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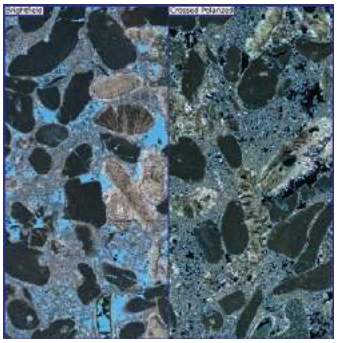

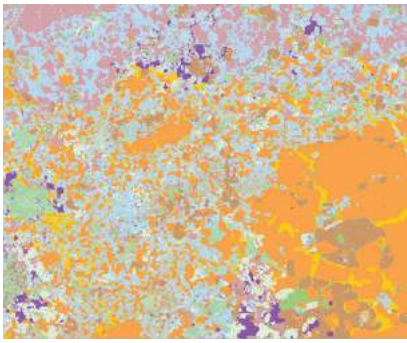

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SCIENCE

Cover: Field photograph showing subrounded garnet-clinopyroxenite xenoliths in host latite ~10 km east of Chino Valley, Arizona. Pen is 14 cm long. These xenoliths represent fragments of Southern California lower crust and upper mantle displaced ~500 km inboard during Laramide shallow-angle subduction. See related article, p. 4–10.

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Fate of the Lower Lithosphere during Shallow-Angle Subduction: The Laramide Example

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ABSTRACT

Continental arc lower crust and underlying mantle wedge assemblages native to the Mojave Desert were dislodged, transported eastward during Laramide shallow-angle subduction, and attached to the base of the Colorado Plateau transition zone (central Arizona, USA) and further inboard. We identify here two late Oligocene xenolith localities from the transition zone (Camp Creek and Chino Valley) that likely contain remnants of the missing Mojave lithosphere. Geochemical, isotopic, and thermobarometric data from garnet clinopyroxenite, the dominant xenolith type at both studied localities, strongly suggest a continental arc residue ("arclogite") rather than a lower plate subduction ("eclogite") origin. Zircon grains extracted from these nodules yield a bimodal age distribution with peaks at ca. 75 and 150 Ma, overlapping ages of continental arc magmas emplaced into the Mojave Desert (the southern California batholith) and suggesting a consanguineous relationship. In contrast, Mesozoic and early Cenozoic igneous rocks from SW Arizona, with age peaks at ca. 60 and 170 Ma, do not provide as close a match. In light of these results, we suggest that a mafic keel to the southern California batholith: (1) formed in two discrete (Late Jurassic and Late Cretaceous) pulses; (2) was transported along the Moho ~500 km eastward along the leading edge of the shallowly subducting Farallon plate; and (3) was affixed to the base of the crust in central Arizona. Titanite U-Pb and garnet Sm-Nd ages spanning ca. 60–30 Ma suggest that displaced arclogite remained at >600 °C for tens of millions of years following its dispersal and until entrainment in host latite. The lack of arclogite and abundance of spinel peridotite xenoliths in ca. 15 Ma and younger volcanic host rocks and the presence of a vertical high-seismic-velocity anomaly beneath the western Colorado Plateau suggest that arclogite has been foundering into the mantle and being replaced by upwelling asthenosphere since the early Miocene.

INTRODUCTION AND BACKGROUND

The SW North American Cordillera

The Laramide orogeny was a regional compressional event that evolved from Late Cretaceous–early Paleogene contraction of the SW margin of North America to Eocene–early Oligocene deformation up to 2,000 km inboard in the craton interior (Saleeby, 2003; DeCelles, 2004; Copeland et al., 2017). A commonly cited mechanism for the orogeny is intensified traction and tectonic erosion of the lowermost crust and upper subcontinental mantle lithosphere (LC-SCML) due to flattening of an ~500-km-wide segment of the subducting Farallon plate (Livaccari et al., 1981; Bird, 1988; Saleeby, 2003; Axen et al., 2018). Parts of the central Andean orogen are regarded as the best modern analogue, where shallow slab segments coincide with colliding aseismic ridges and oceanic plateaux (e.g., Gutscher et al., 2000). Analysis of plate reconstructions for the Pacific-Farallon ridge led to the interpretation that the Laramide orogeny resulted from the subduction of conjugate massifs to the Hess and Shatsky oceanic plateaux (Livaccari et al., 1981; Liu et al., 2010). Furthermore, an ~500-km-wide Laramide deformation corridor parallels the subduction trajectory of inferred Hess and Shatsky conjugates, which were embedded in the Farallon plate as they subducted in Laramide time (Saleeby, 2003; Liu et al., 2010). The damage zone consists of the southern California batholith (SCB) of the Mojave Desert and the southernmost Sierra Nevada batholith (SNB; Fig. 1, inset).

As emphasized below, the impact of oceanic plateaux is consistent with evidence for the shutdown of arc magmatism, deep crustal exhumation, tectonic underplating of trench sediments, and—the focus of this research—removal of the LC-SCML (e.g., Saleeby, 2003; Luffi et al., 2009; Chapman et al., 2012; Chapman, 2017; Ducea and Chapman, 2018).

Overview of the SCB Domain of the Laramide Corridor

The formerly contiguous SNB–SCB–Peninsular Ranges batholithic belt was a >2000-km-long NNW-trending granitic arc emplaced largely during three magmatic "flare-up" events at ca. 230–210 Ma, ca. 160–150 Ma, and ca. 100–75 Ma (e.g., Ducea, 2001). In contrast to the SNB to the north and the Peninsular Ranges batholith to the south (Fig. 1), much of the ~500-km-long SCB is rootless, lying tectonically above underplated trench assemblages (the Rand and related schists) that were transported inboard by shallow-angle subduction (Jacobson et al., 1988; Grove et al., 2003; Chapman, 2017; Ducea and Chapman, 2018). These schists are exposed in the footwall of the shallowly dipping Rand fault, interpreted as a remobilized subduction megathrust (e.g., Cheadle et al., 1986; Chapman, 2017), beneath deep crustal level SCB assemblages and the southern SNB (Fig. 1).

