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 THE GEOLOGICAL SOCIETY  
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VOL. 29, NO. 9 | SEPTEMBER 2019



**Deep Slab Collision during  
Miocene Subduction  
Causes Uplift along Crustal-  
Scale Reverse Faults in  
Fiordland, New Zealand**



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Printed in the USA using pure soy inks.

## SCIENCE

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**Cover:** Graduate student Peter Lindquist (University of Vermont) examines exposures of Cretaceous gneiss in eastern Fiordland where crustal-scale reverse faults placed a large slice of lower crust up and to the east (right) over middle and upper crustal rocks. The faulting occurred at 8–7 Ma when a subducting slab of ocean crust collided with preexisting material at ~100 km depth beneath Fiordland. Photo by Keith Klepeis. See related article, p. 4–10.



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# Deep Slab Collision during Miocene Subduction Causes Uplift along Crustal-Scale Reverse Faults in Fiordland, New Zealand

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## ABSTRACT

A new multidisciplinary project in southwest New Zealand that combines geological and geophysical data shows how and why deep lithospheric displacements were transferred vertically through the upper plate of an incipient ocean-continent subduction zone. A key discovery includes two zones of steep, downward-curving reverse faults that uplifted and imbricated large slices of Cretaceous lower, middle, and upper crust in the Late Miocene. Geochemical and structural analyses combined with  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronology and published images from seismic tomography suggest that the reverse faults formed at 8–7 Ma as a consequence of a deep (~100 km) collision between subducting oceanic lithosphere and previously subducted material. This collision localized shortening and reactivated two crustal-scale shear zones from the upper mantle to Earth's surface. The event, which is summarized in a new lithospheric-scale profile, is helping us answer some long-standing questions about the origin of Fiordland's unique lower-crustal exposures and what they tell us about how inherited structures can transfer motion vertically through the lithosphere as subduction initiates.

## INTRODUCTION

In southwest New Zealand, oceanic lithosphere of the Australian Plate subducts obliquely beneath continental lithosphere of the Pacific Plate at the

Puysegur Trench (Fig. 1A). Northeast of the trench, the subducted slab rotates and steepens to vertical below Fiordland, where it joins the Alpine fault (Reyners et al., 2017), an ~850 km transform that has accumulated some 480 km of horizontal displacement since ca. 25 Ma (Sutherland and Norris, 1995). This region has generated great interest among geologists, in part because it is one of only a few places where the surface tectonic record of an incipient ocean-continent subduction zone can be observed directly (Mao et al., 2017). It also represents Earth's deepest exposed example of an Andean-style continental arc (Ducea et al., 2015). Here, we use this unique setting to explore how Fiordland's surface and crust responded to events that occurred deep within the lithospheric mantle since subduction began in the Early Miocene.

Over the past few years, our understanding of the vertical links that develop within the lithosphere has benefitted from improvements in our ability to extract information from the rock record. Innovative approaches to studying fault zones that combine geochemistry and high-precision geochronology with structural analyses, for example, have enhanced our capacity to relate deformation histories to other processes across a wide range of scales (e.g., Haines et al., 2016; Schwartz et al., 2016; Williams et al., 2017). At the same time, new methods in global teleseismic tomography are revealing the geometry and extent of material that was sub-

ducted into the mantle millions of years ago in unprecedented detail (Wu et al., 2016; Reyners et al., 2017). These imaged slabs can be integrated with surface geology and plate kinematics to reveal previously hidden tectonic histories. Together, these and many other innovations are providing new opportunities to determine how surface tectonic records connect to processes occurring in the mantle as subduction zones form and develop over time (e.g., Liu, 2015; Liu et al., 2017; Kissling and Schlunegger, 2018).

In this article, we integrate structural, geochemical, and geochronologic data with images of the upper mantle derived from seismic tomography to reconstruct the late Cenozoic tectonic history of Fiordland. The results provide new insights into the process of subduction initiation at continental margins, including the causes and consequences of vertical motions within the overriding plate.

## PREVIOUS WORK

### Surface Geology

The surficial geology of Fiordland is dominated by exposures of the Median Batholith (Mortimer et al., 1999), which consist mostly of Carboniferous–Early Cretaceous plutons. An eastern (outboard) belt contains Jurassic and older rocks that accreted onto the Gondwana margin during the Early Cretaceous (Tulloch and Kimbrough, 2003; Marcotte et al., 2005). A western (inboard) belt exposes the Early

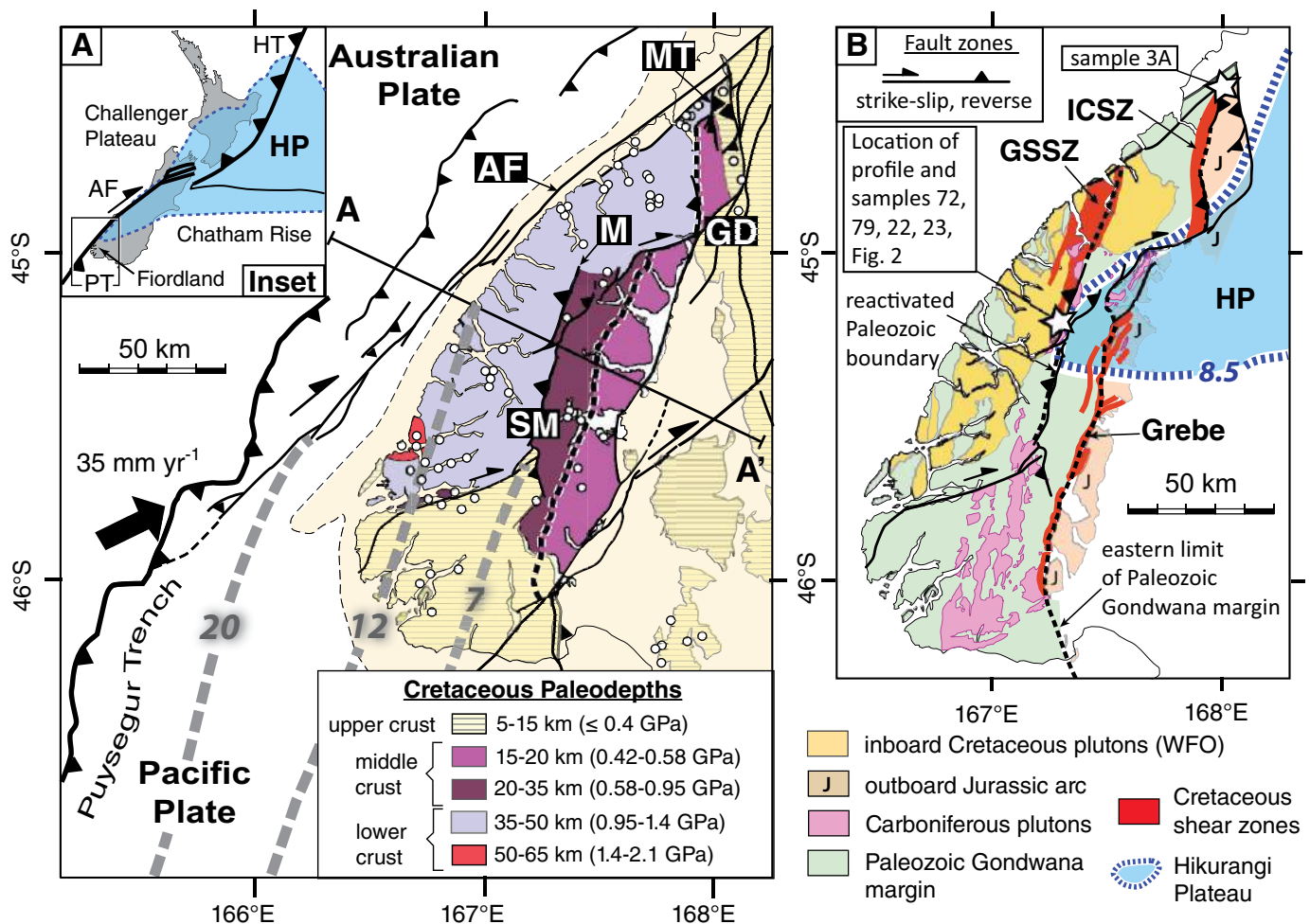


Figure 1. (A) Map of Fiordland showing the imbrication of Cretaceous lower, middle, and upper crust by Miocene reverse faults. Profile along line of section A–A' is shown in Figure 3. Paleodepth uncertainties are  $\pm 0.1$  GPa ( $\pm 3.7$  km). Reconstruction of the subducting Australian Plate at 20, 12, and 7 Ma is from Sutherland et al. (2009). AF—Alpine fault; GD—Glade-Darran fault zone; HP—Hikurangi Plateau; HT—Hikurangi Trench; M—Misty fault; MT—Mt. Thunder fault; SM—Spey-Mica Burn fault zone; PT—Puysegur Trench. (B) Map showing position of two Carboniferous crustal boundaries (black dashed lines). The western boundary coincides with the George Sound shear zone (GSSZ) and SM fault zone. The eastern one coincides with the Grebe and Indecision Creek (ICSZ) shear zones, and Mt. Thunder fault. WFO is Western Fiordland Orthogneiss. Locations of three pseudotachylyte samples (22, 23, 3A) dated at 8–7 Ma shown with white stars. Dashed blue line surrounding light blue region represents high  $V_p$  ( $\sim 8.5$  km s $^{-1}$ ) eclogite crust at the base of the Hikurangi Plateau at  $\sim 100$  km depth (after Reyners et al., 2017).

Cretaceous Western Fiordland Orthogneiss (WFO), which was emplaced mainly as diorite into Paleozoic plutonic and metasedimentary rocks at the base of a Mesozoic arc (Bradshaw, 1990). Early petrologic investigations showed that the western belt records high metamorphic temperatures ( $T \geq 750$  °C) and a depth of exposure that is unique in New Zealand (Oliver, 1976; Blattner, 1976; Bradshaw, 1985). Approximately 35% of the WFO contains high-pressure mineral assemblages indicative of garnet granulite, omphacite granulite, and eclogite facies metamorphism (Turnbull et al., 2010), making it Earth's largest ( $\sim 4500$  km $^2$ ) and deepest (to at least 65 km) known exposure of lower crust from a Mesozoic continental arc (Ducea et al., 2015).

### Rock Uplift and Topographic Growth

Sutherland et al. (2009) documented the onset of rapid exhumation in SW Fiordland at 25–15 Ma, coincident with the initiation of subduction south of New Zealand. During the 15–5 Ma period, zones of high exhumation rates broadened and expanded into the interior of Fiordland, although exhumation occurred mainly in the west. These patterns, which include an estimated 12–15 km of total rock uplift, are thought to be associated with the development of elevated topography. They also have been interpreted to result from either a combination of crustal shortening and dynamic uplift above the subducting slab (Sutherland et al., 2009) and/or glacial erosion coupled with high ( $> 8$  m/yr $^{-1}$ )

precipitation rates (Jiao et al., 2017). Although Sutherland et al. (2009) postulated that age-elevation relationships and spatial variations in exhumation rates were caused by reverse faulting, their relationship to specific faults was unresolvable with existing data.

### Subsurface Imaging

A regional 3D seismic velocity model derived from seismic tomography studies by Eberhart-Phillips et al. (2010) has recently allowed geophysicists to image the subsurface extent of the partially subducted Hikurangi Plateau beneath New Zealand (Fig. 1, inset) (Reyners et al., 2011; Davy, 2014). This oceanic plateau formed ca. 122 Ma (Neal et al., 1997) and was underthrust beneath the

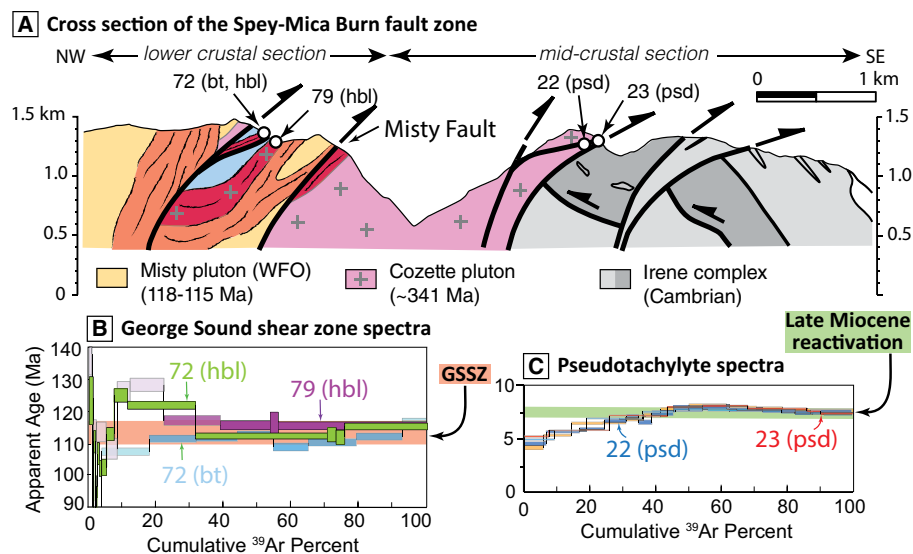
continent twice. The first underthrusting occurred ca. 100 Ma when Fiordland formed part of Gondwana; the second occurred in the late Cenozoic driven by convergence between the Pacific and Australian plates (Davy, 2014; Reyners et al., 2011, 2017). Currently, the western edge of the plateau lies below central and northern Fiordland where it impacts the geometry of the subducting Australian Plate (Reyners et al., 2017). South of the line of section shown in Figure 1A, the subducting plate parallels the Puysegur Trench and dips at  $\sim 68^\circ$  below 50 km depth (Reyners et al., 2011). North of this line, the slab twists to the NE ( $040^\circ$ ) and is vertical below 75 km (Reyners et al., 2017).

## INTEGRATED GEOLOGICAL STUDIES

### Reconstructing Fiordland

Many advances in our understanding of Fiordland's deep-crustal exposures have come from efforts to distinguish the age and significance of various episodes of magmatism, metamorphism, and deformation. In particular, the application of multiple geochronometers (e.g., Klepeis et al., 2016; Schwartz et al., 2016, 2017; Stowell et al., 2017; Tulloch et al., 2010, 2019), combined with an improved understanding of metastability in igneous and metamorphic mineral assemblages (Allibone et al., 2009a; Bhattacharya et al., 2018), have enhanced our ability to correlate tectonic events across thousands of square kilometers. These improvements have allowed us to reconstruct Fiordland's crustal architecture with increased accuracy.

Figure 1A shows a new compilation of Cretaceous paleodepths that provides a snapshot of Fiordland crust ca. 115 Ma, when it reached its maximum thickness of  $\geq 65$  km. It also is the first to delineate the boundaries of the various crustal blocks. The data derive from mineral assemblages that represent the peak of Early Cretaceous metamorphism and estimates of the emplacement depths of plutons whose age and history are known (see Table DR1 in the GSA Data Repository<sup>1</sup>). Our reconstruction shows large blocks of Cretaceous upper, middle, and lower crust, all of which are bounded by faults.



**Figure 2.** (A) Cross section of the Spey-Mica Burn fault zone (location in Fig. 1A). Profile shows steep reverse faults (dark black lines) that uplifted and imbricated the George Sound shear zone (orange-red-lined patterns), placing Cretaceous lower crust to the SE over Cretaceous middle crust. Yellow and blue represent undeformed portions of the Misty pluton and older Jurassic–Early Cretaceous igneous rock, respectively. Orange-lined pattern represents sheared Misty pluton; dark red-lined pattern with pluses represents sheared Cozette pluton (samples 72 and 79). (B) Apparent  $^{40}\text{Ar}/^{39}\text{Ar}$  age spectra from hornblende (hbl) and biotite (bt) from sample 72 and hornblende from sample 79 indicate George Sound shear zone (GSSZ) deformation occurred at 117–110 Ma (dots are dated samples). (C) Apparent  $^{40}\text{Ar}/^{39}\text{Ar}$  age spectra from 8 to 7 Ma pseudotachylyte (psd) within splays of the Spey-Mica Burn fault zone (two runs each of samples 22 and 23). Similar ages were obtained from pseudotachylyte in the Mt. Thunder fault (Figs. DR2 and DR3 in the GSA Data Repository [see text footnote 1] show detailed spectra and a detailed map of the Spey-Mica Burn fault zone, respectively).

These crustal divisions are important because they provide an improved framework for determining how the characteristics of magmatism, metamorphism, and deformation change vertically within the lithosphere.

One of the most significant outcomes of our study is the discovery of a narrow zone of steep, downward-curving reverse faults that placed a large, irregular slice of lower crust up and to the east over the middle and upper crust (Figs. 1A and 2A). The Spey-Mica Burn fault system, which is well-exposed in central Fiordland, extends for  $\sim 80$  km and joins the Misty fault (new name) along the eastern boundary of the lower crustal block. The fault zone then steps to the east in a series of oblique-slip faults that connect with another system of reverse faults, including the Mt. Thunder fault (new name) and the Glade-Darran fault zone (Fig. 1). This discovery is the first to confirm that the last 12–15 km of the uplift and exhumation of Fiordland's unique exposures is directly related to late Cenozoic reverse faulting rather than

to an older period of Cretaceous extension. Consequently, it has sparked new investigations aimed at determining the age of faulting and its relationship to Miocene subduction and zones of high exhumation rates.

### Reactivating Ancient Structures

Determining the age and history of faulting in Fiordland has been challenging, mainly because the surface expression of faults typically is narrow and eroded or concealed by sediment and dense vegetation. To solve this problem, we walked the surface traces of faults and found high-quality exposures that preserve kinematic information (Fig. DR1, Table DR2 [see footnote 1]). Two especially informative localities (stars in Fig. 1B) expose pseudotachylyte-bearing reverse faults at and near the eastern boundary of the lower crustal block. These sites show that the reverse faults reactivated two ancient crustal boundaries that coincide with large, ductile shear zones. The western boundary, which is centered on the

<sup>1</sup>GSA Data Repository item 2019195,  $^{40}\text{Ar}/^{39}\text{Ar}$  analytical methods and data tables, paleodepth data, and fault-slip data, is online at [www.geosociety.org/datarepository/2019](http://www.geosociety.org/datarepository/2019).

George Sound shear zone, is marked in part by a linear belt of Late Carboniferous granites (Ramezani and Tulloch, 2009) within the lower crustal block (Fig. 1B). The eastern boundary coincides with the old Carboniferous edge of Gondwana (Marcotte et al., 2005; Allibone et al., 2009b; Scott et al., 2011; McCoy-West et al., 2014) and is deformed by both the Grebe and the Indecision Creek shear zones (Fig. 1B). All of these structures were infiltrated by magma and reactivated multiple times since the late Carboniferous (e.g., Marcotte et al., 2005; Scott et al., 2011) (Fig. 1B), indicating that they represent long-lived zones of crustal weakness.

Figure 2A provides a detailed view of the superposed deformations caused by the repeated reactivation of the western boundary. It shows that the Carboniferous Cozette pluton (pink) was intruded by the Early Cretaceous (mainly 118–115 Ma) Misty pluton (yellow), both of which are deformed by the George Sound shear zone (red-lined pattern). This same zone also was the site of repeated magma infiltration during the 170–128 Ma interval (blue) (Allibone et al., 2009b). Two phases of steep reverse faulting then imbricated the shear zone, placing lower crust to the east over middle crust.

These findings have allowed us to formulate many new questions, such as: How old is the crustal imbrication? Why do faults deform only parts of the Late Carboniferous boundaries? Our collaborative study aims to answer these questions and, in doing so, determine how the Paleozoic–Mesozoic history of Gondwana influenced Fiordland's late Cenozoic tectonic history.

### Unraveling the Timing of Fault Reactivations

An especially useful approach to distinguishing the age of superposed events at the boundaries of Fiordland's lower crustal slice has been through the use of  $^{40}\text{Ar}/^{39}\text{Ar}$  age spectra derived from step-heating experiments (Tables DR3 and DR4 [see footnote 1]). For example, hornblende from the George Sound shear zone where it deforms the Carboniferous Cozette pluton (sample 79, Fig. 2B) yields a  $116.1 \pm 1.1$  Ma ( $1\sigma$ ) plateau age after an initial complex release pattern. A second sample from where the shear zone deforms this same pluton (sample 72, Fig.

2B) yielded similar hornblende spectra and a  $111.14 \pm 0.76$  Ma biotite plateau age. These ages help establish that Cretaceous magmatism and transpression overlapped in space and time, with pluton emplacement occurring mainly at 118–115 Ma (Schwartz et al., 2016) and deformation occurring at 117–110 Ma (Fig. 2B). They also help establish this zone as a long-lived boundary that was in place prior to subduction initiation at the Puysegur Trench during the Miocene.

To determine the age of the reverse faults, we collected two samples of pseudotachylyte from a well-exposed segment of the Spey-Mica Burn fault zone (samples 22, 23, Fig. 2A) and a third pseudotachylyte sample (3A) from the Mt. Thunder fault (location in Fig. 1B; results shown in the GSA Data Repository [see footnote 1]). Multiple runs of all three samples helped us cross check the reproducibility of the apparent age spectra and interpreted ages. The results indicate that the pseudotachylytes all range in age from 8 to 7 Ma, indicating that faulting occurred approximately simultaneously within both fault zones.

### Probing the Deep Roots of Faults

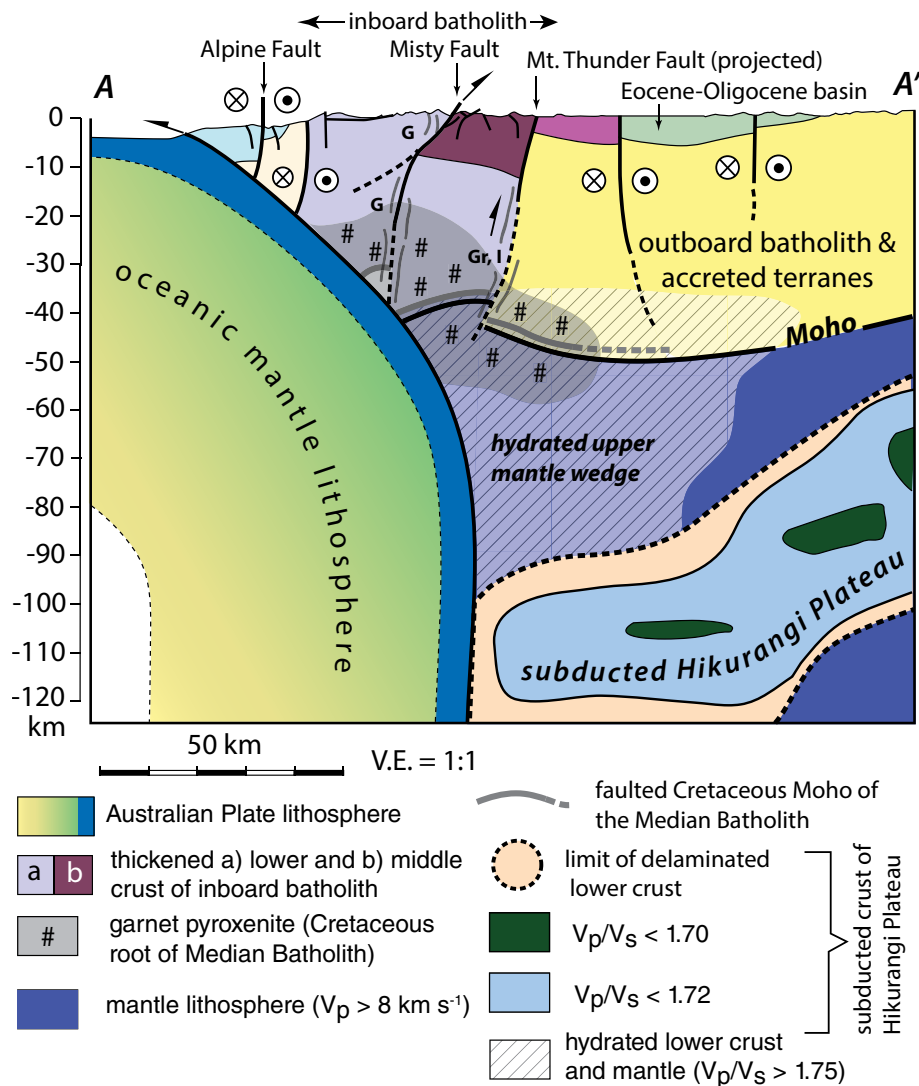
One of the outcomes of the crustal configuration shown in Figures 1A and 1B is an improved framework for determining how structures and tectonic processes are expressed at different depths within the lithosphere. For example, our work shows that it is possible to walk continuously along the boundary between the Paleozoic Gondwana margin and the outboard Jurassic arc from its location in upper crustal exposures at the southern end of the Grebe shear zone to its lower crustal expression in the Indecision Creek shear zone (Fig. 1B). This physical relationship shows how narrow zones of Cretaceous faulting in the upper crust gradually change into thick zones of ductile shear in the lower crust (Fig. 1B). In addition, the systematic mapping and dating of plutons along the length of the shear zones shows that magmatism and deformation were synchronous within them at all levels of the crust (Marcotte et al., 2005; Klepeis et al., 2016; Schwartz et al., 2017). This close association is important because it allows us to use the geochemical signatures and source regions of plutons to determine how deep the George Sound and Indecision Creek shear zones once penetrated.

