae/resume, statements of teaching and research, and a list of four references with names, e-mail addresses, and mailing addresses. Questions or requests for information may be addressed to the Chair of the Hydrogeology Search Committee, Dr. Shannon Dulin, at 405-325-3253 or [ouhydrogeologysearchchair@ou.edu](mailto:ouhydrogeologysearchchair@ou.edu).

The University of Oklahoma (OU) is a Carnegie-R1 comprehensive public research university known for excellence in teaching, research, and community engagement. In 2014, OU became the first public institution ever to rank #1 nationally in the recruitment of National Merit Scholars. The 277-acre Research Campus in Norman was named the No.1 research campus in the nation by the Association of Research Parks in 2013. Norman is a culturally rich and vibrant town located just outside Oklahoma City. With outstanding schools, amenities, and a low cost of living, Norman is a perennial contender on the "Best Places to Live" rankings. Visit <http://soonerway.ou.edu> for more information.

The University of Oklahoma is an equal opportunity employer and all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, disability status, protected veteran status, or any other characteristic protected by law. We encourage members of underrepresented groups to apply.

#### TENURE-TRACK POSITION

##### **HYDROGEOLOGY, UNIVERSITY OF IOWA**

The Dept. of Earth & Environmental Sciences at the University of Iowa ([www.clas.uiowa.edu/ees](http://www.clas.uiowa.edu/ees)) invites applications for a tenure-track Assistant Professor position with interdisciplinary interests in the broad field of hydrogeology. We seek an outstanding researcher with expertise in, but not limited to, physical hydrogeology, groundwater and shallow subsurface flow, surface/ground water interaction, fluid flow through rocks, geothermal energy, reactive and/or contaminant transport, or environmental hydrogeology who best complements current strengths in the Earth and Environmental Sciences Dept.. The candidate is expected to develop an active, externally-funded research program, mentor graduate and undergraduate students, and teach introductory geology courses as well as upper division and graduate courses in hydrogeology and related fields.

The start date of the appointment is August 15, 2018. A Ph.D. in geological sciences or a related field is required by the time of appointment. Candidates must submit applications online at <http://jobs.uiowa.edu/> (requisition #71638). The application should include a cover letter, a curriculum vitae, a statement detailing current and future research activities, a statement of teaching interest, and contact information for three referees. Referees will receive directions by e-mail regarding the electronic submission of letters to the University of Iowa.

Screening of applications will begin November 17, 2017 and will continue until the position is filled. Questions regarding this position can be directed to Dr. Jeff Dorale (Search Commit-

tee Chair; 319-335-1818; [jeffrey-dorale@uiowa.edu](mailto:jeffrey-dorale@uiowa.edu)) or Dr. C.T. Foster, Jr. (Dept. Chair; 319-335-1820; [tom-foster@uiowa.edu](mailto:tom-foster@uiowa.edu)). The Dept. of Earth and Environmental Sciences is home to sixteen faculty conducting research in environmental science, geochemistry, paleontology, and tectonics. The selected candidate will have the opportunity to interact with researchers associated with the Intensively Managed Landscapes Critical Zone Observatory ([www.criticalzone.org/iml](http://www.criticalzone.org/iml)), the Iowa Flood Center, IIHR-Hydrosience and Engineering ([www.iihr.uiowa.edu](http://www.iihr.uiowa.edu)), the Iowa Geological Survey ([www.iihr.uiowa.edu/igs](http://www.iihr.uiowa.edu/igs)), and the Center for Global and Regional Environmental Research ([www.cgrer.uiowa.edu](http://www.cgrer.uiowa.edu)), and have access to University-administered high-performance computing clusters. The Dept. of Earth & Environmental Sciences and the College of Liberal Arts & Sciences are strongly committed to diversity; the strategic plans of the University and College reflect this commitment. All qualified applicants are encouraged to apply and will receive consideration for employment free from discrimination on the basis of race, creed, color, national origin, age, sex, pregnancy, sexual orientation, gender identity, genetic information, religion, associational preference, status as a qualified individual with a disability, or status as a protected veteran. The University of Iowa is an equal opportunity/affirmative action employer.

#### FACULTY POSITIONS

##### **DEPARTMENT OF GEOSCIENCES NATIONAL TAIWAN UNIVERSITY**

The Dept. of Geosciences at NTU is seeking active scientists to fill two faculty positions starting from August 1st, 2018. The positions are open to candidates from all fields in geosciences, but those who have strong background in the fields of petrology and geochemistry, geo-resources, energy exploration, stratigraphy, sedimentology, structural geology and hydro- and applied geology will receive more favorable consideration. Applicants are requested to submit the following documents: CV, list of publications, statements of teaching and research interests, names and contact information of three referees, and three to five articles published within the last seven years (one of which need to be designated as representative paper and must be published after August 1st, 2013). Application materials should be sent by email to Professor J. Bruce H. Shyu, the Chair of the Searching Committee, at [jbhs@ntu.edu.tw](mailto:jbhs@ntu.edu.tw).

Deadline for application: December 15th, 2017. For more information, please refer to the website: <http://web.gl.ntu.edu.tw/>.

##### **TENURE TRACK, ASSISTANT PROFESSOR SEDIMENTARY STRATIGRAPHY HISTORICAL GEOLOGY**

##### **EASTERN WASHINGTON UNIVERSITY**

The Dept. of Geology at Eastern Washington University invites applications for a tenure-track Assistant Professor position in sedimentary stratigraphy and historical geology located on our Cheney campus to begin September 2018. Responsibilities will include teaching and curriculum development at the undergraduate level (both in

the classroom and in the field), and active participation in scholarly and service activities.

The Dept. of Geology offers both B.S. and B.A. degrees in Geology as well as a B.A.E. in Earth and Space Science/Secondary. A B.S. in Environmental Science with Geology emphasis is also offered. The department currently consists of 5 tenured faculty, an instructional technician, two full-time lecturers and an office manager.