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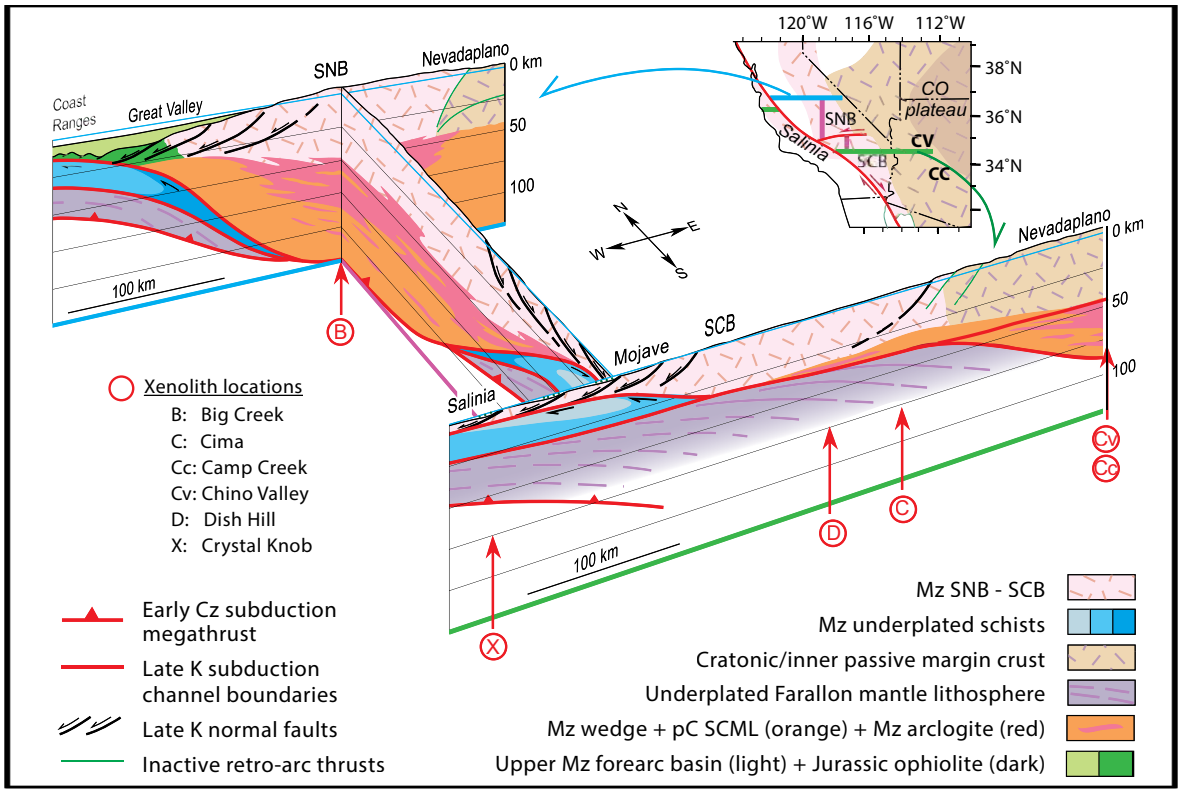

Figure 1. Fence diagram showing idealized lithospheric structure for beginning of Cenozoic time for sections across Sierra Nevada batholith (SNB)–Great Valley forearc, southern California batholith (SCB)–Colorado Plateau transition zone, and linking section across the southern SNB. Locations of sections shown on inset. Cz—Cenozoic; CO—Colorado; K—Cretaceous; Mz—Mesozoic; pC—Precambrian; SCML—subcontinental mantle lithosphere.

The SNB is tilted into a southward deepening section spanning paleodepths of ~10–35 km (e.g., Nadin and Saleeby, 2008). Structural and petrologic relations in the SCB and southernmost SNB indicate that the base of the batholith and underlying LC-SCML was sheared off at 30–35 km depth and replaced with trench materials (Grove et al., 2003; Saleeby, 2003; Chapman, 2017).

What was the fate of the sub-SCB LC-SCML? Do remnants of the displaced material exist, and if so, what is the relationship between LC-SCML remnants and underplated schist? Seismic data and receiver function analysis provide some answers to these questions, linking surface exposures of schist directly to a regional flat fabric with NE-SW seismic anisotropy beneath thin (~30 km) Mojave crust (Cheadle et al., 1986; Porter et al., 2011). Additional constraints from geochemical data reveal an ~N-S–trending boundary at ~116°W, west of which lacks a lithospheric isotopic fingerprint and suggests the presence of underplated schists (Miller et al., 1996). Collectively, these studies reveal a major compositional boundary within the mid- to deep crust of the central Mojave demarcating a western schist-bearing domain, and an eastern domain lacking significant schist and containing remnants of ancient LC-SCML (Fig. 1).

Laramide Imprints in Xenoliths

Xenolith suites of the SW Cordillera record development of the LC-SCML prior to, during, and following the Laramide event. Proterozoic upper mantle and lower crustal xenoliths in the Colorado Plateau and vicinity, in conjunction with Nd isotopic data on mafic volcanic rocks of the region, record local preservation of LC-SCML beneath the region through Laramide time (Livaccari and Perry, 1993).