Over the past few years, several studies (Decker et al., 2017; Milan et al., 2017) have investigated the deep source regions of the WFO batholith using isotopic systems and geochemical data. Decker et al. (2017) showed that Early Cretaceous plutons emplaced into the crustal boundary marked by the George Sound shear zone (Figs. 1B, 2, and 3) were sourced below the continental crust. Structural studies indicate that deformation aided magma ascent (Betka and Klepeis, 2013; Klepeis et al., 2016). Further work using oxygen and hafnium isotopes (Andico et al., 2017) indicates that strong isotopic differences in the lower crust existed across these shear zones during the Jurassic and Cretaceous, indicating they extended to lower crustal depths during, and prior to, these times. This work is important for understanding Fiordland's current crustal architecture because it implies that the Spey-Mica Burn fault system, which reactivated two ancient crustal-scale shear zones in the Late Miocene, also transects the crust and penetrates into the upper mantle.

### CONNECTING SURFACE GEOLOGY TO DEEP LITHOSPHERIC STRUCTURES

Our ability to investigate vertical connections between Fiordland's surface and the deep lithosphere requires a detailed knowledge of crustal architecture, including when and how it was assembled. Figure 3 shows a new profile that combines information from Fiordland's rock record with recently published tomographic models of the deep crust and upper mantle (Eberhart-Phillips et al., 2010; Reyners et al., 2017). The profile shows two narrow zones of reverse faulting directly above the region where the subducting Australian Plate steepens to vertical against the Hikurangi Plateau. This discovery not only enhances our ability to reconstruct Fiordland's subduction history, it also suggests a new mechanism by which Fiordland's crustal architecture and surface record are linked to processes occurring at the base of the lithosphere.

Estimates of crustal thickness beneath Fiordland, derived from isovelocity plots of  $V_p = 7.5$  km s<sup>-1</sup> (Eberhart-Phillips et al., 2010; Reyners et al., 2017), suggest that Moho depths vary from ~30 km below the WFO to more than 50 km below the outboard batholith (Fig. 3).



**Figure 3.** Vertical profile that combines new geological information with published geophysical images (location in Fig. 1A). Colors match those in Figure 1A except where noted. The location and geometry of the subducted Australian Plate is from relocated hypocenters (Reyners et al., 2017). The location of the subducted Hikurangi Plateau is from Eberhart-Phillips et al. (2010) and Reyners et al. (2017). Gray lines are Cretaceous shear zones that penetrate the lower crust: G—George Sound shear zone; I—Incision Creek shear zone; Gr—Grebe shear zone.

These estimates closely match those we obtained for Cretaceous crustal thicknesses using metamorphic mineral assemblages combined with estimates of the vertical offset across faults. This similarity suggests that the Cretaceous Moho approximately coincides with the position of the current Moho, which has been difficult to image using geophysical techniques. It also suggests that the apparent shallowing of both the Cretaceous and the current Moho from east to west beneath Fiordland is a consequence of Late Miocene reverse faulting. This interpretation is compatible with the steep orientation of the reverse faults, their reactivation of inherited

crustal-scale shear zones, and estimates of 12–15 km of late Cenozoic uplift within their hanging walls.

Below the base of the crust, tomographic images show the 3D structure and subsurface extent of the subducted Hikurangi Plateau (Reyners et al., 2011, 2017; Davy, 2014). Images of  $V_p$  and  $V_p/V_s$  show that the plateau within the Pacific Plate mantle is an ~35-km-thick zone of seismicity with a layer of high  $V_p$  (~8.5 km s<sup>-1</sup>) eclogite crust at its base (Fig. 3). Above this layer, high  $V_p/V_s$  ratios (~1.75) probably reflect the presence of a hydrated mantle wedge, which may contribute to the poorly defined Moho. The plateau's southwest

edge lies below central and northern Fiordland, where it appears to step to the northeast. Interestingly, the pattern of Miocene reverse faults at the surface mimics this east-stepping geometry of the plateau at depth (Fig. 1B), which provides an explanation for why the two ancient crustal boundaries were reactivated in different places at 8–7 Ma.

In their tomographic studies of the subsurface, Reyners et al. (2011, 2017) concluded that a late Cenozoic collision between the subducting Australian Plate and the western Hikurangi Plateau caused the underthrust plate to steepen to vertical below 75 km (Fig. 3). A reconstruction of the forward progress of this slab since ca. 25 Ma (Fig. 1A) shows that the time when its leading edge first encountered the plateau margin coincides with both the surface location and the timing of reverse faulting at 8–7 Ma. This relationship suggests that the collision localized shortening and caused the reactivation of two Cretaceous shear zones as reverse faults. Their steep orientations meant that the displacements were partitioned mostly into vertical motion, suggesting that this event also should be visible in Fiordland's exhumation history.

In their compilation of Fiordland's record of surface uplift, Sutherland et al. (2009) inferred that topographic growth and exhumation since ca. 25 Ma were associated with the inception of subduction and the downward deflection of the Australian slab. However, one problem in trying to relate this history of uplift and exhumation to crustal shortening is that neither topographic features nor zones of high exhumation rates could be linked to specific faults. Our discovery of major reverse faults at the edge of Fiordland's lower crustal block helps to solve this problem. In particular, the close spatial and temporal agreement between vertical fault motions at 8–7 Ma and the abrupt expansion of zones of rock uplift and high exhumation rates into eastern and northern Fiordland suggests that these uplift patterns were caused by reverse faulting. We therefore conclude that fault-related uplift and topographic growth in the Late Miocene were direct consequences of the collision between the subducting Australian Plate and the Hikurangi Plateau.



## CONCLUSIONS

The integration of surface and subsurface data sets from southwest New Zealand shows how the history of deformation, exhumation, and fault-related topographic growth above a young ocean-continent subduction zone is linked to events occurring near the base of the continental lithosphere. New geologic mapping and  $^{40}\text{Ar}/^{39}\text{Ar}$  dates show that crustal-scale reverse faults reactivated two ancient shear zones at 8–7 Ma, placing an irregular slice of Cretaceous lower crust up and to the east over the middle and upper crust. The size, age, location, and style of these faults suggest that they formed as a direct consequence of a Late Miocene collision between the leading edge of the subducting Australian Plate and previously subducted oceanic crust of the Cretaceous Hikurangi Plateau. This collision, which occurred at ~100 km depth, localized shortening and caused the subducting slab to steepen to vertical. It also drove the reactivation of inherited structures, resulting in crustal imbrication and 12–15 km of vertical motion. Integrated structural and geochemical analyses suggest that the reverse faults penetrate the entire crust and offset the Moho. The irregular geometry of the Hikurangi Plateau at depth provides a plausible explanation for why two ancient shear zones were reactivated simultaneously in different places at 8–7 Ma. For the first time, this study shows when, how, and why Earth's largest and deepest known exposure of lower crust from a Mesozoic continental arc was uplifted, imbricated, and exhumed to the surface above the Puysegur subduction zone. It also illustrates how inherited zones of crustal weakness facilitate the transfer of displacements between Earth's surface and the upper mantle during the early stages of subduction.

## ACKNOWLEDGMENTS

We thank A. Tulloch and N. Mortimer at GNS (Dunedin) for discussions and assistance. D. Jones (Vermont) provided expertise and assistance with the argon analyses. We thank the Dept. of Conservation Te Anau office for access and permission to sample and two anonymous reviewers for helping to improve the manuscript. Financial support was provided by NSF grant EAR-1119248.

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MANUSCRIPT RECEIVED 13 DEC. 2018

REVISED MANUSCRIPT RECEIVED 15 MAR. 2019

MANUSCRIPT ACCEPTED 20 MAR. 2019

## FY2019 Annual Report



**SCIENCE**



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# Who We Are ... What We Do

## Our Mission

To advance geoscience research and discovery, service to society, stewardship of Earth, and the geosciences profession.

## Our Vision

To be the premier geological society supporting the global community in scientific discovery, communication, and application of geoscience knowledge.

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# It's Time for the Rollout of GSA's Decadal Strategic Plan



In May 2019, GSA Council approved the Decadal Strategic Plan (DSP), a satisfying result of 20 months of effort. This process began in August 2017 with gathering thoughts, desires, creative ideas, and other valuable input from members—

young and old, student and emeritus, industry and academic, government and independents, managers, deans, associated societies, donors, and, importantly, staff. Our desire was that GSA be proactive and intentional about our future.

## PLANNING PROCESS

After acquiring input from the GSA community in a wide variety of ways, with the guidance of a strategic planning expert and facilitator, a strategic planning team assembled the data.

## FIVE STRATEGIC ASPIRATIONS EMERGED:

- Advancing Scientific Discovery, Rigor, and Integrity
- Supporting Early Career Professionals and Students
- Hosting Premier Conferences and Meetings
- Influencing Geoscience Policy and Linking Geoscience to Society
- Providing a Sense of Community and Venues for Networking

A larger planning team composed of more than 60 GSA members, plus many headquarters staff, was then engaged and divided into Program, Finance, and Development Task Forces. Each task force was charged with sorting through the ideas to modify and enhance existing, or develop new, GSA activities and to set priorities.

The **Program Task Force** looked at current programs and future initiatives through the lens of the five GSA aspirations, resulting in some 77 new or revised initiatives. The Task Force then prioritized initiatives into those to be accomplished in the next 1–2 years, the following 3–5 years, and finally those that will stretch into the final 6–10 years. The DSP is dynamic and will require updating in response to GSA's changing situation. The final plan, facilitation, and progress will undergo annual review by Council.

The Program Task Force results were followed by the **Finance Task Force** review. This group had the daunting task of identifying the required resources to implement the program planning as well as proposing the allocation of GSA's internal capital and capacity to fund new initiatives and/or modified programs or to recommend suspension of programs or initiatives.

That accomplished, the DSP was presented to the **Development Task Force**. Relying on their evaluation of existing fundraising capacity, this group translated the plan into a prospectus for future investment and support. And finally, they created a strategy to fund the aspirations and strategic directions that required additional outside funding to succeed.

## 1–2-YEAR PRIORITIES:

- Begin implementing the DSP, putting extra effort into marketing and advertising what the Society currently provides, as some members may not be aware of the many services and benefits available to them.
- Evaluate Annual and Section Meetings on timing, location, content, field trips, and technology; lay the groundwork for future enhancements.
- Create the **GSA Center for Earth & Planetary Discovery**, to include programs and initiatives surrounding geoscience field experiences, innovation, and incubation of multidisciplinary research and revised and new publications.
- Create the **GSA Center for Professional Excellence**, to address professional development needs in the geoscience community, including student and early career programs, service to non-academic members, and expanded research grants, mentoring, professional ethics, and diversity initiatives.
- Develop strategies for membership development and global partnerships.
- Build effective coalitions in the public-policy arena—possibly developing a think-tank with previous GSA Congressional Science Fellows and Policy Fellows and/or sharing policy staff with other organizations.
- Evaluate the GSA headquarters campus and plan ahead for needed building and facilities development.

## GSA FOUNDATION ALIGNMENT IN THE FIRST TWO YEARS:

- Campaign planning for funding the two GSA Centers for Excellence identified above.
- Develop a science communications intern endowment.

## ROLLOUT OF THE DSP

GSA staff members are developing tactical plans—reorganizing within headquarters as needed, and engaging feasibility consultants where required—to implement the DSP. GSA leadership has committed to participate in outreach, ad hoc committees, and review panels to reach its goals. The Programmatic Overview Committee (POC) is reorganizing to become the Strategic Plan Overview Committee, with the aim of keeping the DSP vibrant and dynamic.

## DESIRED EFFECT

GSA leadership expects that the DSP will enable our organization to “jump the curve” by providing the best of benefits and value to members, affiliates, and to society at large for the decade ahead.

**Robbie Rice Gries**  
GSA President, 2018-2019

# Letter from the GSA Executive Director



Dear GSA Members and Staff,

I want to pick up where President Gries left off in her letter and share what we see beyond the first couple of years with the Decadal Strategic Plan (DSP). GSA has made big decisions in the past about who the Society serves, how the Society does that, and where the Society operates. All those

decisions are wrapped up in the new plan. A basic question I want to pose for our students and professionals is “who is a geoscientist?” Should the Society or an individual filter themselves out of the realm of geoscience if they are not following a traditional career path? What tremendous collaborations or ideas are we losing? GSA wants to incubate those connections.

We think GSA can offer a very broad range of science-related initiatives, multidisciplinary opportunities, and professional development to geoscientists no matter how diverse their field of study or career path. We are retooling our programs, from research grants to field experiences, to offer more opportunities for professional success and furthering the geosciences. We are also evaluating where we are best located to be a functional and successful professional society.

## ROLLOUT OF THE DSP

GSA operations have begun the work of defining how we organize around the two Centers for Excellence (GSA Center for Earth & Planetary Discovery and GSA Center for Professional Excellence) and distilling the numerous programmatic concepts and initiatives into workable projects with timelines and metrics. Some initiatives necessitate evaluation of our present-day processes and will require outside consultation to develop viable business plans.

We will be sharing more details of the overall plan over the next few months and look forward to a strategic plan town hall at the GSA 2019 Annual Meeting & Exposition, in Phoenix, Arizona, USA, 22–25 Sept.

## 3–5-YEAR PRIORITIES:

- Continue Annual and Section Meeting planning and revising.
- Offer field camp programs in more key locations (including internationally) with formal academic credit.
- Expand early career professional development globally; develop a more impactful Student Advisory Council.

- Build and expand recruitment efforts for our students and professionals through GeoCareers.
- Continue developing virtual field trips with partners and associates.
- Involve GSA more in global initiatives, such as climate policy and big data.
- Create more mentoring opportunities for the geoscience disciplines that currently do not have a strong program, particularly in the applied science disciplines.

## GSA FOUNDATION ALIGNMENT IN YEARS 3–5:

- Continue with the focused activities developed in years 1–2.
- Build funding for expanding the scope of research grants programs.

## 6–10-YEAR PRIORITIES:

- Consider and plan for a game-changing publication effort, such as collaborating with our Associated Societies to create a worldwide geologic encyclopedia, modeled after GSA’s Decade of North American Geology (DNAG) publications.
- Host an authoritative source of technical data.
- Add a policy staffer to GSA’s Washington, D.C., office.

## GSA FOUNDATION ALIGNMENT IN YEARS 6–10:

- Continue with funding the Centers for Excellence and their goals.
- Continue to fund public-policy office expansion.
- Develop funding for new publication and database initiatives.

## WHAT’S IN IT FOR YOU?

GSA’s mission remains all about furthering the breadth and scope of geoscience research, maintaining professional integrity, assisting society through the relevance of our applied work, and advocating and acting upon stewardship of our planet and beyond. These are great times to be a geoscientist and a GSA member!

A handwritten signature in blue ink that reads "Vicki S. McConnell". The signature is fluid and cursive.

**Vicki S. McConnell**  
GSA Executive Director

## Thanks to These Outgoing Officers and Councilors

All GSA Officers and Councilors are highlighted in the July GSA Today.



**Christopher (Chuck) M. Bailey**



**Mary J. Kraus**  
(Divisions Liaison)



**Frank J. Pazzaglia**



**Tyler King**  
(Student Advisory Council Chair)



**Isabel P. Montañez**  
(Immediate Past President)



**Mark Little** ends his term as Councilor-at-Large, but will continue as a Councilor for the final year of his four-year term.

## Student Representatives and the Student Advisory Council

GSA is dedicated to remaining relevant and responsive to its large student membership and to providing leadership opportunities that will ensure future career success. GSA's Student Advisory Council (SAC) is composed of student representatives serving on behalf of Divisions, Sections, and most GSA Committees. SAC gives voice to student issues and concerns in a consequential way.

SAC is a dynamic and influential committee that is empowered with a direct line of communication with GSA Council. SAC selects a chair each year from among its members who serves a concurrent term as a full voting member of the GSA Council and contributes a valuable student voice to the leadership of GSA.

Interested students should contact their chosen Division or Section and express an interest in being selected as a student representative. A simple email to the chair, secretary, or other officer will suffice to begin the process. To apply as a student representative on a GSA Committee, complete the nomination form at [www.geosociety.org/GSA/About/sac.aspx](http://www.geosociety.org/GSA/About/sac.aspx).

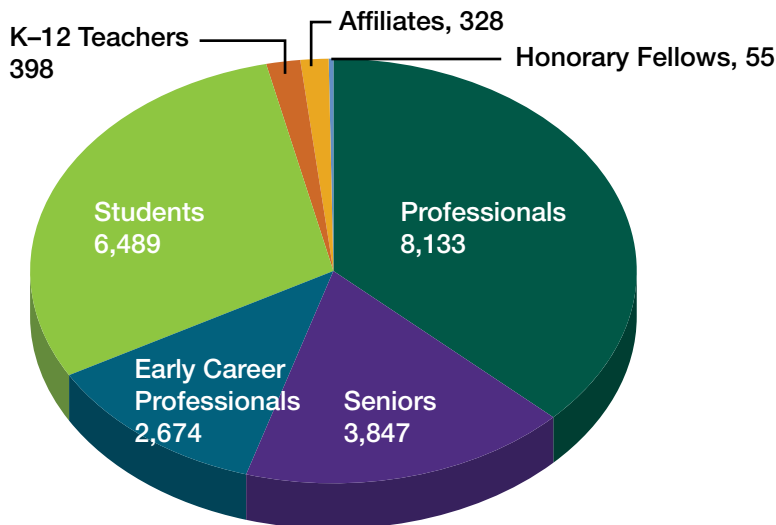
## Awarding Excellence in the Geosciences

In support of its mission to advance the geoscience profession, GSA honors outstanding scientific achievement each year at the awards ceremony held during the Annual Meeting. The three highest awards are the prestigious **Penrose Medal**, the **Arthur L. Day Medal**, and the **Young Scientist Award (Donath Medal)**. Awardees are highlighted in the July *GSA Today* and are online at [www.geosociety.org](http://www.geosociety.org) (click on "About" and then "Honors & Awards").

Other awards include:

- President's Medal of the Geological Society of America
- Randolph W. "Bill" and Cecile T. Bromery Award for Minorities
- Doris M. Curtis Outstanding Woman in Science Award
- GSA Florence Bascom Geologic Mapping Award
- GSA Distinguished Service Award
- GSA Public Service Award
- John C. Frye Award
- AGI Medal in Memory of Ian Campbell
- Honorary Fellows
- GSA Fellowship
- GSA Scientific Division Awards
- GSA International Initiatives

### MEMBERSHIP DEMOGRAPHICS





# Focus on Ethics



**Nan Stout**  
*Ethics and  
Compliance Officer*

Over the past year, GSA has stepped up its focus on ethics, becoming a leader in driving positive culture changes in the geosciences. On 31 August 2019, GSA hired Nan Stout as its first Ethics & Compliance Officer. We are pleased to share the following interview with Nan. Read on to hear what Nan has to say about her new role and the steps GSA is taking to advance professional ethics.

## **How did you get started in Ethics & Compliance?**

I started my career as an employment attorney. I did a lot of trial work early on, but what I loved most was helping clients get ahead of problems by developing sustainable practices to do business the right way, both legally and ethically. I began dedicating myself to this kind of work in 2004, when I became head of global business conduct and ethics for a large multinational company. Since then, I've continued to work in the ethics field. I was drawn to GSA because of its mission and passion for making a difference in the way people are treated and welcomed into the profession. Prior to taking on my current assignment here at GSA, I was a clinical professor in business ethics at Colorado State University.

## **Why did the Society create the Ethics & Compliance Officer role?**

Adding the Ethics & Compliance Officer role reflects GSA's longstanding commitment to promoting greater diversity, inclusion, integrity, and professionalism in the geosciences. GSA has had a Code of Conduct since the late 1990s, and the Society first published its Diversity Position Statement in 2010. In 2016, GSA launched the Events Code of Conduct through the Respectful Inclusive Scientific Events (RISE) program. In concert with all these efforts, in 2018, based on the recommendations of an Ad Hoc Ethics Committee, the GSA Council recognized that it wanted to be a leader in promoting professional ethical conduct and removing barriers to full participation of all talent within our profession. GSA invested in a dedicated Ethics & Compliance Officer to jump-start this process and quickly begin adding resources to weave ethics and integrity into everything it does.

## **Where have you focused your efforts since you started as Ethics & Compliance Officer?**

Initially, I spent a lot of time researching best practices and learning about GSA's structure and operations so that I could tailor my recommendations to GSA's needs. I conducted a governance and operations risk assessment to prioritize my efforts. This work helped me build specific ethics recommendations related to policies, bylaws, complaint-handling, communication and training, leadership, and governance. In May 2019, I presented a comprehensive report to the GSA Council. I'm happy to report that Council signed off on all of my recommendations. GSA is implementing some of them right away, and other recommendations will take a little more time to develop.

## **Which parts of the ethics program is GSA implementing right away?**

Right after the May 2019 Council meeting, GSA implemented two new initiatives. One is a complaint-handling policy known as the "Policy & Procedures for Handling Potential Ethics Violations," which sets forth the rules GSA will follow to process possible ethical violations. This policy was designed to balance GSA's goal of promoting ethics and integrity and to be fair to members alleged to have engaged in wrongdoing by providing them reasonable due process and an opportunity to be heard. (A copy of the policy is available online: go to [www.geosociety.org](http://www.geosociety.org), click on the "About" tab, and then click on "Ethics.") GSA also recently updated its bylaws to underscore the importance of ethics. Going forward, the bylaws make it clear that all members must comply with GSA's Code of Ethics and may be disciplined, up to and including termination, for failing to do so. Finally, GSA has updated many of its internal documents to ensure that it continues to select qualified candidates for leadership positions, honors, and awards—and that the individuals in these roles embody the Society's high ethical standards.

## **What changes are on the horizon?**

One of the most exciting things GSA is doing is replacing its aspirational Code of Conduct—adopted in the late 1990s—with a new enforceable Code of Ethics. GSA's new Code of Ethics will describe the professional ethical standards of conduct GSA expect of its members, together with examples of prohibited behavior that may result in a member's discipline, suspension, or termination from the Society. An ad hoc committee has begun drafting the new Code of Ethics based on an outline approved by the GSA Council. Once the committee has completed an initial draft, members will be invited to review and submit comments. We plan to submit a final draft to the GSA Council at the GSA 2019 Annual Meeting in Phoenix, Arizona, USA. Council also approved the idea of a Fellows revocation policy, so this will be coming sometime next year.

## **Does GSA work with other societies on these issues?**

Yes! In addition to having periodic conversations with other societies to learn about their practices and provide assistance when appropriate, GSA has joined two external groups to advance ethics and diversity more broadly. GSA is a partner in the American Geophysical Union's Ethics and Equity Center. And, I am particularly proud that GSA has been named to serve on the Leadership Council in the Societies Consortium on Sexual Harassment in science, technology, engineering, mathematics, and medical fields (STEMM). The Consortium is a collective effort of 103 scientific and medical societies. It aims to advance professional and ethical conduct, climate, and culture across the STEM fields and to remove barriers that previously have prevented full participation.