Screening of applications will begin after the GSA meeting (to be held in Seattle). We will continue to accept applications until December 1st, 2017. Your materials will be held in confidence, and references will not be contacted without candidate notification.

Requirements Include:

- PhD in Geological Sciences or related field
- Demonstrated ability to teach lower- and upper-division courses in introductory geology, historical geology, and sedimentary stratigraphy and other courses depending on department needs and applicant's area of specialization
- Evidence of field-based or lab-based research and productivity in sedimentary stratigraphy and/or historical geology

See our website at <https://jobs.hr.ewu.edu/hr/postings/2297> for complete position information, required and preferred qualifications, and application instructions. Questions? Call Jenny Thomson at 509-359-7478

##### **ASSISTANT PROFESSOR (SEDIMENTOLOGY)**

##### **UNIVERSITY OF WEST GEORGIA**

The Dept. of Geosciences at the University of West Georgia invites applications for a full-time tenure-track position in Sedimentology or Stratigraphy at the rank of Assistant Professor beginning August 2018. A Ph.D. in Geology focusing on sedimentology, stratigraphy, basin analysis or a related field is required at time of employment. The successful applicant will be expected to teach introductory courses in geology as well as upper level courses in sedimentology, stratigraphy, and possibly additional undergraduate courses in their specialty. This applicant will also be expected to develop a vigorous research program that involves undergraduate students.

The University of West Georgia (UWG) is a comprehensive regional public university located an hour west of Atlanta in Carrollton, GA. Part of the University System of Georgia, UWG has a total enrollment of approximately 13,000 students and is growing annually. The Geosciences department consists of thirteen faculty and manages facilities including GIS teaching labs, the Center for Water Resources, and the West Georgia Microscopy Center. The department also houses research equipment including rock and fossil preparation equipment, petrographic microscopes, XRD, ICP-OES, and variable-pressure SEM-EDS instrumentation.

Applicants should submit a single PDF that includes a cover letter, CV, separate statements of teaching and research interests, transcripts, and contact information for a minimum of three references to [sediment@westga.edu](mailto:sediment@westga.edu). Review of appli-

cations will begin on November 30, 2017. The University of West Georgia is an Equal Opportunity Employer; applications from traditionally under-represented groups are encouraged. Questions should be directed to Dr. Bradley Deline, Search Committee Chair: [bdeline@westga.edu](mailto:bdeline@westga.edu).

**DIRECTOR, PACIFIC NORTHWEST  
SEISMIC NETWORK  
UNIVERSITY OF WASHINGTON**

The University of Washington (UW) seeks an energetic and visionary leader to become Director of the Pacific Northwest Seismic Network (PNSN). The tenured faculty position within the Dept. of Earth & Space Sciences is expected to be at the rank of associate or full professor. The Director will advance the mission of the PNSN (<https://pnsn.org/about/mission>) through scientific pursuits, advocacy, and effective leadership. Operational and managerial duties with the PNSN will be shared or divided among existing faculty and staff.

As part of the Advanced National Seismic System, the PNSN is the authoritative regional seismic monitoring network in the states of Washington and Oregon. It is a collaboration of the UW, the University of Oregon, and the US Geological Survey. Currently there are 15 FTE PNSN staff positions at the UW. With a current annual budget of approximately 4 million dollars, PNSN staff operate more than 300 seismic stations in the Pacific Northwest, and make and distribute earthquake alerts, earthquake catalogs, ground motion maps, and earthquake early warnings (ShakeAlert). The network also monitors seismicity at the region's 9 high-threat active volcanoes, and has provided critical data for studies of abundant regional non-volcanic tremor.

The Director is expected to maintain a vigorous externally funded research program and to demonstrate a commitment to both undergraduate and graduate teaching. The successful candidate will have: research expertise in geophysics or related discipline and evidence of an innovative and collaborative research portfolio; skills at mentoring staff and students; the ability to communicate effectively to a broad range of stakeholders, including politicians, corporate partners, funding agencies and foundations, the media, the public, and students; and the ability to identify new opportunities, pursue funding, and facilitate project management.

This is a 100% FTE, multi-year, 9-month service period position with six months of state funded support and three months of salary support from PNSN operations. The accompanying administrative appointment as Director of PNSN is a 12-month appointment that provides an additional 3 months of salary support at 100% FTE. Teaching duties are expected to be 2 courses per year.

Applicants must hold a Ph.D. or foreign equivalent in Geophysics or similar field, with a preference towards seismology. All University of Washington faculty engage in teaching, research and service. The UW promotes diversity and inclusivity among our students, faculty, and staff and the public; we seek applicants who are committed to these principles. Thus, we are strongly seeking candidates whose research, teaching, and/or

service have not only prepared them to fulfill our commitment to inclusion, but have also given them the confidence to fully engage audiences in higher education from a wide spectrum of backgrounds.

Application Instructions <https://ap.washington.edu/ahr/academic-jobs/position/aa25465/>.

To apply, please send a curriculum vitae with publication list, and the contact information of 3 references. Applicants should also send 4 statements (less than 10 pages total for all statements combined): 1) A statement addressing research and leadership accomplishments, as well as future research plans. 2) A strategic vision for the seismic network. 3) A statement on teaching and mentoring. Applicants are also encouraged to include evidence of teaching effectiveness (e.g. teaching evaluations). 4) A statement on their past or potential contributions to diversity, equity, and inclusion ([seewww.washington.edu/diversity/diversity-blueprint/](http://seewww.washington.edu/diversity/diversity-blueprint/)), including reflections on social vulnerability with respect to natural hazards.