Xenolith suites from the eastern and central Mojave region also provide evidence for underlying remnants of ancient LC-SCML. First, spinel peridotites from the Pliocene–Quaternary Cima cones yield Re-Os model ages of 1.8–3.4 Ga (Fig. 1; Lee et al., 2001), overlapping ca. 2.0 Ga Sm-Nd model ages on nearby Precambrian basement rocks (Bennett and DePaolo, 1987). Second, a subordinate group of peridotite xenoliths from the Quaternary Dish Hill cone yield $\varepsilon Nd = -6.4$ to -13.0 (Fig. 1; Luffi et al., 2009). These data indicate that ancient LC-SCML was not entirely sheared off from beneath the eastern to central Mojave region by Laramide flat-slab subduction.

Remnants of pre- to syn-Laramide mantle lithosphere that constituted the mantle wedge for the SNB are present in late Miocene xenolith suites from the central SNB (e.g., Ducea and Saleeby, 1998; Ducea, 2001; Chin et al., 2012). Pressure-temperature-time constraints indicate that this fossilized mantle wedge extended to ~125 km depth and cooled rapidly following the Late Cretaceous (Laramide) termination of magmatism (e.g., Ducea and Saleeby, 1998; Saleeby et al., 2003; Chin et al., 2012). Peridotites and garnet websterite dominate the base of the section and grade upward into an ~45-km-thick zone of garnet clinopyroxenite followed by garnet granulite at ~40 km paleodepth. Trace-element data and Sm-Nd isochron ages indicate that the garnet clinopyroxenites are partial-melt residues, or deep level cumulates, linked to the overlying SNB (Ducea and Saleeby, 1998; Ducea, 2001). These garnet clinopyroxenites are com-

monly referred to as eclogites, but contrast with classic eclogites by having more Ca- and Mg-rich clinopyroxene, more Fe- and Ca-rich garnet, and commonly contain accessory hornblende. These arc root cumulates are commonly referred to as "arclogites" (Anderson, 2005).

The preservation of >100 km of central SNB lower lithosphere (arc root lower crust and upper mantle) contrasts sharply with the virtual absence of these materials beneath the SCB (Fig. 1). Geochemical proxies for crustal thickness (e.g., Sr/Y and La/Yb) strongly suggest that a deep sub-SCB root indeed existed prior to shallow-angle subduction, forming in the Late Jurassic and thickening significantly during the Late Cretaceous magmatic flare-up (Howard et al., 2016). We now focus on the fate of missing SCB lower lithosphere and the regional extent of Farallon plate mantle lithosphere underplating beneath the "unrooted" SCB.

SCB LOWER LITHOSPHERE DISPLACEMENT AND RECONSTRUCTION

It is important to reiterate here that despite LC-SCML removal from beneath the SCB, and subsequent tectonic underplating of schist, the lithosphere-asthenosphere boundary in the Mojave region currently lies deeper than ~60 km (e.g., Luffi et al., 2009). This profound relationship indicates that latest Cretaceous–Cenozoic reconstruction of the mantle lithosphere beneath the schists must have taken place.

Relationships resolved in Dish Hill and Crystal Knob xenolith suites (Fig. 1) indicate that the underlying mantle lithosphere was reconstructed by tectonic underplating of Farallon plate sub-oceanic mantle between 80 and 30 Ma (Luffi et al., 2009; Liu et al., 2010; Quinn et al., 2018). Considering that eclogitic fragments of the Farallon Plate (Usui et al., 2003) plus significant amounts of ancient LC-SCML both underlie the Laramide interior, the lower lithosphere beneath a significant part of the Laramide corridor must be a composite of these assemblages. As shown on Figure 1, the underplated schists plus underlying mantle lithosphere constitute a lithosphere-scale accretionary complex lying beneath a carapace of SCB granitoids that was stripped of most of its underlying mantle wedge.

As to the fate of the displaced SCB LC-SCML, we suggest that several latest Oligocene lower lithosphere xenolith locations from the Colorado Plateau transition zone contain remnants of the missing lithosphere. This assertion predicts that native sub-arc materials and displaced equivalents should contain similar arrays of rock types. This is indeed the case, as ca. 25 Ma latite at Camp Creek and Chino Valley localities each contain abundant nodules of, in order of decreasing abundance, garnet-pyroxene rocks, garnet granulite, peridotite, and quartzofeldspathic gneiss (Schulze and Helmstaedt, 1979; Arculus and Smith, 1979; Smith et al., 1994; Esperança et al., 1988, 1997; Erdman et al., 2016). As with the sub-SNB suite, garnet clinopyroxenite xenoliths from Chino Valley and Camp Creek are arclogitic in composition, and equilibrated between 600 and 900 °C and 12–28 kbar (45–100 km depth assuming a 2800 kg/m^3 overburden density; Smith et al., 1994; Esperança et al., 1988; Erdman et al., 2016). Furthermore, high field strength element compositions and major element systematics of Arizona xenoliths balance those expected from calc-alkaline magmatic differentiation (Tang et al., 2018, 2019). Finally, Mesozoic plutons of the Mojave Desert and arclogite recovered from Chino Valley and Camp Creek all share similar isotope systematics, with $^{87}Sr/^{86}Sr$ and εNd values ranging from 0.706 to 0.711 and −2 to −10, respectively (Esperança et al., 1988; Smith et al., 1994; Miller et al., 1996). These relations point to a thick sub-SCB residue, rather than a lower plate, origin.