# Bringing Members Together in Countless Ways

GSA's Geographic Sections have their own governance boards and organize scientific meetings in their regions of North America. These meetings attract many geoscience students and provide outstanding learning and networking opportunities closer to home. Sections offer travel grants to the GSA Annual Meeting as well as their own meetings. Many Sections also offer research grants.



## DID YOU KNOW...

The first Scientific Division established in 1947 was the Engineering Geology Division (now Environmental and Engineering Geology).

### MEMBERSHIP BENEFITS INCLUDE:

- ✓ One complimentary Section affiliation is included with membership. Choose others when you renew your membership to expand your geographic interests.
- ✓ Students get one free Division with their membership.

“An opportunity to connect, reconnect, get inspired, and inspire others.”



## GEOGRAPHIC SECTIONS

### **Cordilleran**

The Cordilleran Section is the oldest of GSA's sections, established in 1901.

*In the United States:* The states of Alaska, California, Hawaii, Nevada, Oregon, Washington, and that part of Arizona south of 35 degrees north latitude.

*In Canada:* The province of British Columbia, the Yukon Territory, the Northwest Territories, and the Nunavut Territory.

*In Mexico:* The Distrito Federal and the states of Aguascalientes, Baja California, Baja California Sur, Chiapas, Colima, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, México State, Michoacán, Morelos, Nayarit, Oaxaca, Puebla, Querétaro, San Luis Potosi, Sinaloa, Sonora, Tlaxcala, and Zacatecas.

### **North-Central**

Established in 1966.

*In the United States:* The states of Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin.  
*In Canada:* The province of Manitoba and the western portion of the province of Ontario (west of the 89th meridian).

### **Northeastern**

Established in 1965.

*In the United States:* The District of Columbia and the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New

Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

*In Canada:* The provinces of New Brunswick, Newfoundland, and Labrador, Nova Scotia, Prince Edward Island, Quebec, and that part of Ontario east of the 89th meridian.

### **Rocky Mountain**

Established in 1948.

*In the United States:* The states of Colorado, Idaho, Montana, New Mexico, North Dakota, South Dakota, Utah, Wyoming, and that part of Arizona north of 35 degrees north latitude.

*In Canada:* The provinces of Alberta and Saskatchewan.

### **South-Central**

Established in 1966.

*In the United States:* The states of Arkansas, Kansas, Louisiana, Oklahoma, and Texas.

*In Mexico:* The states of Coahuila, Nuevo León, Tabasco, Tamaulipas, and Veracruz.

### **Southeastern**

Established in 1947.

*In the United States:* The states of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia, and the Commonwealth of Puerto Rico.

*In Mexico:* The states of Campeche, Quintana Roo, and Yucatán.

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## SCIENTIFIC DIVISIONS

GSA has 21 Scientific Divisions to help you stay connected with your colleagues worldwide and receive specific information related to your area of interest.

Divisions provide opportunities for leadership and service, offer awards and support for students, and help develop the GSA meeting technical program. Join one or more when you renew for 2020. Students get one free Division with their membership.

**Continental Scientific Drilling** (established in 2017) focuses on continental scientific drilling and coring research tools used in many GSA Scientific Divisions and fields.

**Energy Geology** (established in 1954) encourages energy research and interchange of scientific information about energy resources and related issues within the wide range of their geologic significance, and to act as an organized group in promoting these objectives within the GSA framework.

### **Environmental & Engineering**

**Geology** (established in 1947) 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.

**Geoarchaeology** (established in 1977) 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.

**Geobiology & Geomicrobiology** (established in 2001) promotes interdisciplinary research focusing on the interplay between the biosphere, lithosphere, hydrosphere, and atmosphere.

**Geochronology** (established in 2018) aims to represent geochronologists of all types, as well as the many geoscientists who use geochronological data.

### **Geoinformatics & Data Science**

(established in 2006) advances “Data to Knowledge,” providing GSA members with an opportunity to participate in the emerging field of cyberinfrastructure.

**Geology and Health** (established in 2005) focuses on the intersection of natural or anthropogenic geological conditions with health, disease, pathology, and death in modern and fossil humans, animals, and plants.

**Geology and Society** (established in 2003) advances the concept of “geology working for society” by providing GSA members with opportunities to bring together multiple fields of geoscience to address important societal issues.

### **Geophysics and Geodynamics**

(established in 1971) facilitates the presentation and discussion of the ideas of scientists interested in geophysics and geodynamics, fosters communication among geophysicists and other earth scientists, and promotes research and publication.

**Geoscience Education** (established in 1991) fosters the active participation of GSA members in all aspects of earth-science education.

**History and Philosophy of Geology** (established in 1976) works to encourage the study and communication of the philosophy and history of geology.

**Hydrogeology** (established in 1959) focuses on the geologic aspects of hydrogeology, the role of geology in the hydrologic cycle, and the importance of hydrogeology to society and science.

**Karst** (established in 2014) studies karst terranes, which necessarily involves a wide variety of subjects and specialties, spanning almost every Division in GSA and scientific disciplines outside of GSA’s purview.

### **Limnogeology** (established in 2002)

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.

### **Mineralogy, Geochemistry, Petrology, and Volcanology** (established in 2009)

promotes awareness, teaching, and research in these fields, and stimulates discussion about the knowledge, ideas, research results, and problems regarding these fundamental areas of the earth sciences.

### **Planetary Geology** (established in 1981)

fosters interactions among planetary scientists, facilitates the presentation and discussion of their research and ideas, stimulates communication with other earth scientists, and promotes planetary geology to a broad audience.

### **Quaternary Geology and**

**Geomorphology** (established in 1955) facilitates communication among scientists in these fields and the presentation of their research and ideas to the wider scientific community.

**Sedimentary Geology** (established in 1985) works to ensure the presentation of sedimentary-related topics and sessions at GSA meetings and actively nurtures the work of students.

**Soils and Soil Processes** (established in 2017) works on issues with particular solutions that include land stewardship, water quality and quantity, carbon cycling and paleoclimate reconstruction.

**Structural Geology and Tectonics** (established in 1980) focuses on the geometry and mechanisms of natural and experimental deformation at all scales and works to promote the research of scientists in these fields and to facilitate communication and discussion at all levels of the earth sciences.



The GSA Annual Meeting & Exposition was held in Indianapolis, Indiana, USA, in November 2018.

# Connecting the Geoscience Community

## DID YOU KNOW...

Fifty-eight countries were represented by attendees of the 2018 Annual Meeting & Exposition.

### MEMBERSHIP BENEFITS INCLUDE:

✓ Members enjoy reduced meeting registration rates.

*“My advice to all geoscience students is to attend GSA annual and section meetings, apply for student and conference travel grants, and to be an active member. You never know when you are going to meet someone who can help you.”*

GSA offers a variety of meetings to geoscientists—from small research forums, to moderate specialty conferences, to the large Annual Meeting. These forums, conferences, and meetings are held around the globe throughout the year. GSA provides a platform for scientists to share their latest research, build upon current knowledge, and network with peers. GSA strives to keep meetings cost-effective yet provide the latest technology platforms for scientific exchange.

In fiscal year 2019 (FY19), GSA hosted six meetings and conferences, bringing together thousands of geoscience professionals and students. The GSA Annual Meeting & Exposition was held in Indianapolis, Indiana, USA, in November 2018.

### 2018 ANNUAL MEETING BY THE NUMBERS

- 5,600 attendees
- 58 countries
- More than 3,500 abstracts
- 17 Scientific Field Trips
- 18 Short Courses
- More than 200 companies, organizations, and universities exhibited

Hundreds of volunteers participate yearly in the GSA Annual Meeting—from local organizing committee members and the Joint Technical Program Committee, to the hundreds of session conveners from every geoscience discipline and the hundreds of student volunteers from campuses across the Americas

and abroad. There is something for everyone at the GSA Annual Meeting.

GSA’s Geographic Section Meetings are unique venues for interdisciplinary science and are an important hub for discussing and presenting current research. They provide an excellent opportunity for both professionals and students to attend and participate in technical sessions, field trips, and short courses close to home. The 2019 Section Meetings brought together more than 2,900 attendees. Meetings were held in Portland, Maine, USA (GSA Northeastern Section); Manhattan, Kansas, USA (joint GSA North-Central, South-Central, and Rocky Mountain Sections); Charleston, South Carolina, USA (GSA Southeastern Section); and Portland, Oregon, USA (GSA Cordilleran Section).

### GSA PENROSE CONFERENCE AND THOMPSON FIELD FORUMS

GSA Penrose Conferences and Thompson Field Forums are GSA’s premiere small-group meeting and field-trip venues for collaborative research around the world. In FY19, GSA held one Thompson Field Forum: “Architecture and Evolution of the Crust during Continental Arc Magmatism: A Transect through the Coast Mountains Batholith, British Columbia.” GSA is now working to revitalize the Penrose Conferences and the Thompson Field Forums rolling out in the future, with the goal of hosting one of each in 2021 (see enclosed flyer).

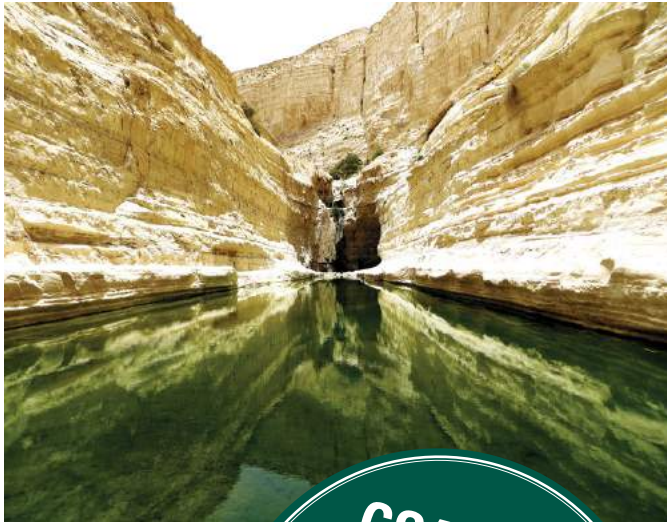
## GSA INTERNATIONAL

GSA is active within the international geoscience community in the belief that science knows no borders. The GSA worldwide member community spans 118 countries outside of North America; most reside in the United Kingdom, Australia, Japan, Germany, and China.

The purpose of GSA International is to promote, create, and enhance opportunities for international cooperation, provide a forum for science and policy discussions that are international in scope and relevance, build collaborative relationships with GSA Scientific Divisions and Associated Societies on international issues, and strengthen cooperation with international geoscientific societies.

GSA International encourages and hosts international geoscience and environmental-related discussion topics through the online GSA Member Community platform and promotes meetings, exchanges of visiting scholars/lecturers, organizes Annual Meeting topical sessions, and helps organize and promote field workshops.

GSA International evaluates and recommends international awardees for the GSA Honorary Fellow, the International Distinguished Career Award, the James B. Thompson Jr. Distinguished International Lectureship, and the Farouk El-Baz Student Research Grant. It also recommends travel grant awards for international students and early career professionals to attend the GSA Annual Meeting.



Ein Avdat, Israel.



## ASSOCIATED SOCIETIES

GSA has a long tradition of collaborating with a wide range of partners (first Associated Society: Geochemical Society, 1956; most recent: Geobiology Society, June 2019; 76 total as of that date) in pursuit of our mutual goals of advancing the geosciences, enhancing the professional growth of society members, and promoting the geosciences in the service of humanity. As GSA looks to the future, it will continue to build strong, meaningful partnerships with societies and organizations around the world in service to members and the larger geoscience community.

## GSA COMMITTEES

GSA provides opportunities for every member to actively participate in its leadership. One of the most effective ways to do this is by serving on a GSA Committee. GSA Committees are advisory to Council and directly impact the direction of the Society. Serving on a committee allows members to network with fellow scientists, contribute ideas to science and education, and support the profession. Self-nominations are welcome, as well as nominations of other qualified student and professional members. Learn more by going to [www.geosociety.org](http://www.geosociety.org) and clicking on “About” and then on “Committees.”

- Academic and Applied Geoscience Relations
- Ad Hoc—Ethics
- Ad Hoc—Membership
- Annual Program
- Arthur L. Day Medal Award
- Audit
- Bascom Mapping Award
- Congressional Science Fellowship Selection
- Diversity in the Geosciences
- Doris M. Curtis Memorial Fund for Women in Science Award
- Education
- Executive
- External Awards
- Finance
- Geology and Public Policy
- GSA International
- Investments
- Joint Technical Program
- Membership and Fellowship
- Nominations
- Penrose Conferences & Thompson Field Forums
- Penrose Medal Award
- Professional Development
- Programmatic Overview
- Public Service Award
- Publications
- Research Grants
- Student Advisory Council
- Young Scientist Award (Donath Medal)

# Publications

GSA and its publications go way back—nearly as far back as the formation of GSA in 1888. The first article in the first issue of the *Bulletin of the Geological Society of America* in 1890 contained the proceedings from the 1889 meeting where GSA organized as a Society.

## NOTABLE BEGINNINGS (AND ENDINGS) AND A FEW HIGHLIGHTS

**1890**  
*Bulletin of the Geological Society of America*

**1890**  
*Bulletin of the Geological Society of America*

**1934**  
*Proceedings of the Geological Society of America* (for 1933)  
 Memoir book series  
 Special Papers book series

**1957**  
*Engineering Geology Case Histories* series

**1959**  
 Map and Chart series

**1961**  
*Bulletin* gets a name change to *Geological Society of America Bulletin*

**1962**  
*Reviews in Engineering Geology* series

**1966**  
*The Geologist*, GSA's first newsletter

**1969**  
*Abstracts with Programs*

**1973**  
*Geology*  
*Memorials* series—previous memorials to deceased members appeared in the *Bulletin* or in *Proceedings* volumes.

**1974**  
 GSA Data Repository established

**1977**  
 GSA Council establishes the Centennial Planning Committee, a first step toward the creation of the Decade of North American Geology (DNAG) project

**1979**  
*GSA News & Information* takes up where *The Geologist* left off  
 Microfiche

**1981**  
 End of microfiche

**1985**  
 First DNAG volume and Continent-Ocean transects published

**1990**  
 Journal subscriptions are “unbundled” from GSA membership, becoming an optional purchase

**1991**  
*GSA Today* takes over for *GSA News & Information*

**1992**  
 Journals on CD (expanded to DVD in 2010)

**1995**  
*Environmental & Engineering Geoscience*, co-published with the Association of Engineering Geologists (previously published as the *Bulletin of the Association of Engineering Geologists*)

**1999**  
 Field Guide series

**2000**  
 Journals are offered online (digitization of all of GSA's journals and books back to volume 1, issue 1 of each continues for the next decade)

**2004**  
 Digital Map and Chart series

**2005**  
 The final piece of DNAG, Continent-Scale Map 001, *Geologic Map of North America*, is published  
*Geosphere*  
 GeoScienceWorld launches, with GSA as a founding publisher

**2008**  
 The last *Memorials* bound volume is printed—individual *Memorials* continue to be produced, and all are posted open access on the GSA website  
 GSA offers authors the option of making their papers open access

**2009**  
*Lithosphere*

**2011**  
 The first GSA calendar is published, featuring images from winners of a photo contest held at the 2009 Annual Meeting in Portland, Oregon, USA

**2013**  
 GSA partners with Geofacets, a research tool using thousands of georeferenced geological maps and other content, including 80,000+ maps from GSA publications

**2015**  
 Last print volume of *Abstracts with Programs* is produced—abstracts back to 2000 are in a searchable online database

**2018**  
*Geosphere* and *Lithosphere* become 100% open access

## DID YOU KNOW...

GSA's 20 science editors, along with about 160 associate editors and editorial board members and hundreds of reviewers, determine the content of GSA journals and books.

### MEMBERSHIP BENEFITS INCLUDE:

- ✓ Subscribe to premier publications when you renew your 2020 membership.
- ✓ All members get free online *Geology* with membership.
- ✓ Supercharge your research with Geofacets—a web-based tool to access thousands of georeferenced maps—included with membership.

“GSA Membership means being part of a greater team and community which values the importance of Earth science across the world.”

## THE JOURNALS AND BOOKS TODAY

The peer-reviewed journals *GSA Bulletin*, *Geology*, *Geosphere*, and *Lithosphere* are published at [www.gsapubs.org](http://www.gsapubs.org), through the aggregate GeoScienceWorld, and on an annual DVD. *GSA Bulletin* and *Geology* are also available in print. *Geosphere*, *Lithosphere*, and *GSA Today* are 100% open access, and *Geology* is free online for all GSA members. Early career professional members, student members, and K–12 teacher members also get free online access to *GSA Bulletin*.

Published jointly by the Association of Environmental and Engineering Geologists and GSA, *Environmental & Engineering Geoscience* (online at GeoScienceWorld) contains peer-reviewed papers on new theory, applications, and case histories illustrating the dynamics of environmental and applied disciplines.

The society publishes three peer-reviewed book series in print and online ([www.gsapubs.org](http://www.gsapubs.org)): Special Papers (seven volumes in fiscal year 2019 [FY19]) are for state-of-the-art treatments of evolving subjects; Memoirs (one volume in FY19) are intended to remain authoritative references for a number of years; and Field Guides (four volumes in FY19) feature guides from GSA or GSA-related field trips.

Also online (and at the GSA Store) is the complete suite of Decade of North

American Geology volumes and maps, *Engineering Geology Case Histories*, Penrose Field Guides, and numerous non-series books. Memorials to deceased GSA members are open access at [www.geosociety.org](http://www.geosociety.org).

### VOLUNTEERS MAKE IT HAPPEN

GSA's 20 science editors, along with about 160 associate editors and editorial board members and hundreds of reviewers, determine the content of GSA journals and books. GSA publications could not exist without these hard-working and dedicated volunteers.

### HELP FOR NEW AUTHORS

An early-career publishing workshop, held at GSA Annual Meetings and led by GSA science editors, covers many aspects of the process of preparing research for submission to scholarly journals, including the importance of contributing as a reviewer.

### GSA STORE

Along with providing a storefront for GSA books, educational materials, specialty tools, and the Map and Chart collection, the GSA Store offers e-versions of hundreds of previously unavailable or out-of-print publications to researchers and citizen scientists alike.



### 2018 JOURNAL IMPACT FACTOR (WEB OF SCIENCE GROUP, 2019)

JOURNAL	2019	5-YEAR
<i>Geology</i>	5.006	5.406
<i>GSA Bulletin</i>	3.970	4.708
<i>Geosphere</i>	2.847	2.989
<i>Lithosphere</i>	2.486	2.961
<i>Environmental &amp; Engineering Geoscience</i>	0.844	0.761

# Communicating the Value of Geoscience

## DID YOU KNOW...

GSA Division websites include community features so Division members can interact with one another. If you are a member of a particular Division, you'll automatically be placed in that group's online community.

### WAYS TO STAY CONNECTED:

- ✓ Join the community page.
- ✓ Follow GSA on social media.
- ✓ Visit GSA's website, [www.geosociety.org](http://www.geosociety.org), to stay up to date on news and communication.

“GSA membership has enriched my life professionally and intellectually.” —S. Stover



## MEDIA RELATIONS

Supporting its strategic aspiration to link geoscience to society, GSA engages in media relations activities to enlarge the footprint of member research and publications.

GSA issues 50–60 press releases each year, highlighting peer-reviewed research published in GSA's journals and books, as well as new findings presented at GSA meetings. These are distributed to an extensive list of science journalists and posted on the American Association for the Advancement of Science (AAAS) online science news service, EurekAlert. In addition, GSA encourages and assists public information officers at universities and government agencies to write their own releases about their GSA-published research or presenting authors and then augments distribution of those releases for wider reach.

GSA invites journalists to attend Annual and Section Meetings with complimentary registration, and hosts a newsroom at the Annual Meeting.

As a result of these efforts, our science gets considerable press coverage, ranging from top-tier outlets like *Science*, *Nature*, *National Geographic*, *Forbes*, *The Economist*, *LiveScience*, *CNN*, *Newsweek*, and others, to more niche audiences in trade publications, blogs, and syndicated websites. Go to [www.geosociety.org](http://www.geosociety.org), click on the “News” tab, and select “GSA in the News” to learn more.

## SCIENCE COMMUNICATION FELLOWSHIP

For the past two years, GSA's communications team has included a Science Communication Fellow, thanks to generous support from the GSA Foundation's Bruce and Karen Clark Fund. This part-time, non-resident position is an opportunity for a science writer, journalist, or scientist with a passion for communicating to spend 10 months gaining experience and professional contacts, working in concert with GSA communications and member leaders. The goal of the fellowship is to help improve the communication of geoscience knowledge between the members of GSA and the non-scientific community.

## SCIENCE COMMUNICATION INTERNSHIP

Each year GSA accepts a small number of geoscience students who are interested in science communication as a possible alternative career path to collaborate with the GSA Science Communication Fellow during the Annual Meeting. Selected students work under the tutelage of the GSA communications staff and GSA's Science Communication Fellow with the goal of building their confidence and skills for conveying scientific subject matter in compelling ways.



Science Communication interns collaborate with Science Communication Fellow Sarah Derouin at the GSA 2018 Annual Meeting in Indianapolis.



## GSA MEMBER COMMUNITY, POWERED BY YOU!

GSA's vibrant Member Community platform is a simple, dynamic way to communicate with your professional network. It allows GSA members to easily connect, learn, and share with fellow members online, and empowers groups to work together more effectively.

### Here's a brief overview of some of the features:

- Centralized discussion groups with enhanced email capabilities—Members receive email notifications from discussion forums that are more structured and easier to read than listservs and allow participants to reply directly from email;
- Member directory—Within the Member Community platform, GSA member search is comprehensive and interactive; and
- Resource libraries help archive shared documents and collaborative work products.

### Did you know?

GSA Division websites also include these community features so Division members can interact with and one another. If you are a member of a particular Division you'll automatically be placed in that group's online community.

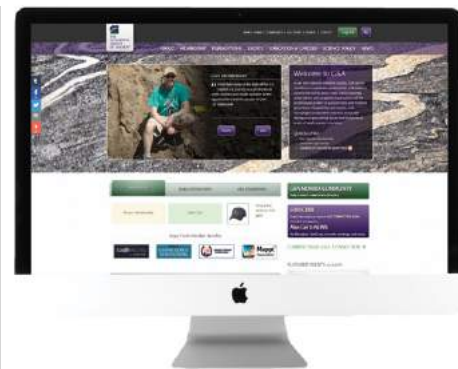
### Features include:

- Division-scale member directories with powerful search capabilities;
- Division-wide discussion forums; and
- Division libraries (document sharing and archives).

**Getting started is easy.** Your Member Community awaits you. Go to **community.geosociety.org** and click on the "Login" button in the upper right-hand corner of the page to get started.

### Interact with your peers today and get involved!

- Update your profile and add a picture;
- Find and connect with other GSA members;
- Post questions and comments to the Open Forum discussion;
- Join a discussion of interest; and
- Post your presentations, pictures, documents, videos, or other content you feel will help other participants in the geoscience community.



## GSA WEBSITE

We've seen a busy year of updates, improvements, and redesigns across GSA's portfolio of web properties as we work to provide a modern, evolving user experience. We have leveraged our extensive database to provide more dynamic content on our sites, allowing us to serve up-to-date information efficiently and consistently in more places.

Our main site received more than three million views over the past 12 months, and the completely redesigned Annual Meeting site enjoyed a significant traffic increase compared to the same period in the previous year. The GSA Geologic Time Scale, job board, and scientific journals consistently draw large numbers of users, new and returning.



GSA has a lot to offer online, so we encourage members and nonmembers alike to continue taking advantage of the depth and breadth of high-quality resources available across our sites—and perhaps to spend a little time discovering something new. Start at [www.geosociety.org](http://www.geosociety.org).


## TOP WEBSITE PAGE VIEWS IN FY2019


1. Home page (81k)
2. Geologic Time Scale (80k)
3. Job Board (59k)
4. GIP home page (37k)
5. Journals home page (16k+)


## GSA ON SOCIAL MEDIA

GSA is a leader among our Society peers in reaching wide audiences with information about our events, publications, membership, programs, and activities through social media.