Electronic materials (.pdf) should be sent to [essast@uw.edu](mailto:essast@uw.edu) with "PNSN Director Search: [Your Name]" in the subject line. Consideration of applications will begin immediately and continue until the position is filled. Preference will be given to applications received prior to December 1, 2017, but applications received after this date may be considered. Questions pertaining to the application process or potential disability accommodations can be addressed to Scott Dakins ([essast@uw.edu](mailto:essast@uw.edu)). Questions about the position can be addressed to Professor David Schmidt, search committee chair ([dasc@uw.edu](mailto:dasc@uw.edu)).

University of Washington is an affirmative action and equal opportunity employer. All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, gender expression, national origin, age, protected veteran or disabled status, or genetic information.

**DIRECTOR (RANK OF FULL PROFESSOR)  
SCHOOL OF GEOSCIENCES,  
UNIVERSITY OF LOUISIANA  
AT LAFAYETTE**

The School of Geosciences at the University of Louisiana at Lafayette (UL Lafayette) invites applications for the position of Director in the rank of Full Professor, beginning August 1, 2018 (EEO#: SC 3-17). The successful candidate should have a proven record of strong research and publications, leadership in academic settings, an ability to lead and advance a diverse group of accomplished teachers and scholars, excellent administrative and interpersonal skills, a proven ability to attract external funding, and an ability to teach geoscience courses at all levels and to mentor graduate students. The School includes 11 faculty members, 4 full time instructors, a research scientist, lab technician, and ~150 total undergraduate majors and 85 graduate students. More information on the position can be found here: [https://humanresources.louisiana.edu/sites/humanresources/files/SC%203-17\\_0.pdf](https://humanresources.louisiana.edu/sites/humanresources/files/SC%203-17_0.pdf).

Applicants should send complete application packages, including a letter of application, curriculum vitae, statement of academic leadership, statement of research, and contact information of

five references electronically (as a single PDF file) to Dr. Brian Schubert, at [schubert@louisiana.edu](mailto:schubert@louisiana.edu). To ensure full consideration, receipt of a complete application is required on or before November 15, 2017. The review process will continue until the position is filled. UL Lafayette is an Equal Opportunity Employer and encourages applications from minority group members and women.

**PROGRAM DIRECTORS  
DIVISION OF EARTH SCIENCE  
NATIONAL SCIENCE FOUNDATION**

The Division of Earth Science (EAR) at the National Science Foundation is seeking candidates for program directors in Education and Human Resources, Geoinformatics, Geophysics, Geomorphology and Land-use Dynamics, Geobiology and Low-Temperature Geochemistry, Sedimentary Geology and Paleobiology, and Tectonics. In addition, we seek program directors to support integrated research activities across the division. Further information about EAR and these programs can be found at [www.nsf.gov/div/index.jsp?div=ear](http://www.nsf.gov/div/index.jsp?div=ear).

The individuals selected for these positions will be knowledgeable in the scientific areas covered by the respective programs and will help identify emerging opportunities in the Geosciences. In addition, the incumbent will undertake the design, development, analysis, documentation, management and implementation of programs and activities within the program and across disciplinary boundaries. Program Director responsibilities include long-range planning for the areas of science represented by the program; administration of the merit review process and proposal recommendations; preparation of press releases, feature articles and material describing advances in the research supported; and coordination with other NSF programs as well as those at other Federal agencies and organizations.

Candidates must have a Ph.D. in an appropriate field plus, after award of the Ph.D., six or more years of successful research, research administration, and/or managerial experience pertinent to the position.

Individuals interested in applying for these vacancies should submit their materials to the appropriate announcement:

- **Education and Human Resources:** Rotator (<https://www.usajobs.gov/GetJob/ViewDetails/479206600>); Permanent (<https://www.usajobs.gov/GetJob/ViewDetails/479174500>)
- **Geoinformatics:** Rotator (<https://www.usajobs.gov/GetJob/ViewDetails/479207900>); Permanent (<https://www.usajobs.gov/GetJob/ViewDetails/479177900>)
- **Geophysics:** Rotator (<https://www.usajobs.gov/GetJob/ViewDetails/479207600>)
- **Geomorphology and Land-Use Dynamics:** Rotator (<https://www.usajobs.gov/GetJob/ViewDetails/479207700>); Permanent (<https://www.usajobs.gov/GetJob/ViewDetails/479176600>)
- **Geobiology and Low-Temperature Geochemistry:** Rotator (<https://www.usajobs.gov/GetJob/ViewDetails/479207200>)
- **Integrated Research Activities:** Rotator (<https://www.usajobs.gov/GetJob/ViewDetails/>)



479207400); Permanent (<https://www.usajobs.gov/GetJob/ViewDetails/479175100>)

- **Sedimentary Geology and Paleobiology:** Rotator (<https://www.nsf.gov/pubs/2017/earl17003/earl17003.jsp?org=OCE>)
- **Tectonics:** Rotator (<https://www.nsf.gov/pubs/2017/earl17004/earl17004.pdf>)

Position requirements and application procedures are located on the NSF Home Page at [www.nsf.gov/about/career\\_opps/](http://www.nsf.gov/about/career_opps/). Hearing impaired individuals may call TDD 703-292-5090. Applications must be received by November 9, 2017.

NSF is an Equal Opportunity Employer.

### **ASSISTANT PROFESSOR GEOLOGY, CALIFORNIA STATE UNIVERSITY, BAKERSFIELD**

The Dept. of Geological Sciences at California State University, Bakersfield (CSUB) invites applications for a tenure-track Assistant Professor position beginning in Fall 2018. We seek a broadly trained geologist with applied research and teaching interests. Preferred specializations include (but are not limited to) petrophysics, basin analysis, subsurface fluid dynamics, and geophysics. Teaching responsibilities will include a course in petroleum geology, introductory geology, and upper-level undergraduate and graduate courses in the faculty member's specialty. Review of applications will begin December 1, 2017, and continue until the position is filled. CSUB fosters and appreciates ethnic and cultural diversity among its faculty and students, and is committed to increasing the diversity of its faculty to reflect the diversity of the campus community. Applications from women, ethnic minorities, veterans, and individuals with disabilities are welcome. The full announcement and instructions on how to apply can be found at: [www.csub.edu/Geology/](http://www.csub.edu/Geology/); email: [geologysearch@csub.edu](mailto:geologysearch@csub.edu).