This assertion also predicts that materials once attached to the base of the SCB should share the early thermal history of the Mojave Desert. For example, the Mojave Desert is underlain chiefly by Middle Jurassic–Early Cretaceous (ca. 160–140 Ma) and Late Cretaceous (90–70 Ma) arc plutonic assemblages with relatively small amounts of Mesozoic to Neoproterozoic metasedimentary rocks (Wells and Hoisch, 2008; Barth et al., 2008; Needy et al., 2009; Chapman et al., 2018). Hence, if xenoliths recovered from Chino Valley and Camp Creek localities are indeed consanguineous with the SCB, the xenoliths should yield chiefly Late Cretaceous and Late Jurassic ages. If instead the xenoliths are native to the Colorado Plateau transition zone, which exposes mainly 1.6–1.8 Ga Yavapai-Mazatzal basement overlain by Proterozoic to Mesozoic strata, much older ages are expected. It should be noted that ca. 70–55 Ma porphyry copper deposits and a ca. 190–160 Ma magmatic arc crop out a few tens of kilometers SW of the studied xenolith localities (GSA Data Repository Fig. DR1[1]; e.g., Vikre et al., 2014; Tosdal and Wooden, 2015; Chapman et al., 2018). Hence, Latest Cretaceous–early Cenozoic and Early–Middle Jurassic xenolith zircon ages, readily distinguishable from Late Cretaceous and Late Jurassic ages expected from the Mojave Desert, may point to a SW Arizona origin.

NEW RESULTS AND INTERPRETATIONS

A small percentage (~5%) of garnet-clinopyroxenite-amphibole xenoliths contains trace amounts of zircon. Zircon separated from host xenoliths were analyzed via laser ablation–multi-collector inductively coupled plasma–mass-spectrometry (LA-MC-ICP-MS) at the Arizona LaserChron Center (see footnote 1).

Three xenolith groups were identified, based on lithologic relations and U-Pb zircon ages. Group 1 xenoliths contain a significant modal proportion of amphibole (>10%), which overprints the primary arclogite assemblage, and are extensively injected and altered by host latite. Zircon grains extracted from these nodules yield a bimodal age distribution consisting chiefly of Late Jurassic (kernel density estimate peak at ca. 150 Ma) ages with a lower proportion (~25%) of Late Cretaceous–early Cenozoic (peak at ca. 70 Ma) grains (Fig. 2). The second group of xenoliths consists of relatively fresh arclogite (i.e., less injected with melt and containing less secondary amphibole). These samples contain zircon that yield a unimodal spread of concordant Cretaceous to early Cenozoic ages ranging from ca. 100–50 Ma with a peak centered at ca. 75 Ma (Fig. 2). A final group of mid- to deep-crustal foliated granitic gneiss is less abundant than its deep-crust/upper mantle arclogite counterparts and yields concordia ages of ca. 1.7 Ga (Fig. DR7 [see footnote 1]). These nodules are interpreted as Proterozoic assemblages native to central Arizona.

Our new results indicate that studied arclogitic xenoliths are coeval with the

[1]GSA data repository item 2019368, field observations, sample descriptions, analytical methods, and zircon U-Pb data, is online at www.geosociety.org/datarepository/2019.

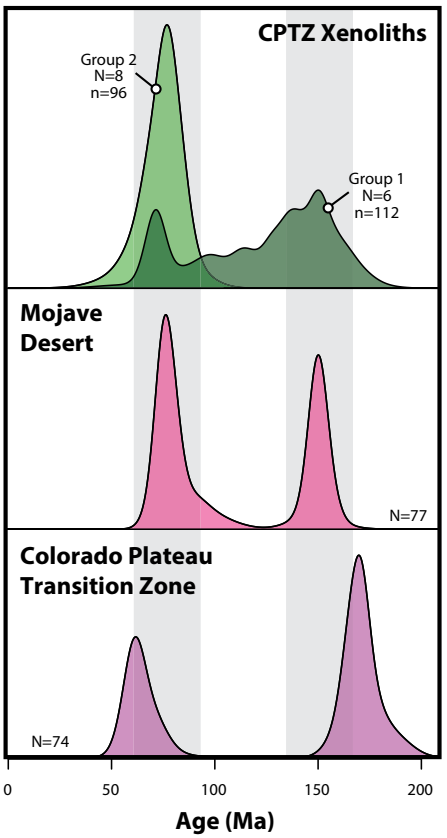

Figure 2. Non-normalized kernel density estimates with 10-m.y. bandwidth comparing U-Pb zircon ages from Colorado Plateau transition zone (CPTZ; Chino Valley and Camp Creek localities) xenoliths with pluton ages from the Mojave Desert (Barth et al., 2008; Wells and Hoisch, 2008; Needy et al., 2009; Chapman et al., 2018) and the CPTZ (Vikre et al., 2014; Tosdal and Wooden, 2015; Chapman et al., 2018). N—number of analyzed samples; n—number of analyzed grains.

SCB and, with the exception of a small proportion (<10% of analyzed grains) of Latest Cretaceous–early Cenozoic grains, are older than Arizona porphyry copper deposits (Vikre et al., 2014; Chapman et al., 2018; Fig. 2). Furthermore, Late Jurassic zircon populations in group 1 xenoliths overlap Mojave Desert pluton emplacement ages and are younger than those expected from the Early–Middle Jurassic magmatic arc of SW Arizona (Fig. 2). These relations lead us to assert that arclogitic xenoliths are not native to central Arizona and instead represent LC-SCML fragments displaced eastward from beneath the SCB and reaffixed beneath the transition zone.