  Follow GSA @geosociety on **Twitter** (more than 38,000 followers) and **Instagram** and use hashtag #GSA2019 to keep up with the latest from the Annual Meeting.

 **Facebook**—Join more than 280,000 GSA fans worldwide at [www.facebook.com/GSA.1888](http://www.facebook.com/GSA.1888).

 **YouTube**—Learn more about GSA and careers in the geosciences at [www.youtube.com/user/geosociety](http://www.youtube.com/user/geosociety).

 **LinkedIn**—Network and stay connected to your professional peers at <http://linkd.in/1HsYwni>.





# Supporting Professional Excellence

## DID YOU KNOW...

GSA partnered with federal land management agencies and organizations to engage more than 185 participants through GeoCorps™ America and the National Park Service Geoscientists-in-the-Parks programs in 2019.

## MEMBERSHIP BENEFITS INCLUDE:

- ✓ Student and early career professional members qualify for reduced membership dues.
- ✓ Some grants, such as AGeS2, are only open to GSA members.

*“GSA has offered me numerous ‘firsts’—presentation, grant, GeoCorps, committees. GSA is more than just a membership. It is a community of learners and scientists ... and a way for me to be a leader.”—T. Rivera*

Earth-science education and outreach activities are at the core of GSA’s mission to increase appreciation of Earth’s history, processes, and resources.

## EXPLORE CAREERS

The Geological Society of America®

# GEOCAREERS

## The GeoCareers Program

GeoCareers disseminates career information, develops resources, and connects the geoscience community through webinars, mentoring, networking, and workshops at Annual and Geographic Section Meetings and throughout the year. With a goal of increasing knowledge of geoscience career pathways, GSA works with the geoscience community at all career levels.

## Webinars

Two career-focused webinars were offered in the spring to students and early career professionals in collaboration with GSA’s Scientific Divisions and Associated Societies. The webinars were introductions to career pathways in some of today’s most popular fields. “Exploring a Career in the Environmental Industry” and “Exploring a Career in the Paleontology Field” were attended by more than 1,300 individuals, counting both the live webinars and those viewed at a later time. The recordings of these webinars are online—just go to [www.geosociety.org](http://www.geosociety.org), hover over “Education & Careers,” and click on “GeoCareers.”

## Mentoring

Participating in a mentorship program can be a valuable experience for both mentors and mentees. Mentees report that they receive good advice related to their career or academic pathway and are introduced to other professionals in their area of interest. Mentors report altruistic gains when helping others as well as enjoyment in meeting promising young scientists. GSA has operated mentor programs since 1996 and recruits new mentors and mentees every year for the following:

- Roy J. Shlemon Mentor Program in Applied Geoscience
- John Mann Mentors in Applied Hydrogeology
- GeoCareers Center
- Drop-in Mentoring in the GeoCareers Center
- Résumé Mentoring in the GeoCareers Center
- GeoCareers Panel Luncheon
- On To the Future

## Networking

Developing relationships at meetings, workshops, and networking events is essential to building social capital in a field and provides critical connections to the profession. Networking programs offer students and early career scientists the opportunity to work on networking skills with practicing geoscientists from a variety of employment sectors.

- Early Career Professionals Coffee
- Networking Reception
- Women in Geology Career Pathways Reception
- Geoscience Career Workshops at Section and Annual Meetings
- GeoCareers Day

## GRANTS AND SCHOLARSHIPS

*On To the Future Program*

Expanding diversity and inclusivity is critical to innovation, scientific advancement, and solving tomorrow's geoscience challenges. GSA's On To the Future (OTF) program supports students from a diversity of backgrounds to attend their first Annual Meeting. In 2018, the Society funded 68 students to attend the Annual Meeting. There, students were paired in mentorships, met with GSA leadership, and learned about participation in internships, scholarships, and research opportunities.

OTF students also participated in a full-day professional development workshop sponsored by the National Science Foundation. This partnership with the University of Arkansas, Fayetteville, helped fund 20 OTF alumni to attend the Annual Meeting and go to the joint South-Central, North-Central, and Rocky Mountain Section Meeting in spring 2019. The workshop focused on helping students define their career goals and identify and begin an application for an internship and/or research experience to aid their transition into the geosciences workforce.

*Northeast Urban Travel Award*

The Northeast Urban Travel Awards Program provides financial assistance to non-traditional students attending urban universities in GSA's Northeastern Geographic Section. Non-traditional students are those who have delayed enrollment in post-secondary education associated with caring for dependents and/or working full-time, and who, due to competing non-academic priorities, are unable to participate in multi-day field or meeting experiences critical to geoscience education and training. This year, seven students were awarded scholarships grants. Since 2014, a total of 31 students have received this award.

*GSA Foundation Field Camp Scholarships*

The GSA Field Camp Scholar Award is a US\$2,000 award to undergraduate students to attend a field camp of their choice. In 2019, 15 students were awarded scholarships based on their economic and financial need, merit, and diversity.



Recent Minority Student Scholarship recipients. From left to right: David Davis, Lisa Duong, and Nora Soto Contreras.

*Minority Scholarships*

GSA awards six scholarships to undergraduate students, one from each of the Society's Geographic Sections, who are from minority backgrounds. In addition to the award, the students receive complimentary membership and registration for the Annual Meeting.

## BY THE NUMBERS



1 hammer = 8 projects

**44** GeoCorps positions filled in 2019



**143**  
NPS-GIP  
projects  
recruited  
for 2019

In 9 years, **US\$90,000** was awarded to geology field camps

 In 2019, **297 people** attended **short courses**

**56%** of these were students



Over **15 years** since the program's creation, **28,500+ EarthCaches** were developed in **205 countries**

**392 Graduate Student Research Grant proposals** were funded in 2019

**68 OTF students** were funded to attend the **2018 Annual Meeting**.



**US\$812,000** was awarded overall for **Graduate Student Research Grants**. The average grant amount was **US\$2,071**

**AGeS2**  
20 proposals funded with **US\$8,186** average grant amount awarded



**693 students** were mentored by **135 mentors**



Marie Jimenez at work during her 2018 National Park Service Geoscientists-in-the-Parks position at Fossil Butte National Monument.

**FIELD AND RESEARCH EXPERIENCES**

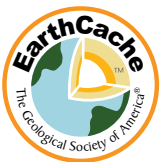
***GeoCorps™ America and the National Park Service Geoscientists-in-the-Parks Program***



GSA is driven to provide young scientists with real-world experiences that enable their learning and contributions beyond the classroom. Through partnerships in GeoCorps America and the National Park Service Geoscientists-in-the-Parks program (NPS-GIP), GSA supports our community’s

involvement in science-driven projects that help meet the current scientific questions, management needs, and stewardship goals of public lands nationwide. GSA partnered with federal agencies, including the National Park Service, U.S. Forest Service, and the Bureau of Land Management, and other organizations, including the Stewards Individual Placement Program and Aerotek Inc., to engage more than 185 participants through these programs in FY2019.

***The EarthCache™ Program***



The EarthCache program, a longstanding partnership between GSA and Geocaching HQ (Geocaching.com), is now in its 15th year. This educational program gets members of the public outdoors to experience geology in the field, thus increasing their knowledge and support of the geosciences. At the 2018 Annual Meeting, GSA hosted a series of presentations about Indiana geology aimed at the geocaching community, educators, and the general public, with the goal of engaging more people in the Earth-Cache program and in the geosciences. In February 2019, 14 members of the volunteer review team joined GSA and Geocaching HQ staff for a teleconference to discuss the program, which resulted in some positive updates to the guidelines for participants. There are more than 28,500 EarthCaches in 205 countries.



“I am hugely grateful that this sort of recognition exists.”

***GSA/ExxonMobil Field Camp Programs***

The GSA/ExxonMobil Field Camp Excellence Award is given annually to a geology field camp that demonstrates safety awareness, diversity, and technical excellence. In May 2019, the US\$10,000 award went to the University of California Riverside.

The GSA/ExxonMobil Bighorn Basin Field Award offers students and faculty an introduction to integrated basin and petroleum systems analysis and is taught by ExxonMobil staff. In August 2019, three faculty, seven graduate students, and 15 undergraduate awardees headed to the Bighorn Basin.

## PROFESSIONAL DEVELOPMENT

### *The GeoTeachers™ Program and Related K–12 Activities*

The GeoTeachers Program was created to provide professional development workshops and field experiences for K–12 teachers with little to no geoscience background. During the summer of 2018, field workshops were held in Flagstaff, Arizona, USA, and Colorado Springs, Colorado, USA, engaging 38 educators. At the 2018 Annual Meeting in Indianapolis, a one-day field workshop engaged six educators. Due to the relatively small number of teachers reached and the limited resources available, GSA decided in late 2018 to discontinue the GeoTeachers program. GSA is seeking input from its Education Committee to determine how best to serve the K–12 and 2-year-college (2YC) communities moving forward. This may involve GSA using new and existing partnerships, as it is doing at the 2019 Annual Meeting in Phoenix, Arizona, USA, where it is collaborating with the National Earth Science Teachers Association (NESTA) to host a one-day workshop for educators. This workshop and partnership may serve as a new model for GSA to serve K–12 and 2YC educators via its Annual Meetings.

### *AGeS2 (Awards for Geochronology Student Research 2) Program*

In 2018, GSA partnered with Becky Flowers (University of Colorado Boulder) and Ramón Arrowsmith (Arizona State University) to apply for and obtain a three-year, cross-programmatic award from the NSF to support the AGeS2 (Awards for Geochronology Student research 2) program, which expands the AGeS1 program into a wider initiative. AGeS offers opportunities for graduate students to develop the scientific rationale for projects involving geochronology and then provides them with hands-on experience acquiring data in labs, all while being mentored by geochronologists. This grants program is available to GSA student members and is separate from, but complementary to, GSA's long-standing Graduate Student Research Grants program. The AGeS2 student awardees will participate in teleconferences with the cohort of funded AGeS students over a two-year interval. Each awardee will also receive an additional US\$500 to attend an AGeS cohort workshop preceding the 2020 or 2021 GSA Annual Meeting, and will be encouraged to present their results at the meeting. Learn more at [www.geosociety.org/ages](http://www.geosociety.org/ages).



"This course blew my expectations out of the water."

### *Short Courses*

GSA offers Short Courses at each of our Geographic Section Meetings and at Annual Meetings. The courses are taught by professional geoscientists and enable attendees to learn new topics, build skills, and network. If you plan to run a field trip or a field camp, consider taking our Field Safety Leadership Course at our next Annual Meeting. An attendee last year said it was an "excellent short course that should be mandatory for all field camp directors, faculty teaching field camp, and any field geologist!"



### *Graduate Student Research Grants*

GSA's Graduate Student Research Grants Program continues to be one of the largest and most prestigious funding programs for graduate students in the geosciences. The goals of the program are to

- Support graduate student research in the geosciences and ultimately enhancement of the geoscience workforce;
- Provide career-development opportunities for students by gaining experience with grant writing, project development, and research; and
- Increase the diversity of the geosciences through opportunities for students from underrepresented communities to achieve success in research.

In collaboration with the Research Grants Committee, GSA staff developed an anti-plagiarism strategy to help educate students about writing research proposals that meet ethical standards.

2019 was the third and final year of GSA's latest three-year NSF grant; GSA staff is currently working on writing a new proposal to seek NSF funding to support the program through 2022.





# Bridging the Geosciences and Public Policy

## DID YOU KNOW...

Five GSA Geographic Sections sponsored students to attend Congressional Visits Day in September 2018.

### HOW GSA MEMBERS CAN GET INVOLVED:

- ✓ Attend Congressional Visits Day.
- ✓ Advocate for science policy.
- ✓ Simply paying your dues helps GSA to work in this area.
- ✓ Apply to be a GSA Science Policy Fellow or GSA-USGS Congressional Science Fellow.

*“From field camp to the halls of the U.S. Capitol, my journey as a professional earth scientist was made possible by the opportunities and the people of GSA.”—D. Szymanski*

## GSA MEMBERS MEET WITH MEMBERS OF CONGRESS

GSA provides opportunities for its members to meet with policy makers by holding Congressional Visits Days and associated training sessions. Participants begin with an orientation workshop that covers relevant legislation, the structure of Congress, and strategies to build relationships between scientists and policy makers before conducting congressional visits.

GSA led the organization of Geosciences Congressional Visits Day in September 2018, during which 40 geoscientists from multiple scientific societies conducted visits to 70 congressional offices. Five GSA Geographic Sections sponsored students to attend, joining GSA leadership and scientists selected through GSA’s online application process. Vanessa Swenton, the Cordilleran Section student

representative, reflected, “I learned so much about geoscience policy, legislation, and how we, the scientists, can have a positive impact on the continuation of geoscience federal funding and support from Congress members. This was an amazing opportunity.”



GSA student representatives meet with Rep. Suzanne Bonamici (D-OR) during Congressional Visits Day.



GSA Geology & Public Policy Committee members meet with Congressional Research Service staff.

### GSA SCIENCE POLICY FELLOW



GSA Science Policy Fellow Laura Szymanski began a one-year term as the in-house fellow in September 2018, working in GSA's Washington, D.C., office to

bring science and scientists into the policy process. Laura assisted with planning and facilitation of Congressional Visits Day, wrote blog posts ([Speaking of Geoscience, https://speakingofgeoscience.org](https://speakingofgeoscience.org)) to keep GSA members updated on policy, represented GSA at hearings on relevant geoscience legislation and programs, and developed resources for GSA members to engage in policy.

### GSA-USGS CONGRESSIONAL SCIENCE FELLOW



Each year, GSA and the U.S. Geological Survey jointly sponsor a geoscientist to spend a year working in the office of a member of Congress or congressional

committee. Caitlin Keating-Bitonti, an earth scientist with expertise in paleontology, spent 2018–2019 working in the office of Senator Tom Udall (D-NM). Caitlin earned her B.S. in geology from Syracuse University, her M.S. in geology from the University of Wisconsin–Madison, and her Ph.D. in geological and environmental sciences from Stanford University.

### VISITING SENIOR POLICY ADVISER



Dr. Monica E. Gowan spent two weeks in Washington, D.C., contributing to and assisting the GSA Geoscience Policy Office in representing the shared

interests of the geoscience community in the federal policy process, collaborating and providing advice on current and emerging science policy issues impacting the geoscience community and society at large, and leveraging opportunities for improving science advice to policy makers.



Above from left: Stephen Moysey discusses virtual reality technology with congressional staff at the Coalition for National Science Funding Exhibition. GSA Director for Geoscience Policy Kasey White presents the 2018 USGS Coalition Leadership Awards to Rep. Vicente Gonzalez (D-TX).

### GSA TESTIFIES IN SUPPORT OF GEOSCIENCE FUNDING

GSA Director for Geoscience Policy Kasey White testified before the House Appropriations Subcommittee on Interior, Environment, and Related Agencies in support of the U.S. Geological Survey (USGS). GSA also submitted testimony for increased funding for the National Science Foundation (NSF) and National Aeronautics and Space Administration (NASA) for fiscal year 2020. GSA is an active member of coalitions that submitted testimony and letters in support of these and other geoscience agencies, including the Coalition for National Science Funding (CNSF), the Coalition for Aerospace and Science, USGS Coalition, the Energy Sciences Coalition, and the Task Force on American Innovation.

### GSA ON THE HILL

GSA showcased geoscience research via Capitol Hill exhibits that drew hundreds of congressional members, staff, and executive branch leaders. At the 25th Annual CNSF Exhibition, in support of NSF research, Stephen Moysey, East Carolina University, and Kelly Best Lazar, Clemson University, presented “Virtual Reality Geoscience Field Trips: Bringing the World into the Classroom” to members of the National Science Board, congressional staff, and other policy leaders.

The 2018 USGS Coalition Leadership Awards were presented to Reps. Doug Lamborn (R-CO) and Vicente Gonzalez (D-TX) on 12 Sept. 2018. USGS Director James Reilly, Dept. of the Interior Assistant Secretary for Water and Science Tim Petty, congressional staff, USGS representatives, and scientists were in attendance.

### GEOSCIENCE AND SOCIETY SUMMIT

GSA was a cosponsor of the Geoscience and Society Summit in Stockholm, Sweden, in March 2019, which created an interactive forum for scientists and users of scientific information to tackle global and local challenges around sustainability of natural resources and systems, global health, and resilience.

### NEW AND UPDATED POSITION STATEMENTS

GSA Council adopted minor revisions to three statements: “Managing U.S. Coastal Hazards,” “Integrating Geoscience with Sustainable Land-Use Management,” and “The Role of the Geoscientist in Assuring the Safety and Integrity of Infrastructure.”

### STATE AND LOCAL POLICY ENGAGEMENT

Kasey White attended the National Conference of State Legislators Legislative Summit in August 2018. Laura Szymanski led district visits to the Maine delegation for participants attending the 2019 Northeastern Section Meeting.



**GEOLOGICAL SOCIETY OF AMERICA**  
**F O U N D A T I O N**

# Serving Geoscience and the Profession

## DID YOU KNOW...

AmazonSmile is a simple and automatic way for you to support the GSA Foundation every time you shop, at no additional cost to you, on [smile.amazon.com](https://smile.amazon.com) (the same products as on Amazon.com). Amazon donates 0.5% of the price of your purchases to GSAF when you designate us as the charitable organization of your choice.



### HOW GSA MEMBERS CAN GET INVOLVED:

✓ Support students, research, and education through a contribution to the GSA Foundation when you renew your 2020 membership.

“GSA, in the forms of inspiring programs, grants and awards, and beautiful rocks, has been there to help guide me along my winding path.” —M. Richards

The mission of the Geological Society of America Foundation is to develop and provide funds to support the goals and programs of the Geological Society of America. These funds are distributed according to the needs of the Society and in a manner consistent with the desire of the donors.

The responsibilities of the Foundation are twofold: (1) to support GSA programs, and (2) to preserve the Foundation’s assets for the future.

## 2018–2019 Highlights

### VENTURING INTO DEATH VALLEY WITH GSAF

Camaraderie over happy hour after dusty days in the field, friendships forged under hot desert sun, new personal and professional connections—although these things may not be what lured attendees to GSAF’s first-ever Rendezvous in April 2019, they are the kinds of experiences had and connections made after a six-day trip based in Shoshone, California, USA.

GSAF was thrilled to kick off the Death Valley Rendezvous, the first in what we hope will become a series of one to two trips per year, with 25 participants from coast to coast. Some attendees were longtime friends of the Foundation, and some we were meeting for the first time; some were students, some current professional geologists across disciplines, others retired from long careers, and some were family members of geologists attending. The trip held interest for all, from a fascinating spectrum of geology to a presentation on the local ecology with a Nature Conservancy naturalist. Trip leader Darrel Cowan led lively, rich discussions at each site. One of the students, a Wright-Troxel Research Grant recipient, gave an evening presentation on his research focused on a nearby site.

Feedback from participants was so positive, and the slots filled so quickly, that we are encouraged to hold similar Rendezvous trips in the future. Keep on the lookout to see where our next destination will be.







## ON TO THE FUTURE

Thanks to dozens of individuals, Associated Societies, GSA Geographic Sections, and corporate sponsors for continuing to help advance On To the Future (OTF), GSA’s flagship diversity-enhancing program. We are pleased to report that the Foundation was able to fully fund 75 students to attend the OTF program at the GSA 2019 Annual Meeting in Phoenix, Arizona, USA, 22–25 Sept.



Amy Moser, GSA Field Camp Scholarship recipient.

## FIELD CAMPS

Our donors, recognizing how vital it is to help students attend field camp, responded so strongly to a campaign we ran that we were able to provide 15 scholarships to help students attend field camps of their choice. We are expanding our efforts to secure funding on a continuing basis for this purpose.

## TEKTONIKOS

In 2018, the Foundation was inspired to recognize our 1,133 student donors by naming their unique giving circle Tektonikos. The accompanying tagline, “Building the Future,” conveys their important role in the geosciences.



Tektonikos student donor receiving a thank-you gift.

## GEOCAREERS

Corporate partnerships supported a sixth year of the GSA GeoCareers Program, now including year-round resources for students and early career professionals and a presence at GSA Geographic Section Meetings.

## PARDEE LEGACY CIRCLE

Also in 2018, the Foundation unveiled newly branded materials with updated messaging for our Pardee Legacy Circle, which recognizes those who have included the Foundation in their estate plans. New members of the Legacy Circle have been included on recent donor visits to steward and cultivate this group.

The Foundation is pleased to help donors support GSA programs and priorities important to them. Looking forward, the Foundation and GSA are collaborating to carry out even more effective resource-building strategies. With your help we will shape a strong future for GSA.

We encourage every member to avail themselves of the opportunity to serve GSA and to support the Foundation in their combined efforts to ensure the dynamism and strength of the geosciences. Please visit the Foundation’s website ([www.gsa-foundation.org](http://www.gsa-foundation.org)) for information and ideas regarding ways you can make a philanthropic impact for GSA and the geosciences.

**John W. Hess**  
President GSA Foundation

**Wesley Ward**  
Chair GSA Foundation  
Board of Trustees

# Broadening Corporate and Organizational Relationships

GSA and the GSA Foundation collaborate with a wide range of partners and sponsors supporting the Annual Meeting and more, including field camp excellence recognition, geoscience students' field camp attendance, diversity programs, and a number of in-kind services. We are pleased to be welcoming companies in a more integrated way during the Annual Meeting, such as in Technical Sessions, Short Courses, and Field Trips, which are now searchable by four different industry tracks, along with applied geoscience sessions. Additionally, representatives from our corporate partners have served on proposal teams, strategic planning task forces, and our careers

program committee, and even attended a Foundation field trip along with individual donors.

The combined efforts of business and science can make a greater difference than any organization alone. As GSA continues to convey its relevance to the private sector, we look forward to expanding corporate relationships in a variety of industries. Together, we can foster the growth of current and future leaders in the geoscience community, engaging business and industry as a positive force to advance science, stewardship, and service.

We thank the companies that join us in the meaningful impacts of partnership (asterisk indicates in-kind contributions).

## Thank You FY2019 Sponsors

### DOUBLE DIAMOND



ExxonMobil

### GOLD



Anadarko Petroleum Corporation



Chevron



Image Audiovisuals\*



Indiana Geological & Water Survey



Newmont Mining Corporation

### SILVER



Indiana State Museum\*



Saudi Aramco

### BRONZE



Chesapeake Energy



Hess Corporation



Paleontological Society

### CONTRIBUTOR

Society of Economic Geologists

# Take Advantage of the following GSA Partnerships with your 2020 Membership



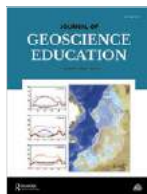
**RENEW  
by 1 Nov.  
SAVE 15%\***

\*Applies to those in high income country/territories



## **Geofacets FREE**

Supercharge your research with Geofacets—web-based research tool to access thousands of georeferenced maps. Search by keyword, map coordinates, scale, map type, and more.



## **Journal of Geoscience Education (JGE) Special Offer**

Peer-reviewed publication for geoscience education research concerning the pedagogy, assessment, and philosophy of teaching and learning—published for the National Association of Geoscience Teachers (NAGT) by Taylor & Francis. Online subscription US\$45 including archives (US\$35 savings).



## **Interior Federal Credit Union Membership (IFCU) Special Offer**

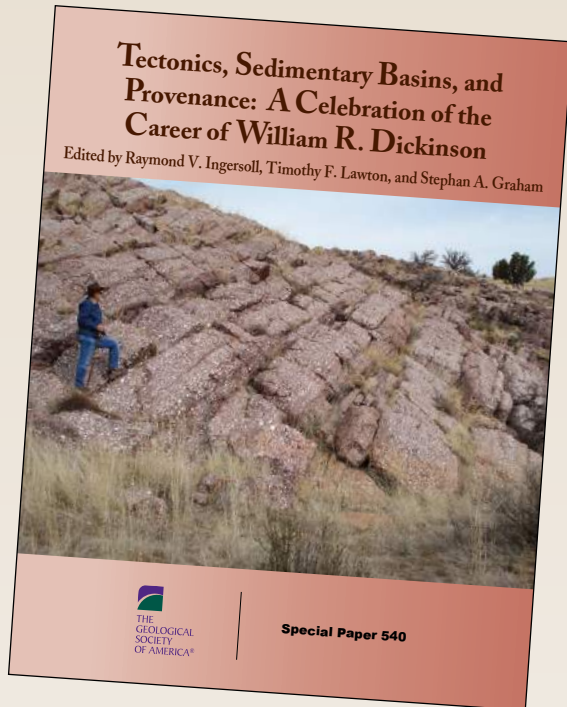
IFCU funds the first US\$25 deposit into a savings account to establish membership. IFCU also offers a young adult account—ideal for GSA student and early career professional members.