### **TENURE TRACK ASSISTANT OR ASSOCIATE PROFESSOR GEOLOGY, COLORADO COLLEGE**

**MISSION:** At Colorado College our goal is to provide the finest liberal arts education in the country. Drawing upon the adventurous spirit of the Rocky Mountain West, we challenge students, one course at a time, to develop those habits of intellect and imagination that will prepare them for learning and leadership throughout their lives.

Title: Assistant or Associate Professor of Geology

Position Summary:

Colorado College is seeking applications for a tenure-track faculty position at the rank of experienced Assistant or Associate Professor. We seek a dynamic scientist with the following characteristics:

- (1) has expertise in a subfield(s) of geology that complements, but does not overlap, those of current faculty members in the department. Areas of expertise could include, but are not limited to: geobiology, evolution of earth systems, hydrology, geochronology, geohazards, and environmental geophysics.
- (2) has an educational and/or research program that focuses in some part on geologic questions in the Rocky Mountains/western United States,

and who is acquainted with the geologic evolution of the Colorado Rocky Mountains.

- (3) has research interests designed to advance fundamental understanding of processes in the Earth's surface and subsurface.
- (4) has a strong background in quantitative approaches such as GIS, numerical models, or geoinformatics, and utilizes novel measurement techniques, models, and datasets.

The successful candidate is expected to have research and teaching interests that can strengthen departmental connections with other science programs at Colorado College (e.g. biology, chemistry, mathematics, physics, archaeology, and environmental science). They are also expected to be excited to spend extended time in the field and the classroom engaging with highly motivated undergraduate students as both a teacher and mentor on the Block Plan.

The College is committed to increasing the diversity of the college community. Further, Colorado College is dedicated to the development of faculty and staff who are committed to inclusive practices in teaching, learning, and working. Candidates who can contribute to that goal are particularly encouraged to apply.

The College has a distinctive academic system in which professors teach, and students take, one course at a time. Each block is three and a half weeks long, with an academic year of eight and a half blocks. Maximum class size is 25 or fewer students. Applicants should submit a cover letter, curriculum vitae, a statement of research and teaching interests, evidence of teaching effectiveness, sample of scholarly publications, and three letters of recommendation to: <https://employment.coloradocollege.edu/postings/3003>.

Review of applications will begin October 15, 2017 (we will have an information booth at GSA) and the deadline is November 15, 2017. If you have any questions, please contact [geology@coloradocollege.edu](mailto:geology@coloradocollege.edu).

**EQUAL OPPORTUNITY EMPLOYER:** Colorado College is an equal opportunity employer committed to increasing the diversity of its community. We do not discriminate on the basis of race, color, national origin, gender, age, religion, gender identity or expression, disability, or sexual orientation in our educational programs and activities or our employment practices.

### **FACULTY POSITION GEOCHEMISTRY, YALE UNIVERSITY**

The Dept. of Geology & Geophysics at Yale University invites applications for an open-rank faculty appointment in the broad area of geochemistry at the Assistant Professor, Associate Professor, or Professor level. Relevant fields include (but are not limited to) geochemical cycling, biogeochemistry, geomicrobiology, cosmology, planetary evolution, petrology, and Earth surface processes.

We seek candidates with outstanding prospects for research, scholarly leadership, and teaching excellence who will complement the existing strengths of the department. A successful applicant will develop and implement independent, externally-funded research programs, teach and

advise students, and facilitate interdisciplinary research.

Applicants should submit a letter of application, a curriculum vitae including a full list of publications, a statement of research, a statement of teaching interests, and four confidential letters of reference. Applications should be submitted online at <http://apply.interfolio.com/44519>. Applications that arrive before November 1, 2017 will receive full consideration. For information regarding Yale Geology and Geophysics, visit our web site at <http://earth.yale.edu>. Yale University is an Affirmative Action/Equal Opportunity employer. Yale values diversity among its students, staff, and faculty and strongly welcomes applications from women, persons with disabilities, protected veterans, and underrepresented minorities.

### **FACULTY POSITION CLIMATE SCIENCES, YALE UNIVERSITY**

The Dept. of Geology & Geophysics at Yale University invites applications for a tenure-track Assistant Professor appointment in the broad area of climate sciences. Relevant fields include (but are not limited to) the physics and chemistry of the atmosphere and ocean, climate change, paleoclimate, and the dynamics of planetary and exoplanetary atmospheres.

We seek candidates with outstanding prospects for research, scholarly leadership, and teaching excellence who will complement the existing strengths of the department. A successful applicant will develop and implement independent, externally-funded research programs, teach and advise students, and facilitate interdisciplinary research.

Applicants should submit a letter of application, a curriculum vitae including a full list of publications, a statement of research, a statement of teaching interests, and four confidential letters of reference. Applications should be submitted online at <http://apply.interfolio.com/44518>. Applications that arrive before November 1, 2017 will receive full consideration. For information regarding Yale Geology and Geophysics, visit our web site at <http://earth.yale.edu>. Yale University is an Affirmative Action/Equal Opportunity employer. Yale values diversity among its students, staff, and faculty and strongly welcomes applications from women, persons with disabilities, protected veterans, and underrepresented minorities.