We propose the following model for the petrologic and tectonic evolution of Colorado Plateau transition zone arclogite (Figs. 3 and 4). In Late Jurassic time, group 1 (i.e., amphibole-rich arclogite) xenoliths began forming as a mafic keel to continental arc magmas

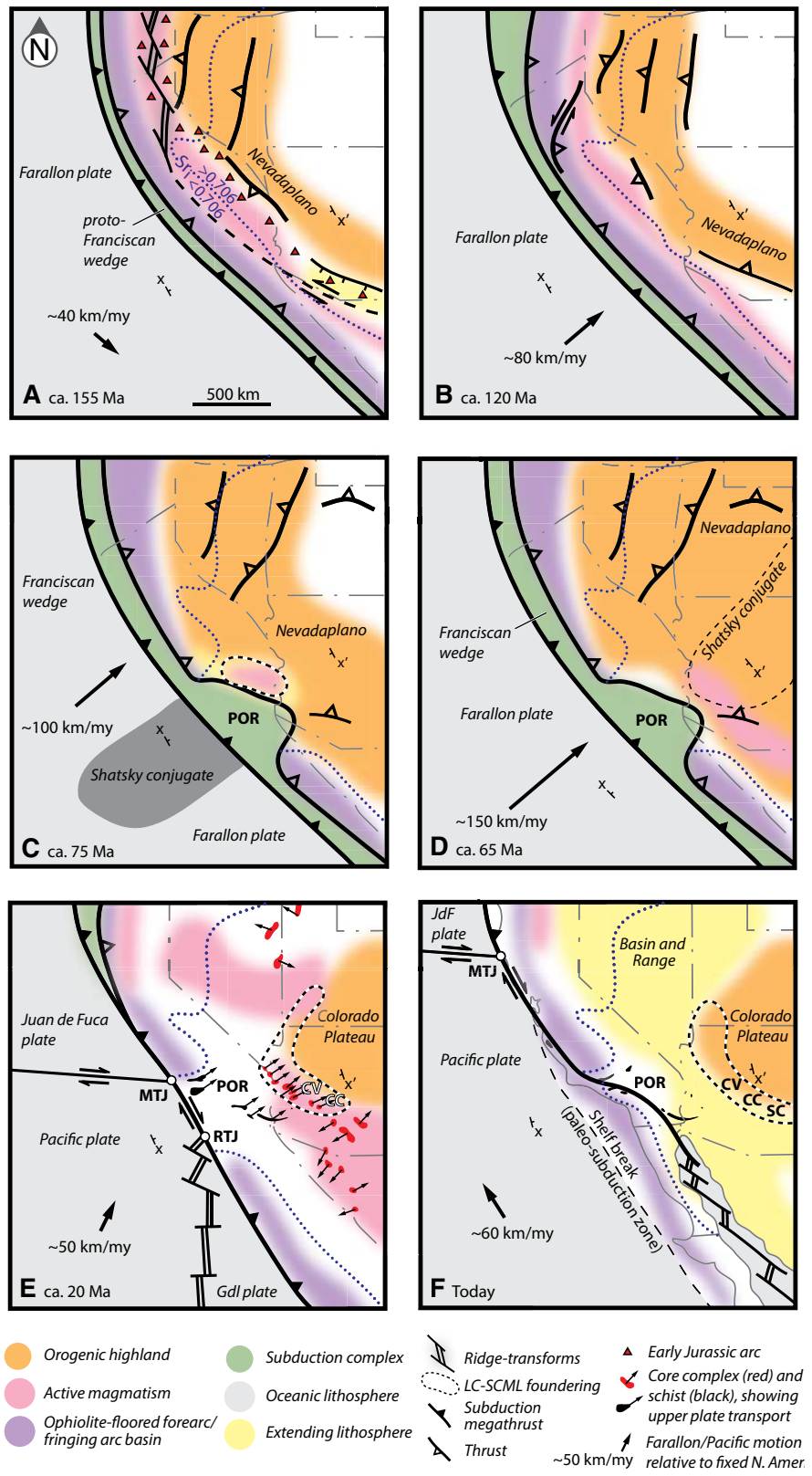

Figure 3. SW U.S. plate tectonic reconstruction for (A) middle Jurassic, (B) Early Cretaceous, (C) Late Cretaceous, (D) Latest Cretaceous, (E) late Cenozoic, and (F) Recent time (modified after DeCelles, 2004; Saleeby and Dunne, 2015). Farallon/Pacific plate trajectories from Engebretsen et al. (1985). Surface outline of lowermost crust and upper subcontinental mantle lithosphere (LC-SCML) foundering from Levander et al. (2011) and Erdman et al. (2016). Core complex and schist kinematics from Dickinson (2009) and Chapman (2017), respectively. See text for details. CC—Camp Creek; CV—Chino Valley; MTJ—Mendocino triple junction; POR—Pelona-Orocopia-Rand schist; RTJ—Rivera triple junction; SC—San Carlos; Gdl—Guadalupe plate.

emplaced into the central and eastern Mojave Desert crust (Barth et al., 2008; Needy et al., 2009; Chapman et al., 2018). Following an Early Cretaceous lull in arc activity, the sub-SCB root experienced a Late Cretaceous pulse of growth associated with increased magmatism in the SCB (Wells and Hoisch, 2008; Needy et al., 2009; Chapman et al., 2018), as recorded by ca. 80–70 Ma zircon ages in group 1 and 2 xenoliths. These Late Cretaceous additions to existing SCB root material and concomitant plutonism at higher levels of the crust likely resulted from delamination and foundering of LC-SCML, destabilized by slab shallowing-related lateral stresses, and ensuing upwelling of hot asthenosphere (Leventhal et al., 1995; Wells and Hoisch, 2008).