## **Mappt Standard Special Offer**

Powerful mobile GIS and data collection app for Android. Easily map and capture data offline in the field using a tablet or mobile phone. Mappt integrates with all major desktop GIS software.

# Add the William R. Dickinson Collection to Your Bookshelf



## **Tectonics, Sedimentary Basins, and Provenance: A Celebration of the Career of William R. Dickinson**

*Edited by Raymond V. Ingersoll, Timothy F. Lawton, and Stephan A. Graham*

Through a remarkable combination of intellect, self-confidence, engaging humility, and prodigious published work, William R. Dickinson influenced and challenged three generations of sedimentary geologists, igneous petrologists, tectonicists, sandstone petrologists, archaeologists, and other geoscientists. A key figure in the plate-tectonic revolution of the 1960s–1970s, he explained how the distribution of sediments on Earth's surface could be traced to tectonic processes, and is widely recognized as a founder of modern sedimentary basin analysis. A tribute to the depth and breadth of his geoscience contribution, this volume presents 31 chapters related to Dickinson's research interests. Many of the authors are his former students, their students, and their students' students, demonstrating his profound influence.

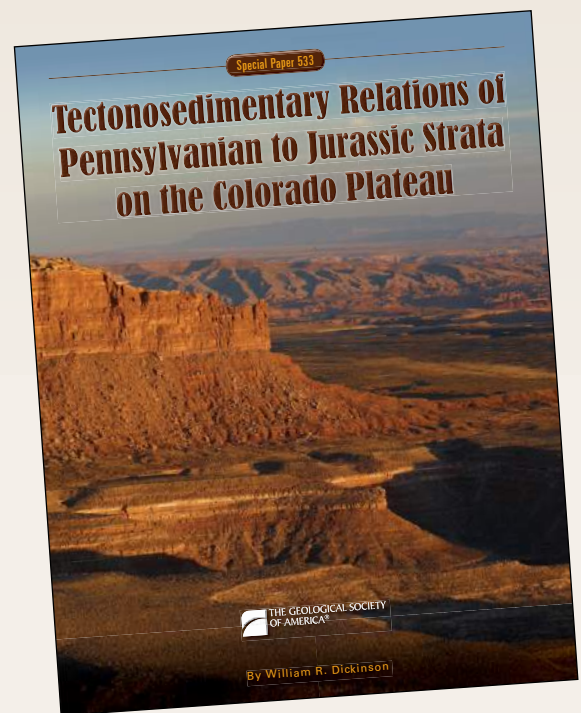
SPE540, 757 p., ISBN 9780813725406  
\$99.00 | **member price \$70.00**

## **Tectonosedimentary Relations of Pennsylvanian to Jurassic Strata on the Colorado Plateau**

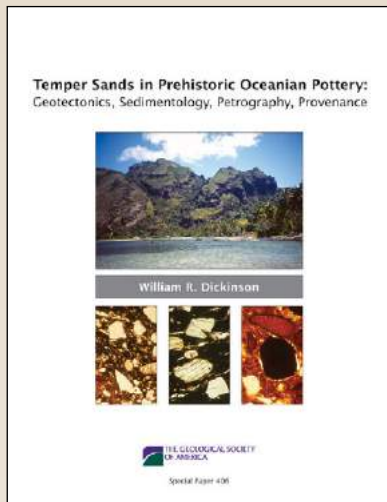
*By William R. Dickinson*

William R. Dickinson (1931–2015) retired in 1991, but didn't stop working, researching, and writing. His detrital-zircon studies, including those with George Gehrels that found much of the Colorado Plateau Pennsylvanian to Jurassic sandstone to be derived from the orogenic belt of the Appalachian Mountains, led Dickinson to his work on identifying key aspects of the sedimentary and tectonic history of Colorado Plateau Mesozoic strata. Dividing the strata into 7 depositional systems, he completed writing on only the lower 5 (Moenkopi, Chinle, Glen Canyon, San Rafael, Morrison) before his death in July 2015. However, his treatment of upper Paleozoic strata and the lower five Mesozoic "deposystems" was comprehensive, and an abstract and conclusion by Jon Spencer complete the volume.

SPE533, 184 p., ISBN 9780813725338  
\$60.00 | **member price \$42.00**



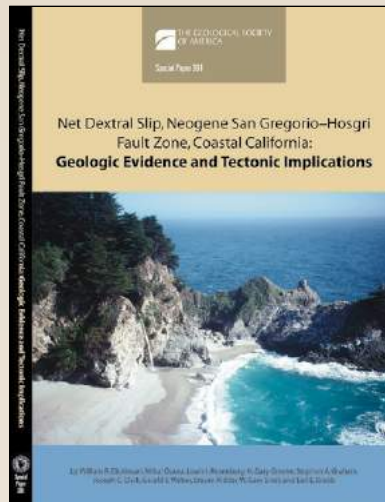
VISIT THE GSA STORE AT <http://rock.geosociety.org/store>



**Temper Sands in Prehistoric Oceanian Pottery: Geotectonics, Sedimentology, Petrography, Provenance**

*By William R. Dickinson*

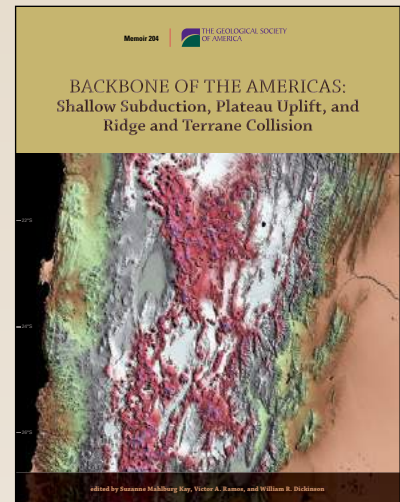
SPE406, ISBN 9780813724065, 160 p., \$10.00



**Net Dextral Slip, Neogene San Gregorio-Hosgri Fault Zone, Coastal California: Geologic Evidence and Tectonic Implications**

*By William R. Dickinson, Mihai Ducea, Lewis I. Rosenberg, H. Gary Greene, Stephan A. Graham, Joseph C. Clark, Gerald E. Weber, Steven Kidder, W. Gary Ernst, and Earl E. Brabb*

SPE391, ISBN 0813723914, 43 p., \$10.00



**Backbone of the Americas: Shallow Subduction, Plateau Uplift, and Ridge and Terrane Collision**

*Edited by Suzanne Mahlburg Kay, Victor A. Ramos, and William R. Dickinson*

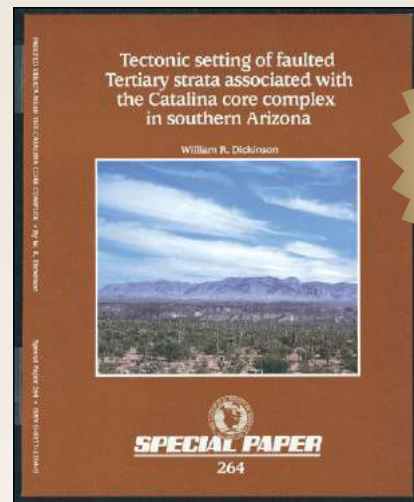
MWR204P, ISBN 9780813712048, 278 p., \$9.99



**Kinematics of Transrotational Tectonism in the California Transverse Ranges and Its Contribution to Cumulative Slip Along the San Andreas Transform Fault System**

*By William R. Dickinson*

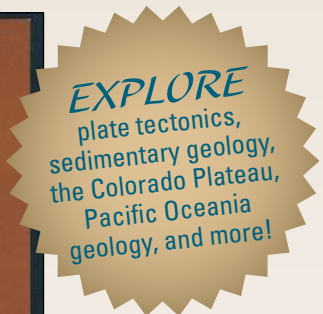
SPE305P, ISBN 0813723051, 46 p., \$9.99



**Tectonic Setting of Faulted Tertiary Strata Associated with the Catalina Core Complex in Southern Arizona**

*By William R. Dickinson*

SPE264P, ISBN 0813722640, 106 p., \$9.99





## Register Today!

Register before you get on site at [community.geosociety.org/gsa2019/attend/registration](http://community.geosociety.org/gsa2019/attend/registration).

### Phoenix Convention Center Registration Desk On-Site Registration

Hall DE Prefunction North Building

Sat., 21 Sept., 7 a.m.–7 p.m.

Sun., 22 Sept., 6:30 a.m.–6:30 p.m.

Mon.–Wed., 23–25 Sept., 7 a.m.–4:30 p.m.

## Travel & Transportation

**Phoenix Sky Harbor International Airport (PHX):** Sky Harbor is less than ten minutes from downtown. Convenient transportation to/from the airport comes by way of PHX Sky Train (free; drops you at the 44th Street & Washington light-rail stop).

**Valley Metro light-rail system:** US\$2; all-day pass: US\$4. Take the light rail west to downtown.

**Transit Bus:** For route information and schedules use NextRide: +1-602-253-5000. Text 64274 and enter NXRD and the bus-stop number; you'll receive a text with the arrival time of the next bus.

**Dial-A-Ride:** This service is available seven days a week for people with disabilities. Hours: 5 a.m.–10 p.m. To reserve your ride, call +1-602-253-5000.

Learn more at [www.valleymetro.org](http://www.valleymetro.org).

## Notice of GSA Council Meetings

GSA 2019 Annual Meeting & Exposition  
Phoenix, Arizona, USA

8 a.m.–noon, Saturday, 21 Sept.

8 a.m.–noon, Wednesday, 25 Sept.

GSA Headquarters Hotel—Sheraton Phoenix Downtown  
340 N 3rd St, Phoenix, Arizona 85004, USA  
Paradise Valley Room \*

All GSA members are invited to attend the open portions of these meetings.

*\*Meeting room is subject to change. Updates will be posted.*

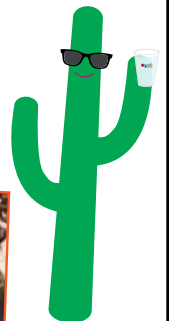


## ICEBREAKER

Get to Know Your Fellow Attendees

Saturday, 21 Sept., 5–7 p.m.

Join fellow industry professionals, students, academics, and GSA's Associated Societies to kick off the meeting with a beverage and great company.



# Schedule at-a-Glance

## Saturday, 21 Sept.

- ▶ Short Courses: 8 a.m.–5 p.m. (some begin on Friday)
- ▶ Pre-Meeting Field Trips (some begin earlier)
- ▶ Various business meetings of GSA, GSA Divisions, and Associated Societies
- ▶ PHOENIX ICEBREAKER: 5–7 p.m.

## Sunday, 22 Sept.

- ▶ Oral Technical Sessions: 8 a.m.–noon
- ▶ GeoCareers Center: 9 a.m.–5 p.m.
- ▶ GeoCareers Events: 9 a.m.–7 p.m.
- ▶ Late-Breaking Session: Ridgecrest Earthquake: 8 a.m.–noon
- ▶ Poster Sessions: 9 a.m.–5:30 p.m.
- ▶ Lunch Break: noon–1:30 p.m.
- ▶ GSA Presidential Address & Awards Ceremony: noon–1:30 p.m.
- ▶ Oral Technical Sessions: 1:30–5:30 p.m.
- ▶ Late-Breaking Session: Ridgecrest Earthquake: 1:45 p.m.–5:30 p.m.
- ▶ Exhibits Open: 2–7 p.m.
- ▶ Company Connection: 2–7 p.m.
- ▶ Exhibits Opening Reception: 5:30–7 p.m.

## Monday, 23 Sept.

- ▶ Oral Technical Sessions: 8 a.m.–noon
- ▶ GeoCareers Center: 9 a.m.–5 p.m.
- ▶ Company Connection: 10 a.m.–6:30 p.m.
- ▶ Poster Sessions: 9 a.m.–6:30 p.m.
- ▶ Exhibits: 10 a.m.–6:30 p.m.
- ▶ Lunch Break: noon–1:30 p.m.
- ▶ Feed Your Brain: 12:15–1:15 p.m.  
(*Lunchtime Enlightenment*, buy your food and take it in)

- ▶ Oral Technical Sessions: 1:30–5:30 p.m.
- ▶ Collaborations & Conversations—Posters: 4:30–6:30 p.m.
- ▶ Alumni Receptions: evening hours

## Tuesday, 24 Sept.

- ▶ Oral Technical Sessions: 8 a.m.–noon
- ▶ GeoCareers Center: 9 a.m.–5 p.m.
- ▶ Company Connection: 10 a.m.–6:30 p.m.
- ▶ Poster Sessions: 9 a.m.–6:30 p.m.
- ▶ Exhibits: 10 a.m.–6:30 p.m.
- ▶ Lunch Break: noon–1:30 p.m.
- ▶ Feed Your Brain: 12:15–1:15 p.m.  
(*Lunchtime Enlightenment*, buy your food and take it in)
- ▶ Oral Technical Sessions: 1:30–5:30 p.m.
- ▶ Collaborations & Conversations—Posters: 4:30–6:30 p.m.

## Wednesday, 25 Sept.

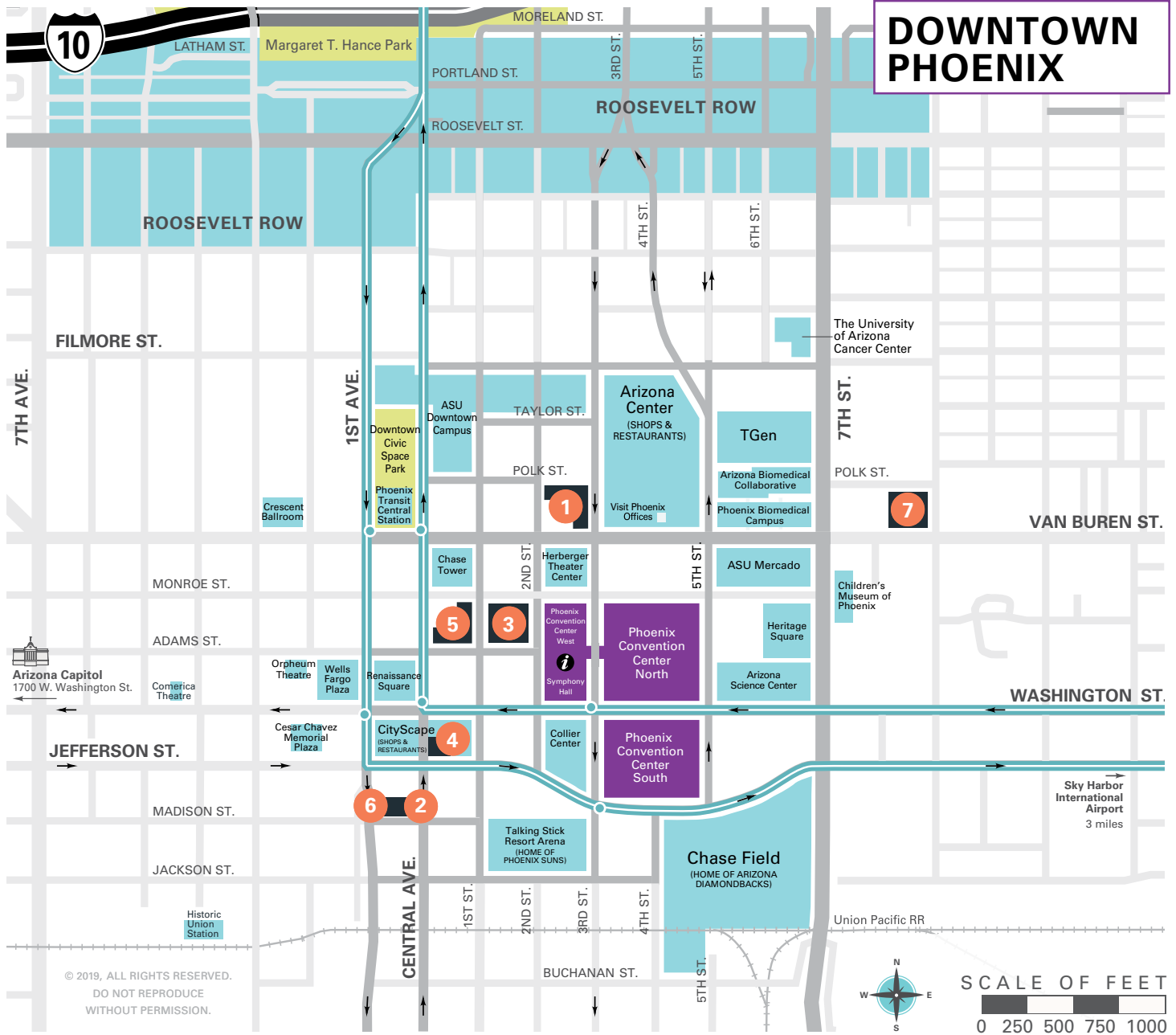
- ▶ Oral Technical Sessions: 8 a.m.–noon
- ▶ GeoCareers Center: 9 a.m.–noon
- ▶ Company Connection: 10 a.m.–2 p.m.
- ▶ Poster Sessions: 9 a.m.–6:30 p.m.
- ▶ Exhibits: 10 a.m.–2 p.m.
- ▶ Lunch Break: noon–1:30 p.m.
- ▶ Feed Your Brain: 12:15–1:15 p.m.  
(*Lunchtime Enlightenment*, buy your food and take it in)
- ▶ Oral Technical Sessions: 1:30–5:30 p.m.
- ▶ Collaborations & Conversations—Posters: 4:30–6:30 p.m.

## Thursday, 26 Sept.

- ▶ Post-Meeting Field Trips

# Downtown Phoenix Hotel Map

## DOWNTOWN PHOENIX



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### HOTELS

### SINGLE/DOUBLE

### LEGEND

1	Sheraton Phoenix Downtown (HQ)	\$199
2	Courtyard by Marriott Phoenix Downtown	\$189
3	Hyatt Regency Phoenix	\$199
4	Kimpton Hotel Palomar Phoenix	\$179
5	Renaissance Phoenix Downtown Hotel	\$199
6	Residence Inn by Marriott Phoenix Downtown	\$209
7	Springhill Suites by Marriott Phoenix Downtown	\$159

- LIGHT RAIL ROUTE
- LIGHT RAIL STATION
- VISITOR INFO CENTER
- CONVENTION CENTER
- POINT OF INTEREST
- HOTELS
- PARK



If you are entering the job market or are supporting someone who is and want more information about career pathways in the geosciences, plan to attend one or more of the events below. PCC—Phoenix Convention Center.



## GeoCareers Events

**Résumé Library:** Upload your résumé for recruiters who will be at the meeting.

**Pre-Meeting Webinar: Exploring a Career in Mining,** Wed., 21 August, 11 a.m. MDT; register at <https://attendee.gotowebinar.com/register/8892842747569519875>

**Pre-Meeting Webinar: Geoscience Careers in the Petroleum Industry,** Wed., 18 Sept., 11 a.m. MDT; register at <https://attendee.gotowebinar.com/register/3422063214384043523>

**Geoscience Career Workshop:** Sun., 9–10:30 a.m., PCC, 120BC North Building

**Company Lightning Talks:** Sun., 10:30–11:30 a.m., PCC, 120BC North Building

**Panel Luncheon:** Sun., noon–1 p.m., PCC, 120BC North Building

**Company Information Booths:** Sun., 2–7 p.m.; Mon.–Tues., 10 a.m.–6:30 p.m.; Wed., 10 a.m.–2 p.m., PCC, Exhibits Hall E North Building

## GeoCareers Center

PCC, 124AB North Building  
Open Sun.–Tues., 9 a.m.–5 p.m.; Wed., 9 a.m.–noon

### Career Information:

- Career Presentations
- Drop-In Mentoring
- Early Career Professional Coffee
- Geology Club Meet-Up
- Networking Reception
- Post or View Jobs
- Résumé Review Clinic
- Women in Geology Program

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## Be a Mentor: Make a Difference

“GSA has given me a platform to share my story and help students prepare for a career.” —**Brandy Barnes**, Draper Aden Associates

- Drop-in Mentor ■
- Networking Reception Mentor ■
- Résumé Mentor ■
- Women in Geology Mentor ■
- On To the Future Mentor ■

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# 2020 GSA Section Meetings



## South-Central

9–10 March  
Fort Worth, Texas, USA  
Chairs: Omar Harvey, [omar.harvey@tcu.edu](mailto:omar.harvey@tcu.edu); Arne Winguth, [awinguth@uta.edu](mailto:awinguth@uta.edu)  
[www.geosociety.org/sc-mtg](http://www.geosociety.org/sc-mtg)

Fort Worth Stockyards. Photo by Visit Fort Worth.



## Joint Southeastern–Northeastern

20–22 March  
Reston, Virginia, USA  
Chairs: Arthur Merschat, [amerschat@usgs.gov](mailto:amerschat@usgs.gov); Patrick Burkhart, [patrick.burkhart@sru.edu](mailto:patrick.burkhart@sru.edu)  
[www.geosociety.org/se-mtg](http://www.geosociety.org/se-mtg)

Great Falls Park. Photo by Visit Fairfax.



## Rocky Mountain

4–5 May  
Provo, Utah, USA  
Chair: Daniel Horn, [hornsd@uvu.edu](mailto:hornsd@uvu.edu)  
[www.geosociety.org/rm-mtg](http://www.geosociety.org/rm-mtg)

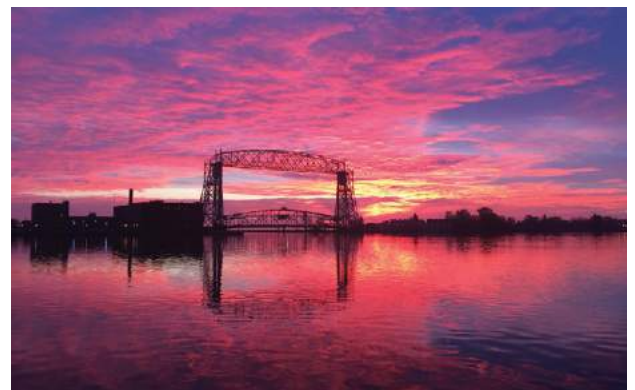
Mount Timpanogos. Photo by Hike395 via Wikimedia Commons.



## Cordilleran

12–14 May  
Pasadena, California, USA  
Chair: Doug Yule, [doug.yule@csun.edu](mailto:doug.yule@csun.edu)  
[www.geosociety.org/cd-mtg](http://www.geosociety.org/cd-mtg)

City Hall. Photo by Pasadena Convention & Visitors Bureau.

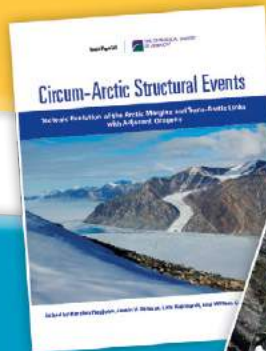


## North-Central

18–19 May  
Duluth, Minnesota, USA  
Chair: Amy Myrbo, [amyrbo@umn.edu](mailto:amyrbo@umn.edu)  
[www.geosociety.org/nc-mtg](http://www.geosociety.org/nc-mtg)

Aerial Lift Bridge at sunrise. Photo by Visit Duluth.