### **TENURE-TRACK ASSISTANT PROFESSOR SEDIMENTARY GEOLOGY TEXAS TECH UNIVERSITY**

The Dept. of Geosciences at Texas Tech University invites applications for a tenure-track Assistant Professor position in the broader field of sedimentary geology to begin in fall 2018. Applicants who demonstrate skills in carbonate sedimentology, paleoclimatology, basin analysis, or micropaleontology will be preferred. The ideal candidate will employ a combination of field, laboratory and/or computational techniques and be willing to participate in the development of petroleum-relevant research and teaching programs in the university. The department has a broad array of in-house analytical equipment; interested applicants should

visit the department website [www.geosciences.ttu.edu/geo.php](http://www.geosciences.ttu.edu/geo.php).

The successful candidate is expected to establish an innovative, externally funded academic research program, teach and advise graduate and undergraduate students, and provide service to the department, college, university and the community. A PhD in Geology or a closely related field is required at the time of appointment.

Applicants must first visit the TTU employment website at <http://jobs.texasstate.edu>. Once there, go to "Search Jobs", search for requisition number 11599BR, and provide the required information. Afterwards, applicants must submit a letter of application, curriculum vitae, a statement of teaching and research interests, names and contact information (including e-mail address) of at least three professional references. These documents must be uploaded to the employment website. Inquiries regarding the position should be sent to [dustin.sweet@ttu.edu](mailto:dustin.sweet@ttu.edu). Review of applications will begin November 27, 2017, and will continue until the position is filled.

As an Equal Employment Opportunity/Affirmative Action employer, Texas Tech University is dedicated to the goal of building a culturally diverse faculty committed to teaching and working in a multicultural environment. We actively encourage applications from all those who can contribute, through their research, teaching, and/or service, to the diversity and excellence of the academic community at Texas Tech University. The university welcomes applications from minorities, women, protected veterans, persons with disabilities, and dual-career couples.

#### **TENURE-TRACK ASSISTANT PROFESSOR WILLIAMS COLLEGE**

The Geosciences Dept. at Williams College invites applications for a tenure-track appointment in the broad field of climate science, at the rank of Assistant Professor, beginning 1 July 2018. We seek a colleague committed to excellence in undergraduate teaching, who will provide a balance of classroom, field, and laboratory experiences for our students, and develop a vibrant and productive research program that engages undergraduates. We are particularly interested in candidates who take an interdisciplinary approach to climate science, and who will be likely to develop research and teaching collaborations across departmental boundaries.

The successful candidate will teach three courses per year (lectures plus labs). Teaching responsibilities are likely to include an introductory course in weather and climate, as well as higher-level courses based on the candidate's interests. Examples of such courses include, but are not limited to: climate system analysis and prediction; physical climatology; climate and society; hydroclimatology; applied climatology; climate engineering; climate dynamics; economics of climate change; statistical analysis of climatologic data; GIS/remote sensing; environmental management; climate and policy; cryosphere-climate interaction; or energy and the environment. Faculty have broad latitude in developing their own

courses and we welcome ideas from candidates for ways in which they might develop courses that would cross traditional disciplinary lines and build dynamic intellectual bridges between Geosciences and other departments.

The Geosciences Dept. [web.williams.edu/Geoscience/](http://web.williams.edu/Geoscience/) is committed to providing excellent training for future geoscientists, as well as teaching earth science as part of a balanced liberal arts education. Our department works closely with the Center for Environmental Studies [ces.williams.edu/](http://ces.williams.edu/), and the successful candidate will be expected to mount courses that would be cross-listed with that program. The College is especially interested in candidates who can contribute to the growing diversity of the academic community through their teaching, scholarship and service. Enthusiasm for teaching, mentoring and advising a diverse population of students is essential.

Applicants should have a Ph.D. or dissertation completed by the time of appointment, demonstrated teaching experience, and a vigorous research program suitable for undergraduate student involvement. Deadline for applications is 30 November 2017. We welcome applications from members of groups traditionally underrepresented in the field, and applicants are asked to state in their cover letter how they will enhance the diversity of offerings and educational experiences if hired. All offers of employment are contingent upon completion of a background check. Further information is available here: [dean-faculty.williams.edu/prospective-faculty/background-check-policy/](http://dean-faculty.williams.edu/prospective-faculty/background-check-policy/).

Candidates should apply via Interfolio (<http://apply.interfolio.com/43847>). The letter of application should include a cover letter, statements of teaching and research philosophy, curriculum vita, and contact information for three references.

Williams College is a liberal arts institution located in the Berkshire Hills of western Massachusetts. The college has built its reputation on outstanding teaching and scholarship and on the academic excellence of its approximately 2,000 students. Please visit the Williams College website ([www.williams.edu](http://www.williams.edu)). Beyond meeting fully its legal obligations for non-discrimination, Williams College is committed to building a diverse and inclusive community where members from all backgrounds can live, learn, and thrive.

#### **ASSISTANT PROFESSOR OF PALEOBIOLOGY BAYLOR UNIVERSITY**

Baylor University is a private Christian university and a nationally ranked research institution, consistently listed with highest honors among *The Chronicle of Higher Education's* "Great Colleges to Work For." The university is recruiting new faculty with a deep commitment to excellence in teaching, research and scholarship. Baylor seeks faculty who share in our aspiration to become a tier one research institution while strengthening our distinctive Christian mission as described in our strategic vision, Pro Futuris ([www.baylor.edu/profuturis/](http://www.baylor.edu/profuturis/)). As the world's largest Baptist University, Baylor offers over 40 doctoral programs and has almost 17,000 students from all 50 states and more than 80 countries.