Shallow-angle subduction likely commenced at the plate margin in the ca. 90–75 Ma time interval, based on plate motion modeling and the timing of schist underplating (e.g., Grove et al., 2003; Liu et al., 2010; Chapman, 2017). The leading edge of the shallowly subducting segment likely reached the central Mojave Desert, then ~500 km inboard from the margin, no later than 70 Ma, assuming an orthogonal converge rate of 100 km/m.y. (Engebretson et al., 1985; Copeland et al., 2017). At this point, schist underplating continued while the slab shallowed quickly, shutting off magmatism in the SCB, dislodging its LC-SCML, and tectonically bulldozing these materials along the Moho and up to ~500 km farther inboard to the Colorado Plateau transition zone (Axen et al., 2018). In the process, strong coupling along the subduction interface drove significant thickening of foreland crust and the formation of a vast orogenic plateau (DeCelles, 2004; Henry et al., 2012; Copeland et al., 2017; Chapman et al., 2018). (It should be noted that lower lithosphere is intact NE of the Colorado Plateau transition zone; hence, deformation along the Laramide corridor as far inboard as the Black Hills of South Dakota was likely due to horizontal end-loading, as suggested by Livaccari and Perry [1993].) Meanwhile, magmatism swept inboard, forming ca. 75–55 Ma granitic stocks and associated copper mineralization in the transition zone (Coney and Reynolds, 1977; Vikre et al., 2014). We suggest that the combination of magmatism and crustal thickening–related radiogenic heating precipitated Latest Cretaceous–early Cenozoic zircon growth in dislodged arclogite.

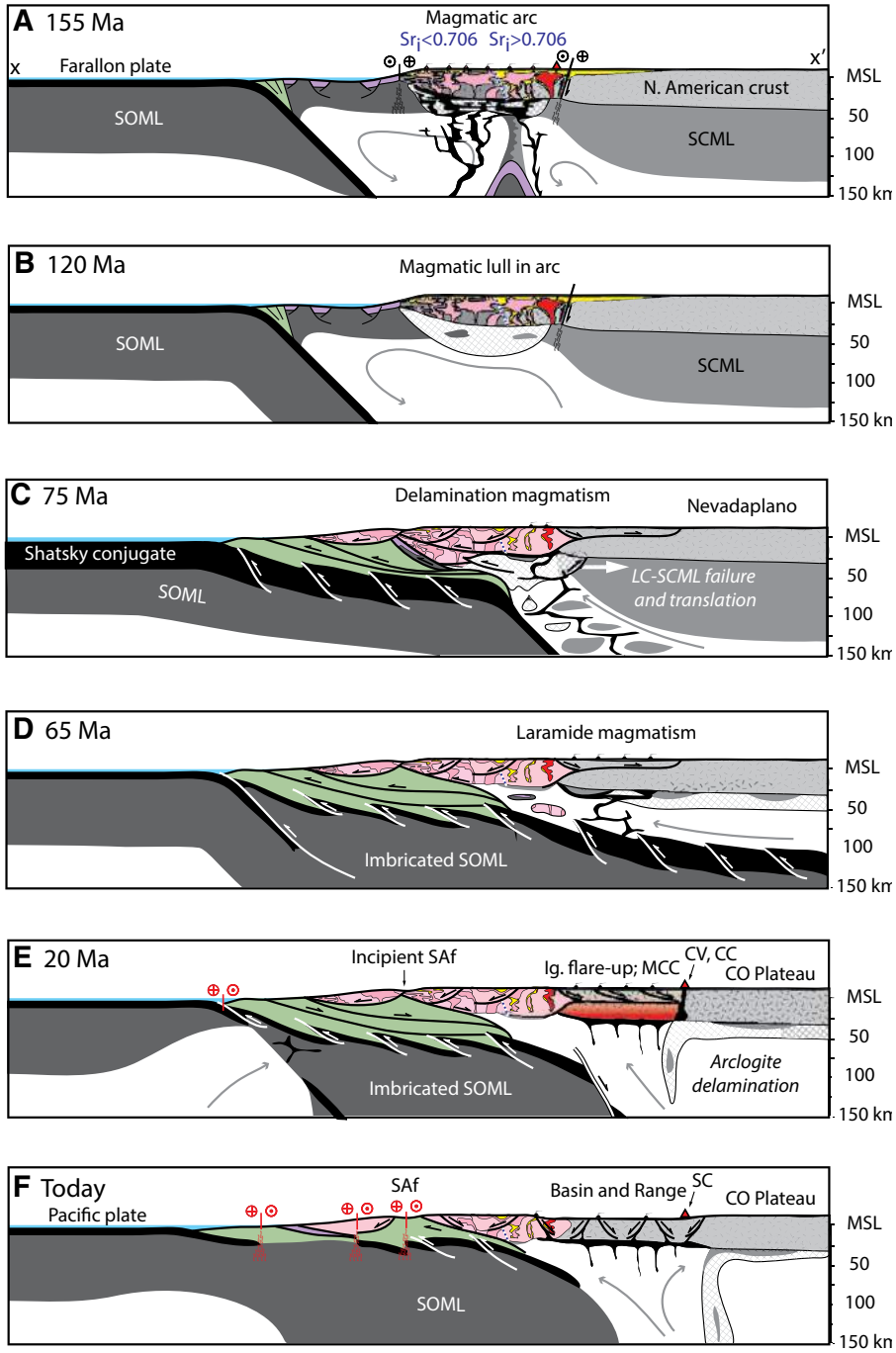

Figure 4. Cross sections corresponding to x–x' locations in Figure 3. Vertical equals horizontal scale. Colors correspond to those in Figure 3. See text for details. CC—Camp Creek; CO—Colorado; CV—Chino Valley; Ig.—ignimbrite; LC—lower crust; MCC—metamorphic core complexes; MSL—mean sea level; SAf—San Andreas fault; SC—San Carlos; SCML—sub-continental mantle lithosphere; SOML—sub-oceanic mantle lithosphere.

A LASTING SCAR: CENOZOIC DELAMINATION AND EXTENSION IN THE SW UNITED STATES

Xenolith garnet Sm-Nd and titanite U-Pb ages span the entire Paleogene, indicating that displaced arclogite remained hot (>600 °C) for tens of millions of years following its dispersal (Dodson, 1973; Esperança et al., 1988; Erdman et al., 2016). This observation is readily explained by the well-documented Eocene to Miocene westward sweep of magmatism (e.g., Coney and Reynolds, 1977; Copeland et al., 2017), including the ca. 25 Ma arclogite xenolith-hosting latite, that accompanied rollback and tearing of the Farallon slab. This time

also marked a shift from convergent to extensional tectonism in the SW United States, including the initiation of the southern belt (i.e., California, Arizona, and Sonora) of Cordilleran metamorphic core complexes (Dickinson, 2009) and exhumation across the schist outcrop belt (e.g., Chapman, 2017).