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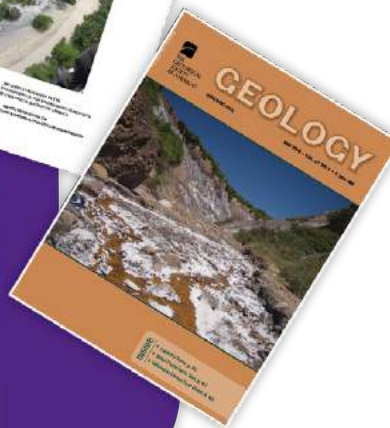
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	2019	5-YEAR	
<i>Geology</i>	5.006	5.406	<a href="http://geology.msubmit.net">geology.msubmit.net</a>
<i>GSA Bulletin</i>	3.970	4.708	<a href="http://gsabulletin.msubmit.net">gsabulletin.msubmit.net</a>
<i>Geosphere</i>	2.847	2.989	<a href="http://geosphere.msubmit.net">geosphere.msubmit.net</a>
<i>Lithosphere</i>	2.486	2.961	<a href="http://lithosphere.msubmit.net">lithosphere.msubmit.net</a>
<i>E&amp;EG</i>	0.844	0.761	<a href="http://eeg.allentrack.net">http://eeg.allentrack.net</a>

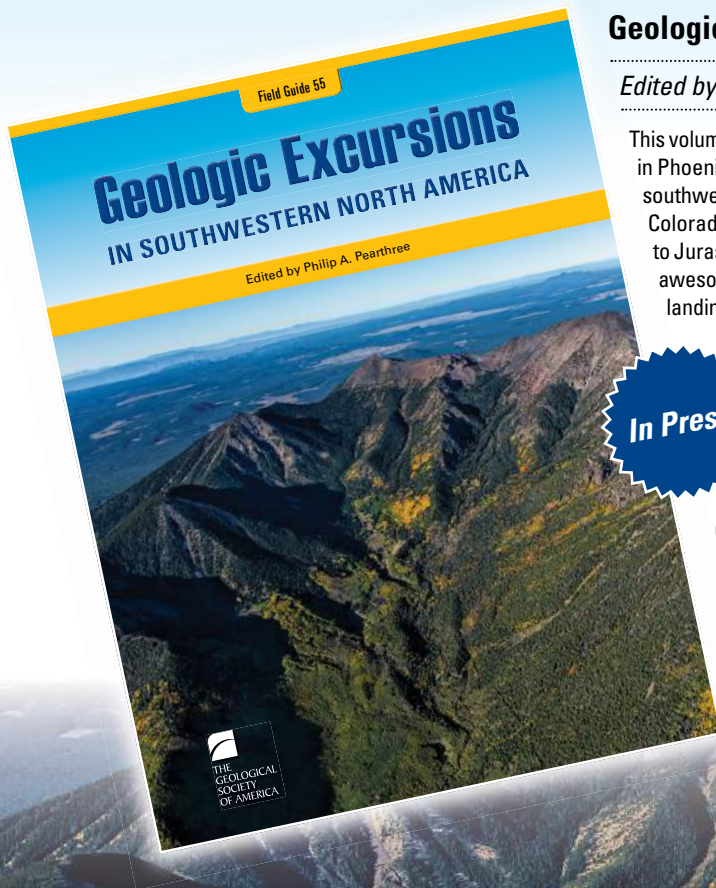
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*Edited by Philip A. Pearthree*

This volume, prepared as part of the Geological Society of America Annual Meeting in Phoenix, includes field guides covering aspects of the spectacular geology of southwestern North America. Field guides tackle the geology of the southern Colorado Plateau, from paleoenvironments of Petrified Forest National Park, to Jurassic sand dunes of southern Utah, to the San Francisco Volcanic Field, to awesome Grand Canyon. Appropriately for the 50th anniversary of the first lunar landing, one trip visits sites in northern Arizona that helped prepare astronauts for their missions. Several guides address aspects of the Proterozoic to Cenozoic tectonic development of the Transition Zone between the Colorado Plateau and the Basin and Range. Exploring the Basin and Range, guides feature Laramide tectonism and ore deposit development, features associated with large-magnitude Cenozoic extensional tectonism, large Miocene volcanic centers in northwestern Arizona, and tectonism and development of the lower Colorado River. Three field guides explore various aspects of northwestern Mexico, including tectonics and ore deposits of Sonora, fauna and paleoenvironments of Colorado River delta deposits, and volcanism in central Baja California. Finally, a guide analyzes anthropogenic earth fissures that have developed in the Phoenix metropolitan area.

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# South-Central Section

54th Annual Meeting of the South-Central Section, GSA  
Fort Worth, Texas, USA

9–10 March 2020

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



Fort Worth Stockyards. Photo by Visit Fort Worth.

## LOCATION

As America's 13th-largest city, Fort Worth is the Texas you want. Visitors can experience the city's vibrant western heritage in the Stockyards National Historic District—complete with the world's only year-round rodeo, authentic saloons, and the world's largest honky-tonk. The renowned cultural district, less than four miles away, is a haven for art enthusiasts and home to five internationally recognized museums plus the emerging art-filled Foundry District. Premier shopping, dining, and live entertainment continue in downtown Fort Worth, with more upscale finds at the new Shops at Clearfork. The Trinity River also provides outdoor activities like canoe and kayak tours, stand-up paddling, and 70+ miles of uninterrupted trails.

## CALL FOR PAPERS

**Abstract deadline:** 3 Dec.

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## TECHNICAL PROGRAM

Please direct questions related to the following sessions to the Technical Program co-chairs, Xiangyang Xie, [x.xie@tcu.edu](mailto:x.xie@tcu.edu), or Arne Winguth, [awinguth@uta.edu](mailto:awinguth@uta.edu).

### Theme Sessions

- T1. **Open Versus Closed Systems in Diagenesis and Hydrothermal Alteration.** R. Douglas Elmore, University of Oklahoma, [delmore@ou.edu](mailto:delmore@ou.edu); Matt Hamilton, University of Oklahoma, [Matt.Hamilton@ou.edu](mailto:Matt.Hamilton@ou.edu); Katie Garrett, University of Oklahoma, [katie-garrett@ou.edu](mailto:katie-garrett@ou.edu). Oral only.
- T2. **Recent Progress in the Southern Oklahoma Aulacogen.** Matt Hamilton, University of Oklahoma, [matt.hamilton@ou.edu](mailto:matt.hamilton@ou.edu); R. Douglas Elmore, University of Oklahoma, [delmore@ou.edu](mailto:delmore@ou.edu); Jonathan D. Price, Midwestern State University, [jonathan.price@msutexas.edu](mailto:jonathan.price@msutexas.edu). Oral only.
- T3. **Unresolved Issues in Integrating Pennsylvanian Stratigraphy, Depositional Systems, and Tectonics in the**

**Eastern Shelf of the Permian Basin.** William A. Ambrose, Bureau of Economic Geology, [william.ambrose@beg.utexas.edu](mailto:william.ambrose@beg.utexas.edu); Tucker F. Hentz, Bureau of Economic Geology, [tucker.hentz@beg.utexas.edu](mailto:tucker.hentz@beg.utexas.edu). Oral only.

- T4. **Geophysical Methods and Application.** Jingyi Chen, The University of Tulsa, [jingyi-chen@utulsa.edu](mailto:jingyi-chen@utulsa.edu); Priyank Jaiswal, Oklahoma State University, [priyank.jaiswal@okstate.edu](mailto:priyank.jaiswal@okstate.edu); Michael Behm, University of Oklahoma, [michael.behm@ou.edu](mailto:michael.behm@ou.edu). Oral only.
- T5. **Recent Advances in Geoscience Research of Northeastern Mexico.** Juan Alonso Ramirez-Fernandez, Universidad Autónoma de Nuevo Leon, [alonso\\_fct@hotmail.com](mailto:alonso_fct@hotmail.com), [juan.ramirezf@uanl.mx](mailto:juan.ramirezf@uanl.mx); Fernando Velasco-Tapia, Universidad Autónoma de Nuevo Leon, [fernando.velascotp@uanl.edu.mx](mailto:fernando.velascotp@uanl.edu.mx); Uwe Jenchen, Universidad Autónoma de Nuevo Leon, [uwe.jenchen@gmail.com](mailto:uwe.jenchen@gmail.com). Oral and poster.
- T6. **Integrating Earth Observations and Geospatial Data for Monitoring and Assessing Natural and Anthropogenic Hazards in the South-Central United States.** Esayas Gebremichael, Texas Christian University, [e.gebremichael@tcu.edu](mailto:e.gebremichael@tcu.edu). Posters only.
- T7. **The Age of American Wastelands: Carboniferous-to-Jurassic Stratigraphy, Sedimentology, and Paleoenvironments of North America.** Neil Tabor, Southern Methodist University, [ntabor@smu.edu](mailto:ntabor@smu.edu); John Holbrook, Texas Christian University, [john.holbrook@tcu.edu](mailto:john.holbrook@tcu.edu). Oral and poster.
- T8. **Permian of the South-Central U.S.: Land and Sea.** Lowell Waite, The University of Texas at Dallas, [lowell.waite@utdallas.edu](mailto:lowell.waite@utdallas.edu); Alicia Bonar, University of Oklahoma, [alicia.bonar@ou.edu](mailto:alicia.bonar@ou.edu); Lily Pfeifer, University of Oklahoma, [lspeifer@ou.edu](mailto:lspeifer@ou.edu); Robert J. Stern, The University of Texas at Dallas, [rjstern@utdallas.edu](mailto:rjstern@utdallas.edu). Oral and poster.
- T9. **Geophysics and Remote Sensing Applications in Tectonics and Geomorphology.** *Cosponsor: GSA Geophysics and Geodynamics Division.* Andrew Katumwehe, Midwestern State University, [andrew.katumwehe@msutexas.edu](mailto:andrew.katumwehe@msutexas.edu); Luel

- Emishaw, Oklahoma State University, leulseg@ostateemail.okstate.edu; Kevin Mickus, Missouri State University, kevinmickus@missouristate.edu. Oral only.
- T10. **Dynamics in Fluvial Process—Landform Relationships across Environmental Gradients.** Peyton E. Lisenby, Midwestern State University, peyton.lisenby@msutexas.edu; Michael C. Slattery, Texas Christian University, m.slattery@tcu.edu. Oral only.
- T11. **Mass Extinction in Earth History: New Insights from Paleobiological, Geochemical, and Modeling Studies of Mass Extinction Events.** Arne Winguth, The University of Texas at Arlington, awinguth@uta.edu. Oral only.
- T12. **Structural Evolution and Sedimentation along the Western Gulf of Mexico Margin.** Timothy Lawton, The University of Texas at Austin, tim.lawton@beg.utexas.edu; Elisa Fitz-Díaz, Universidad Nacional Autónoma de México, elisaf@geologia.unam.mx; Daniel F. Stockli, The University of Texas at Austin, stockli@jsg.utexas.edu. Oral and poster.
- T13. **Sandstone Provenance Study and Its Implications.** Xiangyang Xie, Texas Christian University, x.xie@tcu.edu; Majie Fan, The University of Texas at Arlington, mfan@uta.edu. Oral and poster.
- T14. **Topics in Ichnology: A Session on All Things Related to Trace Fossils.** Patrick Getty, Collin College, pgetty@collin.edu; Stephen Hasiotis, The University of Kansas, hasiotis@ku.edu. Oral only.
- T15. **Orogenesis and Global Change.** Guangsheng Zhuang, Louisiana State University, gzhuang@lsu.edu. Oral and poster.
- T16. **The Role of Geochronology in Constraining the Development of Earth's Lithosphere: Focus on the U.S. South-Central Region, Mexico, and Beyond.** Elizabeth Catlos, The University of Texas at Austin, ejcatlos@jsg.utexas.edu; Rita Economos, Southern Methodist University, reconomos@smu.edu; J. Douglas Walker, University of Kansas, jdwalker@ku.edu. Oral only.
- T17. **Anthropogenic Seismicity in the Central U.S.** Heather DeShon, Southern Methodist University, hdeshon@smu.edu; Maria Beatrice Magnani, Southern Methodist University, mmagnani@smu.edu; Robert T. Gregory, Southern Methodist University, bgregory@smu.edu. Oral and poster.
- T18. **Sedimentology, Geochemistry, Chemostratigraphy, and Geomechanics of Mudrock Systems.** Helge Alsleben, Texas Christian University, h.alsleben@tcu.edu. Oral and poster.
- T19. **Little Minerals, Big Implications.** Nova Mahaffey, The University of Texas at Dallas, nxm154030@utdallas.edu; Leah N. Thompson, The University of Texas at Dallas, sip:ln160230@utdallas.edu; Bob Finkelman, The University of Texas at Dallas, bobf@utdallas.edu. Oral only.
- T20. **Low-Temperature Geochemistry and Biogeochemical Cycles.** Todd Longbottom, Texas Christian University, todd.longbottom@tcu.edu; Sharmila Giri, Case Western Reserve University, s.giri@rsmas.miami.edu. Posters only.
- T21. **Shelf-to-Basin Transition: Carboniferous Sedimentation in Southern Midcontinent.** Walter L. Manger, University of Arkansas at Fayetteville, wmanger@uark.edu; Xiangyang Xie, Texas Christian University, x.xie@tcu.edu; Shaun Prines, Texas Christian University, s.t.prines@tcu.edu. Oral and poster.
- T22. **General Paleontology.** Arthur Busbey, Texas Christian University, a.busbey@tcu.edu. Oral and poster.
- T23. **Hydrogeology and Water Resources.** Gehendra Kharel, Texas Christian University, g.kharel@tcu.edu. Oral and poster.
- T24. **Graduate Student Research across the Geosciences.** Omar R. Harvey, Texas Christian University, omar.harvey@tcu.edu. Oral and poster.
- T25. **Broadening Community Use of Available Data and Tools for Scientific Exploration and Education.** *Cosponsors: EarthCube; GSA Geoinformatics and Data Science Division.* Hongjie Xie, The University of Texas at San Antonio, hongjie.xie@utsa.edu; Alberto Mestas-Nunez, The University of Texas at San Antonio, alberto.mestas@utsa.edu. Posters only.
- T26. **Strengthening Student Engagement, Inclusion, and Learning in the Geosciences, K–Higher Education.** *Cosponsor: National Association of Geoscience Teachers—Mid-Continent Section.* Brendan Hanger, Oklahoma State University, brendan.hanger@okstate.edu; Aida Farough, Kansas State University, afarough@ksu.edu; Liane Stevens, Stephen F. Austin State University, stevenslm@sfasu.edu; Wendi Williams, South Texas College, wwilliam@southtexascollege.edu. Oral and poster.
- T27. **Hands-On Teaching Demonstrations in Geoscience Courses.** Michael T. DeAngelis, University of Arkansas at Little Rock, mtdeangelis@ualr.edu; René A. Shroat-Lewis, University of Arkansas at Little Rock, rashroatlew@ualr.edu. Oral only.
- T28. **Enhancing Diversity in Geoscience Graduate Student Programs.** Samuel L. Moore, The University of Texas at Austin, slmoore@jsg.utexas.edu; Elizabeth J. Catlos, The University of Texas at Austin, ejcatlos@jsg.utexas.edu; Katherine K. Ellins, The University of Texas at Austin, kellins@jsg.utexas.edu; Dana L. Thomas, The University of Texas at Austin, dthomas@jsg.utexas.edu. Oral only.
- T29. **Undergraduate Student Research (Posters).** *Cosponsor: Council on Undergraduate Research.* Omar R. Harvey, Texas Christian University, omar.harvey@tcu.edu.

## FIELD TRIPS

For additional information, please contact the Field Trip co-chairs, Richard Hanson, r.hanson@tcu.edu, and Helge Alseleben, h.alseleben@tcu.edu.

**Building Stones of Downtown Fort Worth.** Tom Dill, tdill@att.net.

### **A View into the Igneous Rift Materials of the Wichita Mountains, Oklahoma: Origins, Emplacement, and Alteration.**

Jonathan D. Price, Midwestern State University, jonathan.price@msutexas.edu; Erin Summerlin-Donofrio, Southern Methodist University, esummerlindonofrio@smu.edu; Matthew Hamilton, University of Oklahoma, matt.hamilton@ou.edu; Amber Quevy, Rigaku Americas Corporation, amberquevy@gmail.com; Alexandria Stevenson, Midwestern State University, alexandria.weiskircher@gmail.com.

**Middle and Upper Pennsylvanian Strata of the Fort Worth Basin.** Michael Read, The University of Texas at Arlington, michael.read@uta.edu; Majie Fan, The University of Texas at Arlington, mfan@uta.edu.

**Geology of the Woodbine Formation in Outcrop along the Shores of Lake Grapevine, North-Central Texas.** Bo Henk, Texas Christian University, bhenk@icloud.com.

**Geology of Paleozoic Outcrops in the Hill Country of Central Texas.** Bo Henk, Texas Christian University, bhenk@icloud.com.

**Wonderings in the Pangaeon Wastelands of Permo-Triassic West Texas.** John Holbrook, Texas Christian University, john.holbrook@tcu.edu; Neil Tabor, Southern Methodist University, ntabor@mail.smu.edu; Anthony Skaleski, Texas Christian University, a.skaleski@tcu.edu.

## WORKSHOPS

- W1. **An Overview of Earth-Science Applications in the Shimadzu Institute for Research Technologies at The University of Texas at Arlington.** Matthew Loocke, The University of Texas at Arlington, matthew.loocke@uta.edu; Jeff Campbell, The University of Texas at Arlington, jeff.campbell@uta.edu. Sun., 8 March, 10 a.m.–3 p.m.
- W2. **Making Geoscience Animations and Videos and Assessing Them in the Classroom.** Robert Stern, The University of Texas at Dallas, rjstern@utdallas.edu; Jeffrey Ryan, University of South Florida, ryan@usf.edu; Ning Wang, The University of Texas at Dallas, Ning.Wang@utdallas.edu; Siloa Willis, The University of Texas at Dallas, Siloa.Willis@utdallas.edu. Sun., 8 March, 10 a.m.–4 p.m.
- W3. **Seismic Modeling, Imaging, and Inversion.** Jingyi Chen, The University of Tulsa, jingyi-chen@utulsa.edu. Sun., 8 March, 1–5 p.m.
- W4. **Mudstones in Core and Thin-Section.** Richard Denne, Texas Christian University, r.denne@tcu.edu. Wed., 11 March, 9 a.m.–4 p.m. Max.: 20.

## ACCOMMODATIONS

**Hotel registration deadline:** 17 Feb.

A block of rooms has been reserved at the Omni Fort Worth Hotel at 1300 Houston Street, Fort Worth, Texas 76102, USA, at a

special meeting rate of US\$209 per night plus tax. Reservations should be made online ([www.omnihotels.com/hotels/fort-worth/meetings/geological-society-of-america](http://www.omnihotels.com/hotels/fort-worth/meetings/geological-society-of-america)) or by calling Omni Reservations at +1-800-THE-OMNI (toll free) and referencing the group name “Geological Society of America.”

## REGISTRATION

**Early registration deadline:** 3 Feb.

**Cancellation deadline:** 10 Feb.

Registration opens in December. For further information or if you need special accommodations, please contact one of the meeting co-chairs, Omar Harvey, omar.harvey@tcu.edu, and Arne Winguth, awinguth@tcu.edu.

## OPPORTUNITIES FOR STUDENTS AND EARLY CAREER PROFESSIONALS

### **Career Mentoring Luncheons**

Ask your career-related questions and learn about non-academic pathways in the geosciences while networking with professionals at the Roy J. Shlemon and John Mann Mentor Luncheons. Students and early career professionals are welcome.

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To learn more about mentors and career workshops, go to [www.geosociety.org/mentors/](http://www.geosociety.org/mentors/) or contact Jennifer Nocerino at [jnocerino@geosociety.org](mailto:jnocerino@geosociety.org).

## PROFESSIONALS

If you like to share your interest, enthusiasm, and experience in applied geology, consider being a GSA mentor at the meeting. Being a mentor is a rewarding experience. To learn more, contact Jennifer Nocerino at [jnocerino@geosociety.org](mailto:jnocerino@geosociety.org).

This meeting also offers an excellent opportunity to earn CEUs toward your continuing education requirements for your employer, K–12 school, or professional registration. The CEU certificate can be downloaded from the meeting website after the meeting.

## LOCAL COMMITTEE

**Co-Chairs:** Omar Harvey, omar.harvey@tcu.edu; Arne Winguth, awinguth@tcu.edu

**Technical Program Co-Chairs:** Cheyenne Xie, x.xie@tcu.edu; Arne Winguth, awinguth@tcu.edu

**Student Volunteer Chair:** Helge Alseleben, h.alseleben@tcu.edu

**Sponsorship Chair:** Richard Denne, r.denne@tcu.edu

**Field Trip Co-Chairs:** Richard Hanson, r.hanson@tcu.edu; Helge Alseleben, h.alseleben@tcu.edu

**Judging Coordinator:** John Holbrook, john.holbrook@tcu.edu

**Exhibits Chair:** Majie Fan, mfan@uta.edu

**Budget/Finance Chair:** Omar Harvey, omar.harvey@tcu.edu

**Education Program (K–12) Chair:** Arne Winguth, awinguth@tcu.edu

**Media Chair:** Bob Stern, rjstern@utdallas.edu

**Meeting Secretary:** Cornelia Winguth, cwinguth@uta.edu



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## Tour the Southwest with FREE GSA Field Guides



If there's one thing Arizona has in abundance is its breathtaking geologic formations, and we want to help you explore them all. To coincide with GSA's 2019 Annual Meeting in Phoenix, we're offering free digital access to the following selection of Southwest field guides—available now through the end of September. Visit the GSA Store at <http://rock.geosociety.org/Store/> and search "FreePhoenix" to download your copy today.

◆ **The mid-Miocene Wilson Ridge pluton and River Mountains volcanic section, Lake Mead area of Nevada and Arizona: Linking a volcanic and plutonic section**  
Field Guides, 2008, p. 1–20, [https://doi.org/10.1130/2008.fld011\(01\)](https://doi.org/10.1130/2008.fld011(01))

◆ **Cenozoic evolution of the abrupt Colorado Plateau–Basin and Range boundary, northwest Arizona: A tale of three basins, immense lacustrine–evaporite deposits, and the nascent Colorado River**  
Field Guides, 2008, p. 119–151, [https://doi.org/10.1130/2008.fld011\(06\)](https://doi.org/10.1130/2008.fld011(06))

◆ **Quaternary volcanism in the San Francisco Volcanic Field: Recent basaltic eruptions that profoundly impacted the northern Arizona landscape and disrupted the lives of nearby residents**  
Field Guides, 2008, p. 173–186, [https://doi.org/10.1130/2008.fld011\(08\)](https://doi.org/10.1130/2008.fld011(08))

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Photos by Steven Semken.

# Joint Meeting: Southeastern and Northeastern Sections

69th Annual Meeting of the Southeastern Section, GSA  
55th Annual Meeting of the Northeastern Section, GSA  
Reston, Virginia, USA  
20–22 March 2020

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



Great Falls Park. Photo by Visit Fairfax.

## *Sediments, Structures, Shores, and Storms: Keeping a Keen Eye on Eastern Geology*

### LOCATION

The joint meeting of GSA's Southeastern and Northeastern Sections will be held in Reston, Virginia, USA. Reston is a modern, planned community located in northern Virginia. The numerous historic and cultural attractions of Washington, D.C., are just a short distance away and ready to be explored. A mix of bistros, restaurants, and shopping on an extensive pedestrian mall are just out the door of the Hyatt Regency Reston, the conference venue. Situated at the Fall Zone and the transition from the southern to the central and northern Appalachians, Reston provides a unique vantage point to examine all aspects of eastern geology. We have developed a robust and diverse technical program that links together the geology of the southeastern and northeastern U.S., a program that ranges from the crust to mantle, data to policy, mountains to coastal processes, and paleontology to energy. We invite you to join us for a field trip across D.C. or the Appalachian orogen, a workshop on applied micropaleontology or making geologic videos, and a broad scope of technical sessions and symposia that will help us keep a keen eye on eastern geology.

### CALL FOR PAPERS

**Abstracts deadline:** 10 Dec.

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

**Abstract submission fee:** US\$18 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 PROGRAM

#### Symposia

S1. **The Past is the Key to the Present—The Role of Paleontology and Geology in Management and Decision Making.** G. Lynn Wingard, U.S. Geological Survey, [lwingard@usgs.gov](mailto:lwingard@usgs.gov); Chris Bernhardt, U.S. Geological Survey, [cbernhardt@usgs.gov](mailto:cbernhardt@usgs.gov).