Baylor seeks to fill the following tenure track faculty position within the College of Arts and Sciences: **Tenure-Track Assistant Professor, Paleobiology.**

The Baylor University Dept. of Geosciences ([www.baylor.edu/Geology/](http://www.baylor.edu/Geology/)) seeks a dynamic scholar to fill this position beginning August, 2018. Candidates should have a Ph.D. in Paleobiology, Paleontology, Geology, Ecology and Evolutionary Biology, or a closely related discipline. We seek an individual with a research focus in aspects of biological paleontology such as invertebrate paleontology, vertebrate paleontology, ichnology, palynology, micropaleontology, paleoecology, paleogeography, molecular paleontology, taphonomy, phylogeny, systematics, macroevolution, functional morphology, and other biological and paleobiological processes and patterns. Regardless of research focus area, enthusiasm for interdisciplinary research and cultivation of new collaborations is essential to this position. The successful candidate will contribute to the undergraduate curriculum by teaching courses in historical geology and invertebrate paleontology and to the graduate programs (MS and PhD) in Geosciences by teaching graduate courses and seminars in his/her areas of specialization, establish and participate in externally-funded research, and successfully mentor M.S. and Ph.D. candidates to graduation. The department currently consists of 18 tenured and tenure-track geoscientists, and has considerable analytical and computing facilities with equipment including Stable Isotope, Gas Chromatograph, Nuclear Magnetic Resonance, FTIR, and Raman Spectrometers. Additionally, shared Mass Spectrometry, Molecular Biosciences, and Microscopy and Imaging Centers are available. Research space is available in the 500,000 ft<sup>2</sup> "state-of-the-art" Baylor Sciences Building.

The application package for this position should include a cover letter, current curriculum vitae, official transcripts, reprints of three peer-reviewed publications, separate statements of your research plan and teaching philosophy, and the names and contact information of three references. The application package should be submitted electronically to: Dr. Daniel Peppe, Search Committee Chair, Dept. of Geosciences, One Bear Place #97354, Baylor University, Waco, TX 76798-7354 USA (Telephone: +1-254-710-2629; email: [daniel\\_peppe@baylor.edu](mailto:daniel_peppe@baylor.edu)).

Salary is commensurate with experience and qualifications. Applications will be reviewed beginning 11/01/2017 and will be accepted until the position is filled. To ensure full consideration, complete applications must be submitted by 11/17/2017.

To learn more, please visit these links: [www.baylor.edu/geology/](http://www.baylor.edu/geology/), [www.baylor.edu/artsandsciences/](http://www.baylor.edu/artsandsciences/), and [www.baylor.edu/hr/facultypositions](http://www.baylor.edu/hr/facultypositions).

Baylor University is a private not-for-profit university affiliated with the Baptist General Convention of Texas. As an Affirmative Action/Equal Opportunity employer, Baylor is committed to compliance with all applicable anti-discrimination laws, including those regarding age, race, color, sex, national origin, marital status, pregnancy sta-

tus, military service, genetic information, and disability. As a religious educational institution, Baylor is lawfully permitted to consider an applicant's religion as a selection criterion. Baylor encourages women, minorities, veterans and individuals with disabilities to apply.

#### EARTH AND ENVIRONMENTAL GEOSCIENCE INFORMATICS DARTMOUTH COLLEGE

The Dept. of Earth Sciences at Dartmouth College invites applications for an assistant or associate rank tenure-track position in the area of earth and environmental geoscience informatics with specific application to one or more of our core research areas: ice and climate systems, watershed and soil processes, or environmental (bio)geochemistry. We are especially interested in candidates who combine a focus on understanding fundamental physical and/or geochemical processes in modern or ancient systems using innovative analyses of big and/or broad datasets and to candidates who provide synergy with ongoing research activities within the department and elsewhere at Dartmouth.

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 as well as 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. We have strong traditions in graduate and undergraduate teaching, and the successful candidate will help develop curricular and research opportunities in the analysis of big and/or broad data. Teaching responsibilities consist of three courses per year at both introductory and graduate-levels. To learn more about Dartmouth College and the Dept. of Earth Sciences, visit [www.dartmouth.edu/~earthsci](http://www.dartmouth.edu/~earthsci).

Dartmouth College has undergraduate and graduate student populations that are diverse by many measures. We seek applicants with a record of successful teaching and mentoring of students from all backgrounds (including first-generation college students, low-income students, racial and ethnic minorities, women, LGBTQ, etc.). Dartmouth provides opportunities to participate in undergraduate diversity initiatives in STEM research, such as our Women in Science Program, E. E. Just STEM Scholars Program, and Academic Summer Undergraduate Research Experience (ASURE).

To submit an application, upload a cover letter, 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 <http://apply.interfolio.com/43899>

Application review will begin November 1, 2017, and continue until the position is filled.

The appointment will be effective July 1, 2018.

Dartmouth College is an equal opportunity/affirmative action employer with a strong commitment to diversity. In that spirit, we are particularly interested in receiving applications from a broad spectrum of people, including women, minorities, and individuals with disabilities, veterans or any other legally protected group.

### Opportunities for Students

**Doctoral Fellowship in Transdisciplinary Tectonics at Utah State University.** The Dept. of Geology at USU seeks outstanding PhD applicants for a Presidential Doctoral Research Fellowship pursuing research in tectonics, starting fall 2018. This selective fellowship provides four years of support in the form of a competitive stipend, tuition, and health benefits. Two research themes in tectonics within the department are:

1. What controls fault zone and plate boundary behavior through time? Critical to understanding these processes are constraints on earthquake process, timing, and physics, characterization of Earth material properties and petrology, the role of fluids in fault slip, and the rheological evolution of the lithosphere.
2. What are the interactions among tectonics, surface processes, and landscape evolution? Research in tectonic geomorphology and geodynamics involves deep-Earth and near-surface/critical zone processes, drainage analysis, and natural hazards.

The Dept. of Geology at USU is field oriented, has a dynamic graduate program, and is located in northern Utah surrounded by excellent outdoor opportunities.