The lack of arclogite and abundance of spinel peridotite xenoliths in ca. 15 Ma and younger volcanic host rocks of the transition zone (e.g., the San Carlos locality; Nealey and Sheridan, 1989), in conjunction with a vertical high-seismic-velocity anomaly and the presence of a "double Moho" within the Colorado Plateau transition zone (Levander et al., 2011; Erdman et al., 2016), suggest that arclogite has been foundering into the mantle and being replaced by upwelling asthenosphere since early Miocene time. We speculate that post-Laramide rollback and tearing of the Farallon slab and associated influx of asthenosphere destabilized the foreign mafic keel of the Colorado Plateau, leading to its removal and heating of overlying material. Ensuing flow in the weakened lower crust, which remained feebly coupled to the upper crust, facilitated the localized surface extension that ultimately resulted in the southern belt of Cordilleran metamorphic core complexes.

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GSA Adopts New Code of Ethics & Professional Conduct

On 21 Sept. 2019, the GSA Council approved a new Code of Ethics & Professional Conduct. This new ethics policy replaces GSA's Code of Conduct, which was put in place in the 1990s. It was developed in response to a 2017 decision by GSA leadership, under then GSA President Isabel Montañez, to form an ad hoc committee to evaluate GSA's ethics policies and practices in light of high-profile ethics cases in many scientific fields. According to Dr. Montañez, "As a premier society for professional geoscientists, GSA saw a pressing need to establish enforceable ethics standards—not only to provide for accountability, but to set a positive example for the geoscience profession overall."

GSA's new code sets forth enforceable standards of conduct for all GSA members and aspirational standards that embody GSA's goal of fostering a culture of integrity across the geosciences. Many GSA members and staff contributed to this effort over the past two years, including an 11-person ad hoc ethics committee and a seven-person ad hoc code of ethics drafting committee. In addition, GSA received 120 comments from members on an early draft before the code was finalized. Our members' input was invaluable; it enabled us to create a streamlined policy to address the most critical ethics and compliance issues facing our scientific community.

More detailed policies on specific topics, including GSA's Events Code of Conduct and the Ethical Guidelines for Publication, support our new code. While both these policies apply to GSA members and non-members who participate in GSA-sponsored activities and publications, our new Code of Ethics & Professional Conduct only applies to GSA members. "Our new ethics policy reflects expectations of professional conduct," says GSA's executive director, Vicki McConnell. "GSA now has clearly defined standards of professional conduct as guidance for our members regardless of the professional setting or location, even if the activity is not sponsored by GSA."

In adopting the new code, GSA's leaders recognized the critical importance of having a fair process for resolving allegations of misconduct. "GSA takes all ethics complaints seriously," says GSA's current president, Don Siegel, "but we also need to protect members through the use of reasonable due process and confidentiality procedures." To that end, GSA's Policy & Procedures for Handling Potential Ethical Violations sets forth specific rules to process ethics complaints to ensure fairness, confidentiality, and consistency. Ultimately, the GSA Council is responsible for determining whether the code has been violated and, if so, what corrective action is appropriate.

So far, the new code has been well received. As GSA member Wendy Bohon writes, "I believe that having a code of conduct is critical for a healthy organization. By articulating our values, expectations and accountabilities we reinforce and encourage respectful, inclusive, collaborative meetings and workspaces. A code of conduct doesn't just lay out expectations for behavior, although it certainly does that as well, it shows an organization's commitment to the safety, dignity and well-being of its members. All of these elements are necessary for producing the rich, outstanding science that comes from a broad and diverse set of scientists where everyone is able to perform to their full potential."

For further information about GSA's Code of Ethics & Professional Conduct and other ethics resources, check GSA's ethics homepage by navigating to the "About" tab on GSA's website, **https://www.geosociety.org.** You also may submit an email to ethics@geosociety.org.

Being a member of a professional society inherently indicates that we, as individuals, are professionals. Professionalism means conducting oneself with responsibility, integrity, accountability, and excellence at all times. If our behavior isn't ethical, then we aren't an ethical profession. A lack of ethics erodes not only our standing as a scientific society, but also the integrity of science. GSA's new Code of Ethics affirms that by virtue of GSA membership, we extend and expect professional conduct in every aspect of conducting science. Congrats GSA on this vital step forward!

Monica E. Gowan
GSA Fellow
Former GSA Councilor
Former Officer, Geology and Health Division
Past Chair, GSA Geology and Public Policy Committee

GSA 2019 Annual Meeting & Exposition Wrap-Up

To all the attendees, sponsors, Scientific Divisions, Associated Societies, invited guests, speakers, awardees, and exhibitors, I extend a sincere thank you for a job well done at the 2019 GSA Annual Meeting and Exhibition in Phoenix, Arizona, USA. It was a great meeting with impressive science, compelling speakers and stimulating special sessions, plenty of networking, and fun. Join me in thanking the local planning committee and all the volunteers who make this happen. Let's do it again in 2020 by proposing a session, a Pardee Symposium, or a Short Course or by presenting your science during the meeting. See you in Montréal!"