- S2. **The Appalachians, from North to South, from Crust to Mantle.** *Cosponsors: GSA Structural Geology and Tectonics Division; GSA Geophysics and Geodynamics Division.* Allison Severson, Colorado School of Mines, [aseverson@mymail.mines.edu](mailto:aseverson@mymail.mines.edu); Yvette Kuiper, Colorado School of Mines, [ykuiper@mines.edu](mailto:ykuiper@mines.edu); Maureen Long, Yale University, [maureen.long@yale.edu](mailto:maureen.long@yale.edu); Lara Wagner, Carnegie Institution of Washington, [lwagner@carnegiescience.edu](mailto:lwagner@carnegiescience.edu); Chuck Bailey, College of William & Mary, [cmbail@wm.edu](mailto:cmbail@wm.edu).
- S3. **From the Margins to the Deep: A Tribute to the Science and Art of A. Conrad Neumann.** Blair R. Tormey, Western Carolina University, [btormey@wcu.edu](mailto:btormey@wcu.edu); Paul J. Hearty, University of Texas at Austin, [kaisdad04@gmail.com](mailto:kaisdad04@gmail.com).
- S4. **New Developments in Diversity and Inclusion in the Geosciences.** Alexander Gates, Rutgers University, [agates@rutgers.edu](mailto:agates@rutgers.edu); Marilyn Suiter, National Science Foundation, [msuiter@nsf.gov](mailto:msuiter@nsf.gov).
- S5. **Radionuclides: Biogeochemistry, Transport, and Geological Applications.** Jim Kaste, College of William & Mary, [jmkaste@wm.edu](mailto:jmkaste@wm.edu).
- S6. **Stratigraphic Problems and Solutions in the Appalachian Basin.** *Cosponsors: GSA Energy Geology Division; GSA Sedimentary Geology Division; GSA Hydrogeology Division; GSA Karst Division.* Daniel Doctor, U.S. Geological Survey, [dhdoctor@usgs.gov](mailto:dhdoctor@usgs.gov); Randall Orndorff, U.S. Geological Survey, [romdorff@usgs.gov](mailto:romdorff@usgs.gov); David Weary, U.S. Geological Survey, [dweary@usgs.gov](mailto:dweary@usgs.gov).
- S7. **The Grenville Orogen in Eastern North America.** Greg Walsh, U.S. Geological Survey, [gwalsh@usgs.gov](mailto:gwalsh@usgs.gov); John

Aleinikoff, U.S. Geological Survey, jaleinikoff@usgs.gov; Paul Mueller, University of Florida, pamueller@ufl.edu; Richard Tollo, George Washington University, rtollo@gwu.edu; Arthur Merschat, U.S. Geological Survey, amerschat@usgs.gov; Peter Valley, pvvalley@gmail.com; Mike Williams, University of Massachusetts Amherst, mlw@geo.umass.edu.

### Theme Sessions

- T1. **Abiotic-Biotic Interactions in the Critical Zone.** Justin Richardson, University of Massachusetts Amherst, jbrichardson@umass.edu.
- T2. **Wetlands in a Changing World: Impacts of Environmental Change on Wetland Function and Ecosystem Services.** Miriam Jones, U.S. Geological Survey, miriamjones@usgs.gov; Debra Willard, U.S. Geological Survey, dwillard@usgs.gov.
- T3. **Paleolimnological Records of Climate and Environmental Change.** Timothy L. Cook, University of Massachusetts Amherst, tcook@geo.umass.edu; Nicholas L. Balascio, College of William & Mary, nbalascio@wm.edu.
- T4. **Geoarchaeology of Dynamic Landscapes.** *Cosponsor: Eastern Section–SEPM (Society for Sedimentary Geology).* Daria Nikitina, West Chester University of Pennsylvania, dnikitina@wcupa.edu; Ilya Buynevich, Temple University, coast@temple.edu; Heather Wholey, West Chester University of Pennsylvania, hwholey@wcupa.edu.
- T5. **Drill Baby, Drill! A Tribute to USGS Drillers Eugene “Big Gene” Cobbs, Eugene “Little Gene” Cobbs, III, and Jeff Grey, and Their Contributions to Geologic Research East of the Mississippi River.** Jean M. Self-Trail, U.S. Geological Survey, jstrail@usgs.gov; Kenneth G. Miller, Rutgers University, kgm@rci.rutgers.edu.
- T6. **Engineering and Environmental Geology of Karst Terranes.** *Cosponsor: GSA Karst Division.* Wendell Barner, Barner Consulting, wendell.barner@gmail.com.
- T7. **Conservation Paleobiology: Insights into the Preservation and Sustainability of Ecosystems.** *Cosponsor: Paleontological Society.* Jacalyn M. Wittmer, SUNY Geneseo, malinowski@geneseo.edu; Andrew Michelson, SUNY Maritime College, amichelson@sunymaritime.edu.
- T8. **Mega-Traces: Advances in Ichnology and Zoogeomorphology.** *Cosponsor: Eastern Section–SEPM (Society for Sedimentary Geology).* Ilya V. Buynevich, Temple University, coast@temple.edu; Stephen T. Hasiotis, University of Kansas, hasiotis@ku.edu; Logan A. Wiest, Mansfield University, Logan\_Wiest@baylor.edu.
- T9. **Neoproterozoic to Cambrian Transitions on the Appalachian, Laurentian Margin.** *Cosponsor: Paleontological Society.* Steven J. Hageman, Appalachian State University, hagemansj@appstate.edu; Edward L. Simpson, University of Pennsylvania Kutztown, simpson@kutztown.edu.
- T10. **Provenance of the Eastern North American Margin: From Triassic Rifting to Modern Sedimentation.** Zachary Foster-Baril, University of Texas at Austin, zfosterbaril@utexas.edu.
- T11. **Integrating Field and Modeling Approaches to Understand Changing Coastal Systems.** Justin Shawler, Virginia Institute of Marine Science, jshawler@vims.edu; Rose Palermo, Massachusetts Institute of Technology and Woods Hole Oceanographic Institution, rpalermo@mit.edu; Arye Janoff, Montclair State University, janoffa2@montclair.edu; Isamar Cortes, Montclair State University, cortes1@montclair.edu.
- T12. **Shale Production in the Eastern U.S.—E<sup>3</sup>: Environmental, Economic & Energy System Impacts.** Timothy R. Carr, West Virginia University, tim.carr@mail.wvu.edu; Shikha Sharma, West Virginia University, shikha.sharma@mail.wvu.edu.
- T13. **Developing and Using Open Educational Resources in the Geosciences (Posters).** *Cosponsors: National Association of Geoscience Teachers; Virtual Library of Virginia.* Elizabeth Johnson, James Madison University, johns2ea@jmu.edu; Karen M. Layout, Reynolds Community College, klayout@reynolds.edu.
- T14. **Out of the Classroom, Out of the Box: Innovative Approaches to Geoscience Education.** *Cosponsor: National Association of Geoscience Teachers Southeastern Section.* Patricia Kelley, University of North Carolina Wilmington, kelleyp@uncw.edu; Michelle Casey, Towson University, mcasey@towson.edu.
- T15. **Active Learning and the Use of Technology in the Geoscience Classroom.** *Cosponsor: National Association of Geoscience Teachers.* Tarin Weiss, Westfield State University, tweiss@westfield.ma.edu; Lori Weeden, University of Massachusetts–Lowell, Lori\_Weeden@uml.edu.
- T16. **Reimagining Earth-Science Teacher Education: Reworking Veteran Approaches for Innovations in Preparing Geoscience Teachers.** *Cosponsor: National Association of Geoscience Teachers Teacher Education Division.* Christopher Roemmele, West Chester University, croemmele@wcupa.edu.
- T17. **NAGT and NESTA Share-a-Thon: I’ve Got an Activity (Lab or Demo) for That!** *Cosponsors: National Association of Geoscience Teachers; National Earth Science Teachers Association.* Christopher Roemmele, West Chester University, croemmele@wcupa.edu.
- T18. **Undergraduate Research (Posters).** *Cosponsor: Council on Undergraduate Research–Geosciences Division.* Lee Phillips, University of North Carolina at Greensboro, plphilli@uncg.edu; Jeff Ryan, University of South Florida, ryan@mail.usf.edu.
- T19. **Eastern Activities of the USGS Earth Mapping Resources Initiative.** *Cosponsors: U.S. Geological Survey; Association*

of *American State Geologists*. Nora K. Foley, U.S. Geological Survey, nfoley@usgs.gov; Arthur Merschat, U.S. Geological Survey, amerschat@usgs.gov; William L. Lassetter, Virginia Division of Geology and Mineral Resources, william.lassetter@dmme.virginia.gov.

- T20. **Defining 3D Geologic Mapping in the Eastern North America.** Christopher Bernhardt, U.S. Geological Survey, cbernhardt@usgs.gov; Peter Chirico, U.S. Geological Survey, pchirico@usgs.gov.
- T21. **Geologic Maps, Digital Geologic Maps, Geophysical Maps, and Derivatives from Geologic and Geophysical Maps (Posters).** Randy L. Kath, University of West Georgia, rkath@westga.edu; Thomas J. Crawford, University of West Georgia, crawfordthomasj@gmail.com.
- T22. **What Are We Dating?: The Utility of Petrochronology in Linking Accessory Mineral Dates to Rock Forming Processes.** Thomas “Alex” Johnson, University of California Santa Barbara, tajohnson@ucsb.edu; Ryan McAleer, U.S. Geological Survey, rmaleer@usgs.gov.
- T23. **New Developments in the Understanding of Pre-Appalachian Rocks of Eastern North America.** Brent Miller, Texas A&M University, bvmiller@geo.tamu.edu; Brent Owens, College of William & Mary, beowen@wm.edu; Sandra Barr, Acadia University, sandra.barr@acadiau.ca.
- T24. **Timescales and Conditions of Appalachian Metamorphism.** *Cosponsors: GSA Geochronology Division; GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division; GSA Structural Geology and Tectonics Division.* Calvin Mako, Bates College, cmako@bates.edu; Alexandra Nagurney, Virginia Tech, nagurney@vt.edu.
- T25. **Using Microstructural Analysis to Investigate Macroscale Structural Features.** *Cosponsor: GSA Structural Geology and Tectonics Division.* Jamie Levine, Appalachian State University, levinejs@appstate.edu; Jeffrey Rahl, Washington & Lee University, RahlJ@wlu.edu.
- T26. **Deciphering Active Tectonics and Seismic Hazard in Eastern North America.** Lisa S. Schleicher, Defense Nuclear Facilities Safety Board, LisaS@dnfsb.gov; J. Wright Horton, U.S. Geological Survey, whorton@usgs.gov; Chris Cramer, University of Memphis, ccramer@memphis.edu; Christine A. Powell, University of Memphis, capowell@memphis.edu.
- T27. **Appalachian Petrology: A Session to Honor the Career of Dr. Robert J. Tracy.** Willis Hames, Auburn University, hameswe@auburn.edu; Nicholas M. Ratcliffe, U.S. Geological Survey, ratcliffe2@gmail.com; Craig Dietsch, University of Cincinnati, dietscc@ucmail.uc.edu; Mark Caddick, Virginia Tech University, caddick@vt.edu.

## FIELD TRIPS

Trip registration opens in December. For additional information, please contact the Field Trip Co-Chairs: Mark Carter, mcarter@usgs.gov, and Chris Swezey, cswezey@usgs.gov.

**The Central Appalachian Orogen: From Ancient Tectonics to Modern Seismicity.** Christopher M. Bailey, College of William & Mary, cmbail@wm.edu; Callan Bentley, Northern Virginia Community College, cbentley@nvcc.edu; Frank J. Pazzaglia, Lehigh University, fjp3@lehigh.edu; Allan Pitts, University of Camerino, pitts.alan@gmail.com.

**Geology and Geomorphology of the Trout Rock Caves (Hamilton Cave, Trout Cave, New Trout Cave), Pendleton County, West Virginia.** Christopher Swezey, U.S. Geological Survey; cswezey@usgs.gov.

**Geology and the Civil War at the North Anna River Fall Zone, Virginia.** Christopher M. Bailey, Dept. of Geology, William & Mary, cmbail@wm.edu.

**The Geology of Washington, D.C.** Callan Bentley, Northern Virginia Community College, cbentley@nvcc.edu; Christopher Roemmele, West Chester University, croemmele@wcupa.edu.

**Military Geology of the Manassas Battlefield Area, ×2.** John C. Jens, U.S. Army Geospatial Center, jcjens@earthlink.net.

**Accreted Forearc, Continental, and Oceanic Rocks of Maryland’s Eastern Piedmont: The Potomac Terrane, Baltimore Terrane, and Baltimore Mafic Complex.** Rebecca Kavage Adams, Maryland Geological Survey, rebecca.adams@maryland.gov; William Junkin, Maryland Geological Survey, william.junkin@maryland.gov; David K. Brezinski, Maryland Geological Survey, david.brezinski@maryland.gov.

**Age and Tectonic Significance of Diamictites at the Devonian–Mississippian Transition in the Central Appalachian Basin.** F.R. Etensohn, University of Kentucky, fettens@uky.edu; Clay Seckinger, University of Kentucky, clayseckinger@icloud.com.

**Proterozoic and Paleozoic Tectonic Evolution of the Northern Shenandoah Massif.** Bill Burton, U.S. Geological Survey, bburton@usgs.gov; Richard Tollo, The George Washington University, rtollo@gwu.edu; John Aleinikoff, U.S. Geological Survey, jaleinikoff@usgs.gov; Paul C. Hackley, U.S. Geological Survey, phackley@usgs.gov.

## SPECIAL EVENT

**Experience Capitol Hill: Geoscience and Public Policy in Washington, D.C.** Kasey White, Geological Society of America, kwhite@geosociety.org.

## WORKSHOPS

**Clastic and Carbonate Petrology—From Hand Samples to Thin Sections.** John Haynes, James Madison University, haynesjx@jmu.edu; Mercer Parker, U.S. Geological Survey, mercerparker@usgs.gov.

**Making Geoscience Animations and Videos and Assessing Them in the Classroom.** Robert J. Stern, University of Texas at Dallas, [rjstern@utdallas.edu](mailto:rjstern@utdallas.edu); Jeff Ryan, University of South Florida, [ryan@usf.edu](mailto:ryan@usf.edu).

**Applied Micropaleontology for Non-Paleontologists: How to Interpret and Use Fossil Data.** Marci Robinson, U.S. Geological Survey, [mmrobinson@usgs.gov](mailto:mmrobinson@usgs.gov); Jean Self-Trail, U.S. Geological Survey, [jstrail@usgs.gov](mailto:jstrail@usgs.gov).

**Stormwater Management in Karst Terrain.** Robert K. Denton Jr., Terracon, [robert.denton@terracon.com](mailto:robert.denton@terracon.com).

**GSA On To the Future Professional Skills Workshop for Students.** Stephen K. Boss, University of Arkansas, [sboss@uark.edu](mailto:sboss@uark.edu); Tahlia Bear, Geological Society of America, [tbear@geosociety.org](mailto:tbear@geosociety.org); Katherine Ellins, University of Texas at Austin, [kellins@jsg.utexas.edu](mailto:kellins@jsg.utexas.edu).

## REGISTRATION

**Early registration deadline:** 18 Feb.

**Cancellation deadline:** 24 Feb.

Registration opens in December. For further information or if you need special accommodations, please contact one of the general co-chairs, Arthur Merschat, [amerschat@usgs.gov](mailto:amerschat@usgs.gov), or Patrick Burkhart, [patrick.burkhart@sru.edu](mailto:patrick.burkhart@sru.edu).

## ACCOMMODATIONS

**Hotel registration deadline:** 26 Feb., 5 p.m. Eastern Time

A block of rooms has been reserved at the Hyatt Regency Reston, 1800 Presidents Street, Reston, Virginia, 20190, USA, located in the vibrant Reston Town Square. The meeting rate is US\$159 per night plus tax. The hotel offers many amenities (restaurants, bar, pool, Wi-Fi) and a complimentary shuttle to/from Dulles International Airport. Reservations can be made by calling +1-703-709-1234. Please be sure to identify yourself with the group code SEGSA20 and that you are attending the GSA Southeastern and Northeastern Sections Joint Meeting. Parking is available at the hotel and at Reston Town Parking Garage next to the hotel.

## OPPORTUNITIES FOR STUDENTS AND EARLY CAREER PROFESSIONALS

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To learn more about mentors and career workshops, go to [www.geosociety.org/mentors/](http://www.geosociety.org/mentors/) or contact Jennifer Nocerino at [jnocerino@geosociety.org](mailto:jnocerino@geosociety.org).

### Student Volunteers

Take advantage of work opportunities to earn free meeting registration. Students interested in helping with the various aspects of the meeting should contact Wilma B. Aleman Gonzalez, U.S. Geological Survey, [waleman@usgs.gov](mailto:waleman@usgs.gov).

## PROFESSIONALS

If you like to share your interest, enthusiasm, and experience in applied geology, consider being a GSA mentor at the joint meeting. Being a mentor is a rewarding experience. To learn more, contact Jennifer Nocerino at [jnocerino@geosociety.org](mailto:jnocerino@geosociety.org).

This meeting also offers an excellent opportunity to earn CEUs toward your continuing education requirements for your employer, K-12 school, or professional registration. The CEU certificate can be downloaded from the meeting website after the meeting.

## LOCAL COMMITTEE

**General Co-Chairs:** Arthur Merschat, [amerschat@usgs.gov](mailto:amerschat@usgs.gov); Patrick Burkhart, [patrick.burkhart@sru.edu](mailto:patrick.burkhart@sru.edu)

**Technical Program Co-Chairs:** Chuck Bailey, [cmbail@wm.edu](mailto:cmbail@wm.edu); Wendell Barner, [wendell.barner@gmail.com](mailto:wendell.barner@gmail.com)

**Field Trip Co-Chairs:** Mark Carter, [mcarter@usgs.gov](mailto:mcarter@usgs.gov); Chris Swezey, [cswezey@usgs.gov](mailto:cswezey@usgs.gov)

**Short Course Co-Chairs:** Daniel H. Doctor, [dhdoctor@usgs.gov](mailto:dhdoctor@usgs.gov); Katie Tamulonis, [ktamulonis@allegheny.edu](mailto:ktamulonis@allegheny.edu)

**Exhibits Chair:** Daniel Harris, [harris\\_d@calu.edu](mailto:harris_d@calu.edu)

**Treasurer:** Patrick Burkhart, [patrick.burkhart@sru.edu](mailto:patrick.burkhart@sru.edu)

**Student Volunteer Chair:** Wilma Aleman Gonzalez, [waleman@usgs.gov](mailto:waleman@usgs.gov)

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### POSITIONS OPEN

#### Geosciences/Solid Earth, Wellesley College

The Dept. of Geosciences invites applications for an open rank tenure track faculty member with broad teaching and research interests in Solid Earth Geosciences. Our ideal future colleague will be engaged in teaching at all levels of the curriculum including our core classes Dynamic Earth and Earth Materials. Advanced courses are centered around petrology, structural geology and tectonics depending on the research program of the candidate. We are seeking a colleague with a strong background in field geology and a commitment to teaching in the field. The ideal candidate will be able to develop an externally funded research portfolio that provides rich research experiences for Wellesley undergraduates. Successful applicants will have a Ph.D. in geoscience (though applicants who are ABD will be considered).

Wellesley is a highly selective liberal arts college for women located 12 miles west of Boston. Wellesley is dedicated to the goal of building a diverse and inclusive academic community. We strongly encourage applications from candidates who can demonstrate through their teaching, research, and service that they can contribute to this goal. Familiarity with, and experience using, pedagogical methods that enable students across all racial, ethnic and socio-economic groups to reach their maximum potential will be considered a valuable additional qualification.

Review of applications begins on Oct. 15, 2019, and will continue until the position is filled. Applicants should submit a cover letter, curriculum vitae, research and teaching statements, and the names/email addresses of three references through our online application system at: <https://career.wellesley.edu>.

#### Assistant/Associate/Full Professor in Mineralogy and Petrology (Tenure Track Position), Furman University

The Dept. of Earth and Environmental Sciences at Furman University invites applications for an open-rank, tenure-track position in Mineralogy and Petrology beginning in Aug. 2020. The successful candidate will have a Ph.D. prior to the date of appointment and demonstrate a commitment to excellence in teaching, student advising,

and research with undergraduates, with a primary interest in igneous or metamorphic processes and a broad interest in mineral resources and sustainable resource use. We welcome candidates with diverse perspectives who employ a variety of research methods, including field, analytical, and computational approaches. The successful candidate will demonstrate a capacity to develop an innovative research program that provides meaningful, rich, and varied educational experiences for undergraduate students. Furman's location at the foothills of the Blue Ridge Mountains provides easy access to a geologically and ecologically diverse region with ample opportunity for integrating field experiences and local research into the curriculum. Teaching responsibilities consist of four courses with labs per year, including Earth Systems (EES 115), Mineralogy and Petrology I (EES 220), and upper level electives. Candidates with experience in GIS or spatial analysis methods as well as an interest in collaborative research connecting geosciences and sustainability science are particularly desirable.

The Dept. of Earth and Environmental Sciences is home to two undergraduate majors: Earth and Environmental Sciences, and Sustainability Science. Innovative curriculum, engaging students in class and in the field, and collegiality are the core values of our Dept. We have a diverse faculty representing physical and social sciences with a common mission to positively impact the environment and society through teaching, research, and mentorship. The Dept. hosts extensive lab facilities and instrumentation, with opportunities to incorporate analytical techniques into teaching and research.

Applicants should include PDF versions of a letter of application, a curriculum vitae, a statement of teaching interests and philosophy (2 pages maximum), a statement of research interests and future research priorities (2 pages maximum), an initial research plan for work with undergraduates (2 pages maximum), diversity & inclusiveness statement describing how your teaching, scholarship, mentoring and/or service might contribute to a liberal arts college community that includes a commitment to diversity & inclusiveness as part of its core values (2 pages maximum); unofficial transcripts; and names of three references. Visit Dept. of Earth and Environmental Sciences website (<http://ees.furman.edu>) for additional information about the position and the Dept. Applications will be accepted until Nov. 1, 2019.

Furman University is a nationally ranked private, residential liberal arts college located near Greenville, South Carolina, which has a thriving downtown and a vibrant international community. Furman University is an equal opportunity employer committed to increasing faculty diversity. The university aims to create a community of people representing a multiplicity of identities including, but not limited to, gender, race, religion, spiritual belief, sexual orientation, geographic origin, socioeconomic background, ideology, world view and varied abilities.

For more details about the position, application information and instructions, go to <http://ees.furman.edu> or contact Dr. Suresh Muthukrishnan

([suresh.muthukrishnan@furman.edu](mailto:suresh.muthukrishnan@furman.edu)).

Furman University will meet with prospective candidates at the GSA 2019 annual meeting in Phoenix.

#### Igneous Petrology, Western Washington University

The Geology Dept. at Western Washington University (WWU) invites applications for a tenure-track, assistant professor position with specialty in Igneous Petrology to begin Sept. 16, 2020. We seek individuals who are enthusiastic about teaching and who will establish a vigorous research program, and are particularly interested in those who will combine field and analytical, experimental or modeling approaches in their research, and who will involve undergraduate and master's-level students in their research.

The ideal candidate will enhance our existing strengths in geoscience teaching and research by developing new courses and research avenues in igneous petrology. Broad areas of interest include, but are not limited to, the timescales of magmatic processes, the evolution of the continental crust, mantle, oceanic lithosphere/ocean island/mid-ocean ridge processes, the recycling of elements and volatiles within arc magmas and subduction systems, and links between tectonic and magmatic processes.

For details about the position, application information and instructions, go to the WWU Employment website <http://employment.wwu.edu/cw/en-us/job/497184/assistant-professor-of-igneous-petrology>.

Review of applications begins Dec. 15, 2019, and continues until position is filled. Please contact the search committee chair, Susan DeBari ([debari@wwu.edu](mailto:debari@wwu.edu)) for questions about this position.