Visit <http://geology.usu.edu> for more information about our program and possible faculty mentors, and contact [tammy.rittenour@usu.edu](mailto:tammy.rittenour@usu.edu) for questions. Applications are due January 8, 2018 at [www.usu.edu/graduateschool/](http://www.usu.edu/graduateschool/).

#### Graduate Assistantships at Indiana University–Purdue University Indianapolis (IUPUI)

With broad expertise in geosciences and particular strengths in Geochemistry, IUPUI's Earth Sciences department provides opportunities for graduate training and research in downtown Indianapolis. We offer an M.S. in Geology and Ph.D. in Applied Earth Sciences. The Ph.D. program provides opportunities for advanced interdisciplinary research at the interface of earth sciences, public health, and geospatial analysis, and will prepare graduates for solving important interdisciplinary problems of the 21st century. Our interdisciplinary program welcomes individuals from diverse backgrounds in Geology, Environmental Science, Chemistry, Biology, Physics, Engineering, Medical or Mathematics. Applicants will be considered for our Mirsky Fellowship, along with other teaching and research assistantships available in the department for Fall 2018. The department has 14 full time faculty with active research programs in topics including aqueous and microbial geochemistry, stable isotopes, paleoclimatology and global change, medical geology, surface and hard rock geology, planetary geology, remote sensing, biogeosciences, geomorphology and hydrology.

Several new state-of-the-art geochemistry labs have been built and equipped with stable isotope ratio mass spectrometers, cavity ring down spectrometers, GC-MS, ICP-MS, ICP-OES, electrochemical equipment, chromatographs (IC, HPLC, GC), spectrometers, XRD, multisensor core scanner, and a full suite of wet chemical, solid state, and biological lab and field equipment. Assistantships include salary, tuition remission, and health insurance. Indianapolis is a very affordable, livable, and vibrant city with a wealth of outdoor, cultural, and sporting activities. Visit <http://earthsciences.iupui.edu/> and <http://earthsciences.iupui.edu/graduate/> for additional information on our department and graduate degrees, respectively.

**Graduate Student Opportunities at 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 geodynamics, planetary materials, high-pressure mineral physics and geochemistry, core and mantle processes, sedimentary geology, and sediment transport. For more information, please visit <http://eeps.case.edu> or write to [eeps-gradinfo@case.edu](mailto:eeps-gradinfo@case.edu). Financial assistance is available. Application deadline: 1/15/2018.

**Lindahl Ph.D. Scholarships: The University of Alabama,** Dept. of Geological Sciences seeks Ph.D. students with specializations that complement faculty research interests. Exceptional students will receive Research or Teaching Assistantships and a Lindahl Scholarship totaling \$22,000 for a nine month appointment, and the cost of non-resident tuition is covered. Funding is renewable for 4 years if expectations are met. Other fellowships are available from the Graduate School. Further details are at [www.geo.ua.edu](http://www.geo.ua.edu). Applicants should contact Dr. Robinson ([dmr@ua.edu](mailto:dmr@ua.edu)) to express interest. Review of applications for Fall 2018 admission will begin January 15, 2018.

## Hiring?

Find qualified geoscientists to fill vacancies. Use print issues of *GSA Today* and GSA's Geoscience Job Board (web). Bundle and save for best pricing options.

That unique candidate is waiting to be found.





## Leave a Legacy and Ensure the Future

The Geological Society of America is fortunate to have a long history of extraordinary people having the foresight to include the Society in their estate plans, providing a firm foundation for GSA’s mission to continue into the future. In 1931, GSA received its most generous bequest of nearly US\$4 million from R.A.F. Penrose, a mining geologist and entrepreneur who had been president of the Society the year prior to his death, among numerous other positions since being elected a member in 1889. Income from this fund allowed GSA to purchase the land it now occupies in Boulder, Colorado, USA, and continues to support various GSA efforts.



Joseph T. Pardee

The Pardee Legacy Circle (formerly referred to as the Pardee Coterie) is named after a later US\$2.7 million bequest from Joseph T. Pardee’s daughter’s estate and honors others who have included GSA Foundation in their estate plans through bequests, retirement plan designations, charitable trusts, or other deferred gift arrangements. The Pardee bequest is the second largest in GSA’s history; the Society is extremely appreciative of all planned gifts since these initial, groundbreaking gifts that made GSA what it is today.

A planned gift provides stability to the long-term success of the GSA Foundation in supporting GSA programs. It enables an emerging scientist to present research for the first time, employs a scientist to work on federal lands, helps a student from an underrepresented group to pursue a career in geology, and provides an author with sufficient resources to publish in a highest-quality scientific journal. These are the kinds of programs, central to GSA’s mission, that are sustained with legacy gifts.

Geoff Feiss (a GSA Foundation past president) and Nancy West found it gratifying to include the GSA Foundation in their estate plans. When Nancy was a graduate student, she received a GSA Research Grant to conduct the fieldwork for her M.S. thesis in the Mohave Desert. Geoff benefited from the Penrose bequest as a graduate student, allowing him to attend the very first Penrose Conference in 1969, which guided his research for the next several decades.

Geoff explains, “Beyond such direct and identifiable support for our careers, we both have benefited repeatedly and indirectly from literally dozens of annual and section meetings, field trips, papers we have read, talks we have given or heard, and myriad opportunities to network with old friends and new colleagues through GSA events—none of which occurs without support from past donors to the Foundation.

“In short, our careers were measurably advanced by the generosity of previous GSA members whom we did not know. This alone motivates us to support the GSA Foundation via a legacy gift. But, beyond that, we both feel that it is incumbent upon us to assist future generations of students and early career geoscientists so that they may have careers as satisfying and as much fun as we have had. We feel it a privilege to share our good fortune so that our science can thrive.”