#### Assistant Professor, Geology-Marine and Coastal Science, Western Washington University

The Geology Dept. and the Marine and Coastal Science (MACS) program at Western Washington University (WWU) invite applications for two tenure-track, assistant professor positions with specialties in one of three fields:

**Coastal Geomorphology/Coastal Geohazards:** The ideal candidate will enhance our existing strengths in geoscience teaching and research by developing new courses and research avenues in coastal geomorphology, coastal tectonics and geo-hazards. Broad areas of interest include, but are not limited to, coastal erosion and sediment transport, delta evolution, beach/tidal morphodynamics, marine geohazards, and tectonic processes that impact coastal zones, including uplift, subsidence, and tsunami generation and impacts.

**Paleoceanography/Paleoclimate:** The ideal candidate will enhance our existing strengths in geoscience teaching and research by developing new courses and research avenues in paleoceanography/paleoclimatology. Broad areas of interest include, but are not limited to, oceanic circulation and heat transport, micropaleontology/paleoecology, the carbon cycle, and geochemical processes that are related to climate variations on geological timescales. Tools and techniques used to address these problems can



include geochemical or sedimentological proxies of climate variations, paleontological proxies/indicators of climate variations, physical oceanographic data, or other appropriate techniques.

**Marine Geologist:** The ideal candidate will enhance our existing strengths in geoscience teaching and research by developing new courses and research avenues in marine geology with a focus on crustal/lithospheric evolution and/or tectonic processes. Broad areas of interest include, but are not limited to, formation of the oceanic lithosphere and crustal evolution, geodynamics of the ocean basins, hydrothermal circulation at mid-ocean ridges, geochemistry of rock-water interactions, submarine volcanic systems, or tectonic processes associated with oceanic plate boundaries. Tools and techniques used to address these problems can include geochemical analyses, geophysical methods, geospatial analysis, textural rock analysis, numerical models, or other appropriate techniques.

These positions will begin Sept 16, 2020. As members of the group of initial faculty hires into the MACS program, the successful applicant will foster an interdisciplinary approach to teaching and research in geology and marine science. We seek individuals who are enthusiastic about teaching and who will establish a vigorous research program, and are particularly interested in those who will combine field, experimental, and/or modeling approaches in their research program, and who will involve undergraduate and Masters-level students in their research.

To apply, and for further details regarding qualifications and position responsibilities, please see <http://employment.wvu.edu/cw/en-us/job/497185/assistant-professor-geology-marine-and-coastal-science>

Please contact the search committee chair, Bernie Housen ([bernieh@wvu.edu](mailto:bernieh@wvu.edu)) for questions about these positions. Review of applications begins Oct. 14, 2019, and continues until the positions are filled.

### **Geoscience Education, California State University, Fullerton**

The Dept. of Geological Sciences invites applications for a tenure-track Assistant Professorship beginning Aug. 2020. CSUF is a minority-serving institution, and an affirmative action and equal opportunity employer with a strong commitment to increasing campus diversity. We seek a geoscience educator who develops, applies, and evaluates new geoscience teaching innovations and curricula, as well as develops and tests geoscience education research questions and hypotheses. We expect candidates to show evidence of an existing or developing active, externally funded student-centered research program. We seek a scholar who demonstrates interest and ability to teach courses in general geology and geoscience education at various levels including: general education, lower- and upper-division undergraduate, and graduate courses. The successful candidate shall: (1) coordinate geoscience education courses; (2) help facilitate the integration of teacher preparation; and (3) be involved in program-level assessment for our Dept. Applicants should submit a cover letter con-

taining past and/or potential contributions to diversity through research, teaching, and or service, CV, research statement, teaching statement, and a list of three individuals who will provide letters of reference. Submit materials online at: <https://apps.fullerton.edu/facultyrecruitment>. Questions concerning the application or receipt of application materials should be sent to: Dr. Nicole Bonuso [Geoscience-ed-search@fullerton.edu](mailto:Geoscience-ed-search@fullerton.edu).

### **Full Professor and Dept. Chair, Dept. of Geological Sciences and Engineering (DGSE), University of Nevada, Reno**

The Dept. of Geological Sciences and Engineering (DGSE) at UNR invites applications for a tenured, full professor to serve as Dept. Chair. Applicants must have a Ph.D. in Geological Sciences or a related field, and a proven track record in research and service as well as evidence of successful personnel and financial management. Leadership qualities, enthusiasm, effective interpersonal communication and organizational skills are required.

The University of Nevada, Reno is an equal opportunity/affirmative action employer. We promote excellence through diversity and encourage all qualified individuals to apply.

For additional details on the Dept. and UNR please see the full application: [https://nshe.wdl.myworkdayjobs.com/en-US/UNR-external/job/University-of-Nevada-Reno---Main-Campus/Professor-Chair-Geological-Sciences\\_R0116800](https://nshe.wdl.myworkdayjobs.com/en-US/UNR-external/job/University-of-Nevada-Reno---Main-Campus/Professor-Chair-Geological-Sciences_R0116800).

### **Assistant Professor of Paleontology, Colgate University**

The Dept. of Geology at Colgate University invites applications for a tenure-stream position in the area of Paleontology at the rank of Assistant Professor, beginning fall semester 2020.

We seek an individual with a Ph.D. who is committed to excellence in teaching and research at the undergraduate level. Completion of the Ph.D. is expected prior to or shortly after the date of hire. The area of specialization is open but could include invertebrate or vertebrate paleontology, paleobotany, micropaleontology, paleoecology, or paleoclimatology. The successful applicant will teach introductory courses for non-majors, an intermediate-level Paleontology course for majors, as well as develop upper-level courses in their area of specialty. Participation in the Geology Dept.'s summer field courses and meaningful involvement of undergraduates in research are expected. All Colgate faculty are expected to participate in all-university programs, including the Liberal Arts Core Curriculum.

A cover letter, CV, research and teaching statements, and two reference letters must be submitted through <https://academicjobs.colgate.edu/ajob/14050>. Review of applications will begin Sept. 27, 2019, and continue until the position is filled. Colgate strives to be a community supportive of diverse perspectives and identities. All applications should speak directly to the candidate's ability to work effectively with students across a wide range of identities and backgrounds.

Colgate is a highly selective liberal arts university of 2900 students situated in central New York.

Colgate faculty are committed to excellence in both teaching and scholarship. The Geology Dept. comprises seven faculty, a senior lecturer, and a technician. Analytical facilities include SEM-EDS, XRF, XRD, ICP-MS, IC, AA, stable isotope mass spectrometer, micropaleontology lab, and geophysical equipment. Further information about the Geology Dept. can be found at [www.colgate.edu/geology](http://www.colgate.edu/geology).

It is the policy of Colgate University not to discriminate against any employee or applicant for employment on the basis of their race, color, creed, religion, age, sex, pregnancy, national origin, marital status, disability, protected Veterans status, sexual orientation, gender identity or expression, genetic information, status as a victim of domestic violence or stalking, familial status, or any other categories covered by law. Colgate is an Equal Opportunity/Affirmative Action employer. Candidates from historically underrepresented groups, women, persons with disabilities, and protected veterans are encouraged to apply. Applicants with dual-career considerations can find postings of other employment opportunities at Colgate and at other institutions of higher education in upstate New York at [www.upstatenyherc.org](http://www.upstatenyherc.org).

### **Hydrogeology and Environmental Geology, Albion College**

The Albion College Dept. of Geological Sciences invites applications for a tenure-track Assistant Professor of Hydrogeology and Environmental Geology beginning Aug. 2020.

The successful candidate will have a Ph.D. prior to the date of appointment and will have demonstrated teaching and research interests in hydrogeology and environmental geology. The successful candidate will normally teach two courses (lectures and labs) per semester to a diverse student body. The courses include introductory and advanced undergraduate courses in hydrogeology, environmental geochemistry, and an area of specialization that will enhance and complement our undergraduate geology and interdisciplinary environmental curricula. The Dept. offers a nationally recognized biennial Summer Field Camp in the Rockies and annual regional geology field trips. Candidates with interests in interdisciplinary collaborations, field-based research and teaching, GIS, and engagement in local environmental issues and the Center for Sustainability and the Environment are particularly desirable. Interest in curricular innovation and increasing diversity and inclusion in geology both in the classroom and field are also valued. Candidates are expected to conduct research that includes undergraduate students, participate in co-curricular Departmental activities, and contribute to all-college programs and/or interdisciplinary programs.

The institution and Dept. have well-funded undergraduate and faculty research initiatives and strongly support faculty travel, teaching, and scholarship. The Dept. of Geological Sciences has five FTE faculty positions and two technicians and is well equipped with a dedicated GIS computer lab, analytical instruments (including XRF, XRD, ICP-OES), and field equipment (extensive GPS, surveying, water quality multi-parameter sondes). Depart-

## GEOSCIENCE JOBS & OPPORTUNITIES

mental facilities include seven teaching labs, six faculty research labs, a student research lab, and a dedicated environmental geochemistry lab.

Candidates should submit: a cover letter; current vita; graduate and undergraduate transcripts; documentation of teaching excellence; an undergraduate teaching statement that includes pedagogy, experiences, objectives and commitment to equity and inclusion; a research statement that includes a plan to incorporate students; and letters from at least three references to <https://apply.interfolio.com/64680>. Direct questions to Dr. Carrie Menold, [cmenold@albion.edu](mailto:cmenold@albion.edu). The deadline for submission of the complete application is Oct. 25th. Submissions of vita and cover letter received by Aug. 30th will be considered for an in-person interview at GSA Annual Meeting in Phoenix (Sept. 23–24) other preliminary interviews will be held after Oct. 25th.

Albion College is a small (1550 undergraduates) private, residential, liberal arts college located in a racially diverse community of about 9,000 in south-central Michigan. Albion College is dedicated to the highest quality in undergraduate education, with a commitment to diversity as a core institutional value. The College is committed to a policy of equal opportunity and non-discrimination on the basis of race, color, national origin, sexual orientation, religion, sex, gender, age or disability, as protected by law, in all educational programs and activities, admission of students and conditions of employment. Albion is especially interested in candidates who will contribute to a campus climate that supports equality and diversity. Visit our website at [www.albion.edu](http://www.albion.edu).

### **Bruce D. Benson Endowed Chair in Petroleum Geology, University of Colorado Boulder**

The Dept. of Geological Sciences at the University of Colorado Boulder, invites applications for the Bruce D. Benson Endowed Chair in Petroleum Geology. We seek an outstanding scientist who has a demonstrable record for excellence in teaching and a strong scholarly record in the broad field of petroleum geosciences. Candidates with an ability to integrate multiple specialties to solve difficult technical questions are desired. The focus of teaching and research can be in any aspect of petroleum geology, such as reservoir characterization, structure and geomechanics, reflection seismology, petroleum geochemistry, or petroleum systems modeling.

The successful candidate is expected to bridge to wider faculty interests, build collaborations with existing faculty, and complement our strengths in petroleum geology, sedimentology, stratigraphy, geophysics, paleontology, structure and tectonics, geochemistry, geohydrology, paleoclimatology, geomorphology, and geobiology. The successful candidate will need to: develop an externally funded, innovative and impactful research program (preferably with industry participation); supervise independent student research at both graduate and undergraduate levels; contribute to Departmental teaching at all levels; and provide applied training and guidance for students interested in a career in the energy sector.

This academic-year, open rank, tenure-track

position has a start date as early as Jan. 1, 2020. A PhD in Geological Sciences or a related field is required, and we especially encourage applications from candidates with prior industry, research, and/or faculty experience. 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. Visit [www.colorado.edu/geologicalsciences](http://www.colorado.edu/geologicalsciences) to learn more about the Dept., these affiliations, and resources.

For consideration, applications must be submitted through <https://jobs.colorado.edu/jobs/JobDetail/?jobId=19641>.

Applications must include statements of research and teaching interests; a curriculum vita; 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 the applicant considers to be the important problems in their field, and how their research contributes to these questions. Teaching statements should address goals and approaches to instruction.

Review of applications will begin on July 20, 2019, and full consideration will be given to applications received by Sept. 1, 2019. Applications will be accepted until the position is filled.

The University of Colorado Boulder is committed to building a culturally diverse community of faculty, staff, and students dedicated to contributing to an inclusive campus environment. We are an Equal Opportunity employer, including veterans and individuals with disabilities.

### **Director, Electron Microbeam Laboratory, University of Wisconsin–Madison**

The Dept. of Geoscience at the University of Wisconsin–Madison invites applications at the Assistant, Associate, or Senior Scientist level to fill the Director's position in the Eugene Cameron Electron Microprobe Laboratory ([www.geology.wisc.edu/~johnf/sx51.html](http://www.geology.wisc.edu/~johnf/sx51.html)). This is a full-time, institutionally-supported position. The lab houses SX51 and SX5FE electron microprobes, a Hitachi S3400 VP scanning electron microscope, and a lab manager to assist with SEM maintenance and operations. The lab serves as a hub for interdisciplinary scientific inquiry, providing hands-on training of students from disciplines across campus. Additional Departmental resources include two electronics engineers and a staffed thin-section lab.

Applicants should hold a Ph.D. in Earth Sciences, Chemistry, Physics, Material Science, or related fields at time of appointment. Demonstrated ability and experience in the use of electron beam instruments for high-quality, quantitative analyses is required. Two or more years of daily hands-on management of an electron microprobe lab is preferred, as is demonstrated ability to pursue fundable research using electron microbeam instrumentation.

Applicants should submit the following: (1) cover letter that includes your research statement, (2) curriculum vitae, and (3) the names and contact information for three referees. Please apply

by Oct. 15, 2019 to guarantee full consideration, although applications will continue to be accepted until the position is filled. For more information and to apply, go to: <https://jobs.hr.wisc.edu/en-us/job/502003/epma-lab-director>.

The University of Wisconsin–Madison is an Affirmative Action, Equal Opportunity Employer with a commitment to diversity at all levels.

### **Assistant Lecturer/Assistant Teaching Professor Position, Geoscience, Miami University**

The Dept. of Geology and Environmental Earth Science at Miami University invites applications for a full-time Assistant Lecturer or Assistant Teaching Professor position on the Oxford campus, beginning Aug. 2020. The Assistant Lecturer/Assistant Teaching Professor will teach undergraduate courses, including foundation courses in physical and environmental geology, as well as intermediate level courses; advise undergraduate students; and provide professional service to the Dept. and university. Required: M.S. in geoscience (for appointment as Assistant Lecturer) or Ph.D. in geoscience (for appointment as Assistant Teaching Professor) by time of appointment, and documented teaching experience; applicant must be a U.S. citizen, a lawful permanent resident, admitted for residence as an applicant under the 1986 immigration amnesty law, refugee, or asylee. Desired: interest in contributing to supervision of undergraduate student research and field-based experiences. Submit letter of application, curriculum vitae, and evidence of teaching effectiveness to <http://jobs.miamioh.edu/cw/en-us/job/495551>. Letters of reference will be requested upon receipt of application. Inquiries can be directed to Cathy Edwards at [edwardca@miamioh.edu](mailto:edwardca@miamioh.edu). Review of applications will begin on Oct. 2, 2019 and continue until position is filled.

Miami University, an EO/AA employer, encourages applications from minorities, women, protected veterans and individuals with disabilities. Miami does not permit, and takes action to prevent harassment, discrimination and retaliation. Requests for reasonable accommodations for disabilities should be directed to [ADAFacultyStaff@miamioh.edu](mailto:ADAFacultyStaff@miamioh.edu) or 513-529-3560. Annual Security and Fire Safety Report may be found at: [www.MiamiOH.edu/campus-safety/annual-report/index.html](http://www.MiamiOH.edu/campus-safety/annual-report/index.html). Criminal background check required. All campuses are smoke- and tobacco-free.

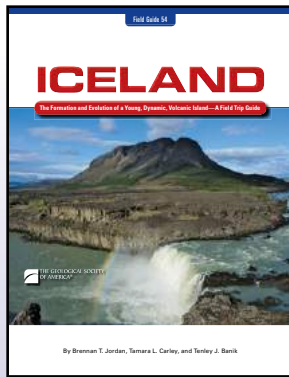
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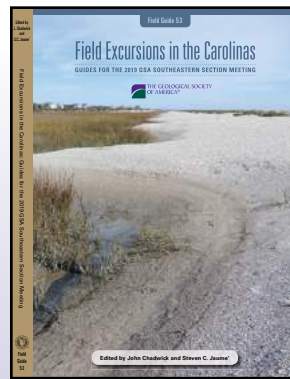
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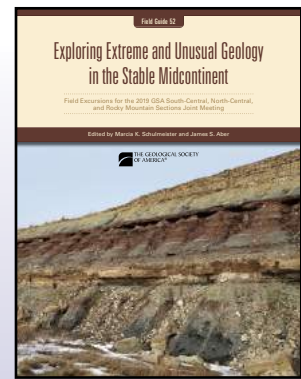
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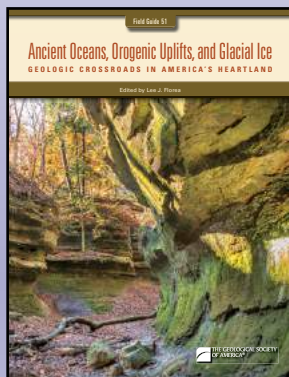
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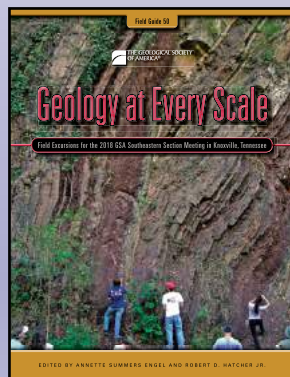
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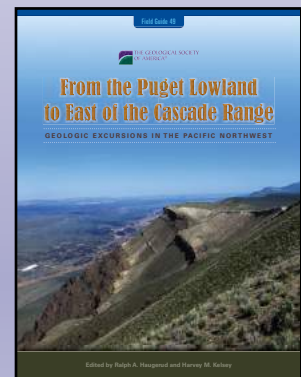
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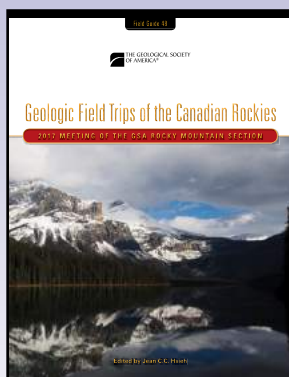
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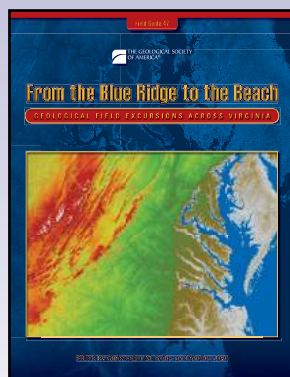
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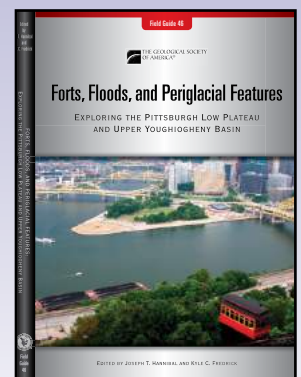
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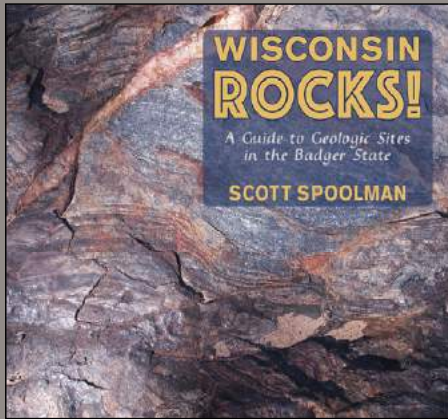
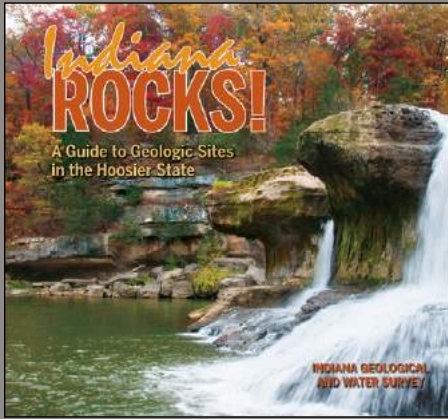


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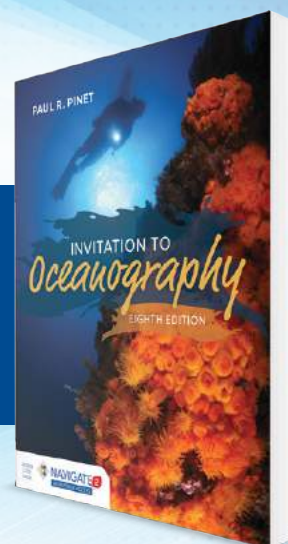
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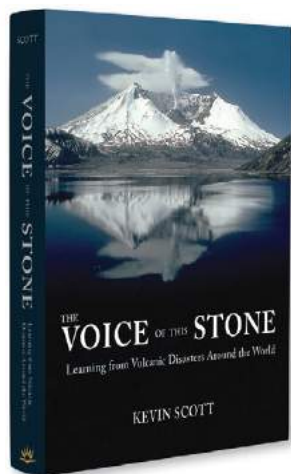
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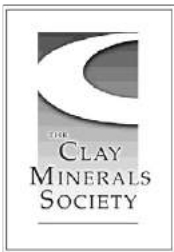
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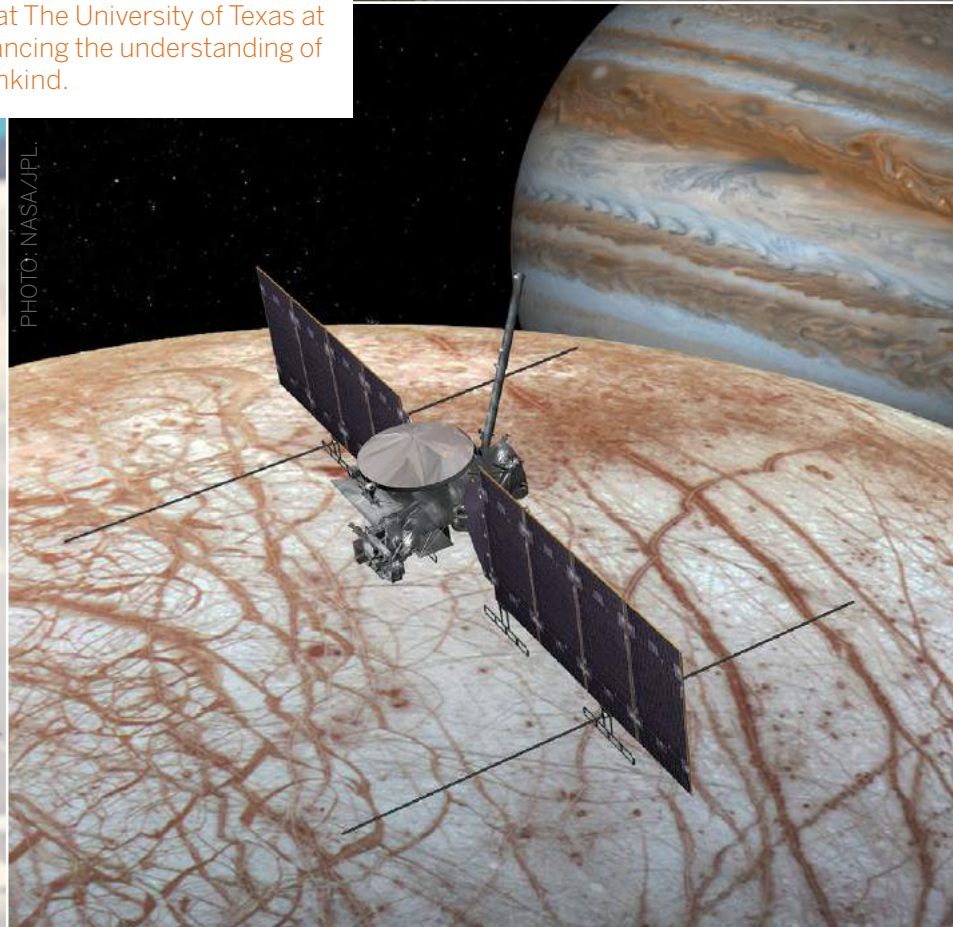


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