If you would like more information about making a lasting contribution to help ensure the future geoscience community, contact me directly at +1-303-357-1011 or [jhess@geosociety.org](mailto:jhess@geosociety.org).



Nancy West and Geoff Feiss in Rocky Mountain National Park, Colorado, USA.



## Take the lead in environmental geosciences

With Penn's **Master of Science in Applied Geosciences**, you stay ahead of the curve in remediation practices.

Advance your career and learn from industry leaders about:

- Geologic field methods
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Discover more about our full- and part-time flexibility:

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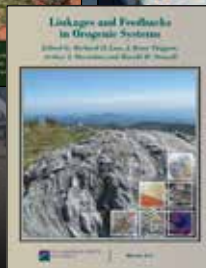
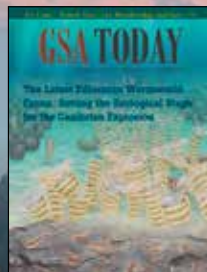
## Put Your Annual Meeting Presentation to Work

Your well-received technical presentation at the GSA Annual Meeting can go far. Submit a manuscript to one of GSA's top-rated journals. Or, if you have a whole session's worth of great papers, consider submitting a book proposal.

With six journals and three book series, GSA has a range of publication outlets to meet your needs for

speed of publication, article size, targeted collections, and distribution. Author information can be found at [www.geosociety.org/AuthorInfo](http://www.geosociety.org/AuthorInfo).

For details on submitting to any of these publications, contact us at [editing@geosociety.org](mailto:editing@geosociety.org).





## Call For Field Trip, Short Course, and Technical Session Proposals

# GSA 2018 Indianapolis Meeting



**4-7 November**  
Indianapolis, Indiana, USA

It's time to plan for our 2018 Annual Meeting in Indianapolis, Indiana, USA. Help ensure that your area of research and expertise is represented at next year's annual meeting. Any individual or geosciences organization is welcome to submit proposals.

**Show** the geology by leading a field trip.

**Field Trip proposal deadline:** 1 Dec. 2017

Trips can be anywhere from half a day to five days long. Field trip proposals may be submitted by any member of GSA, its affiliated societies, or other people interested in field geoscience. The proposal form is online at <https://gsa.confex.com/gsa/2018AM/fieldtrip/cfs.cgi>.

**Exchange** the geology by organizing and chairing a technical session.

**Technical Session deadline:** 1 Feb. 2018

Proposals are being taken for both Pardee Keynote and Topical Sessions. The proposal form is online at <https://gsa.confex.com/gsa/2018AM/cfs.cgi>.

**Share** the geology as an instructor through a Short Course.

**Short Course proposal deadline:** 1 Feb. 2018

Courses run the Friday and Saturday before the Annual Meeting and are typically half a day to two full days. The proposal form is online at <https://gsa.confex.com/gsa/2018AM/shortcourse/cfs.cgi>.



Photo courtesy of VisitIndy.com.



Photo courtesy of Go Ape.



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GEOLOGICAL  
SOCIETY  
OF AMERICA®

Photo courtesy of Jason Lavengood, VisitIndy.com.



# SCIENCE EDITOR

## OPENINGS FOR 2019

GSA is soliciting applications and nominations for science co-editors with **four-year terms beginning 1 January 2019**. Duties include: ensuring stringent peer review and expeditious processing of manuscripts; making final acceptance or rejection decisions after considering reviewer recommendations; and maintaining excellent content through active solicitation of diverse and definitive manuscripts.

### POSITIONS AVAILABLE

**ENVIRONMENTAL & ENGINEERING GEOSCIENCE** Research interests that complement those of the continuing editor include, but are not limited to: hydrogeology, low-T geochemistry, geomorphology, and/or environmental geophysics.

**E&EG** ▶ 1 position

**GSA BOOKS** Editor duties include soliciting high-quality book proposals and ensuring that proper peer review procedures are followed by volume editors. Editors handle the entire peer-review process for authored volumes. The successful candidate will have a wide range of interests and expertise, prior editing experience, and a strong publication record.

**GSA Books** ▶ 1 position

**LITHOSPHERE** Research interests that complement those of the continuing editors include, but are not limited to: tectonics and structural geology; geomorphology and neotectonics; metamorphic geology.

**Lithosphere** ▶ 1 position

**GSA BULLETIN** Research interests that complement those of the continuing editors include, but are not limited to: deformation; geochemistry; paleoclimatology; Precambrian geology; seismology; stratigraphy; structural geology; volcanology.

**GSA Bulletin** ▶ 1 position

**GSATODAY**, one of the most widely read earth science publications in the world, seeks an editor who has a wide range of interests and expertise, the ability to identify research topics of both high quality and broad appeal, a strong publication record, and prior editing experience.

**GSA Today** ▶ 1 position

Note that candidates should not feel they must have expertise in *every* area listed; however, editors will sometimes need to handle papers outside of their main disciplines.

### INTERESTED?

- ▶ Submit a curriculum vitae and a letter describing why you (or your nominee) are suited for the position to Jeanette Hammann, [jhammann@geosociety.org](mailto:jhammann@geosociety.org).

Editors work out of their current locations at work or at home. The positions are considered voluntary, but GSA provides an annual stipend and funds for office expenses. **DEADLINE:** First consideration will be given to nominations or applications received by **15 February 2018**.

### A SUCCESSFUL EDITOR WILL HAVE

- ▶ a broad interest and experience in geosciences, including familiarity with new trends;
- ▶ international recognition and familiarity with many geoscientists and their work;
- ▶ a progressive attitude and a willingness to take risks and encourage innovation;
- ▶ experience with online manuscript systems and the ability to make timely decisions; and
- ▶ a sense of perspective and humor.

**FUTURE OPENINGS** (terms begin January 2020):

*GSA Bulletin* (one position), *Geology* (two positions), *Lithosphere* (one position), GSA books (one position).