—Vicki S. McConnell, GSA Executive Director

By the Numbers
Attendees: 5,519
Professionals: 2,514
Early Career Professionals: 502
Students: 2,014
K–12 Teachers: 61
Mentors: 121
On To the Future Scholars: 75
Countries Represented: 44
Abstracts Presented: 3,654 (2,228 orals; 1,426 posters)
Short Courses: 19, with 391 participants
Field Trips: 23, with 499 participants
Companies Exhibiting: 207

GSA 2019
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In case you missed these talks at GSA 2019, we've saved them online for you!
GSA Presidential Address and Awards Ceremony: **https://livestream.com/accounts/7595903/events/8768783**

Late-Breaking Session: Ten-Million Years of Deformation along the Eastern California Shear Zone: Context and Characterization of the July 2019 M_W7.1 Ridgecrest Earthquake: **https://livestream.com/accounts/7595903/events/8768809**

P2. Grand Ideas, Grand Events: Geoscience Research, Geoscience Education, and Human Connections to Grand Canyon at its Six Millionth, 150th, and 100th Anniversaries: **https://livestream.com/accounts/7595903/events/8768814**

Feed Your Brain: Scott W. Tinker, "*Switch* is Back! Energy Poverty, the Energy Transition, and Modern Energy Education": **https://livestream.com/accounts/7595903/events/8768816**

P3. Geoscience Communication in the Modern Age: **https://livestream.com/accounts/7595903/events/8768819**

P4. Fostering an Inclusive Academic Culture for the 21st Century: Advancing Policies, Departments, and Supporting Faculty to Address the Needs and Challenges for Building a Healthy Geoscience Enterprise: **https://livestream.com/accounts/7595903/events/8768822**

Feed Your Brain: Katharine Hayhoe, 2019 Michel T. Halbouty Distinguished Lecturer, "Climate Change: The Threat Multiplier": **https://livestream.com/accounts/7595903/events/8768826**

P5. Extreme Impacts of Global Climate Change: Effective Communication for Geoscientists, Educators, Policy Makers, and the Press: **https://livestream.com/accounts/7595903/events/8768829**

P6. Understanding the Neoproterozoic Earth-Life System: **https://livestream.com/accounts/7595903/events/8768832**

Feed Your Brain: Meghan Kish, "Your Park. Your Science. Our Future: Inspiring Geoscience and Other STEM Careers via Collaboration with the NPS": **https://livestream.com/accounts/7595903/events/8768833**

Thank You Sponsors!

Your support of the Geological Society of America's Annual Meeting & Exposition continues a longstanding tradition of serving science and the profession. The Society appreciates your investment in the growth of current and future leaders in the geoscience community. Asterisks indicate in-kind contributions.

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FINAL CALL

Award & Nomination Deadlines

www.geosociety.org/gsa/awards/nominate.aspx

For details, see the October 2019 *GSA Today* or go to **https://www.geosociety.org/awards.** You can also email awards@geosociety.org.

Nomination deadline: 1 Feb.

2020 GSA Medals and Awards

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

Application deadline: 1 Feb.

2020 Cole Research Grant Awards

- The **Gladys W. Cole Memorial Research Award** for research on the geomorphology of semiarid and arid terrains in the United States and Mexico is awarded annually to a GSA member or Fellow between 30 and 65 years of age who has published one or more significant papers on geomorphology.
- The **W. Storrs Cole Memorial Research Award** for research on invertebrate micropaleontology is awarded annually to a GSA member or Fellow between 30 and 65 years of age who has published one or more significant papers on micropaleontology.

Learn more at **https://www.geosociety.org/gsa/grants/postdoc.aspx.**

Nomination deadline: 1 Feb.

AGI Awards

Submit nominations for the following awards at **www.agiweb.org/direct/awards.html.**

- AGI Medal in Memory of Ian Campbell for Superlative Service to the Geosciences recognizes singular performance in and contribution to the profession of geology.
- AGI Marcus Milling Legendary Geoscientist Medal is given to a recipient with consistent contributions of high-quality scientific achievements and service to the Earth sciences having lasting, historic value; who has been recognized for accomplishments in field(s) of expertise by professional societies, universities, or other organizations; and is a senior scientist nearing completion or has completed full-time regular employment.

Proposal deadline: 1 Feb.

Tim W. Wawrzyniec Fellowship at the Rocky Mountain Biological Laboratory

This fellowship is intended to support research conducted by Ph.D.-holding investigators who have not previously worked through Rocky Mountain Biological Laboratory (RMBL). The intent is for this fund to award US$5,000 annually. The deadline for new proposals to RMBL is 1 Feb. The deadline for the fellowship application form is 15 Feb. Go to **http://www.rmbl.org/scientists/** to learn more about conducting research at RMBL. For information about fellowships and working at RMBL, please contact gis@rmbl.org.

Nomination deadline: 1 Mar.

• GSA International Distinguished Career Award
• James B. Thompson, Jr., Distinguished International Lecturer Award

Learn more at **https://www.geosociety.org/gsa/about/GSA_international/GSA/international/awards.aspx.**

Nomination deadline: 31 Mar.

John C. Frye Environmental Geology Award

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

For a list of other national awards and nomination forms, go to **https://www.geosociety.org/gsa/about/awards/gsa/awards/national.aspx.** If you know of an award not listed, please send the details to awards@geosociety.org.

CALL FOR NOMINATIONS

GSA Scientific Division Awards

ENERGY GEOLOGY DIVISION

Gilbert H. Cady Award

Nominations due 28 Feb.

Submit nominations to Marc L. Buursink at buursink.usgs@gmail.com.

The Gilbert H. Cady Award, first presented in 1973, recognizes outstanding contributions in the field of coal geology that advance the science both within and outside of North America. For more information, go to **https://community.geosociety.org/energydivision/awards/cady.**

NEW: Curtis-Hedberg Petroleum Career Achievement Award

Nominations due 1 Mar.

Submit nominations to Laura S. Ruhl, lsruhl@ualr.edu

The inaugural Curtis-Hedberg Petroleum Career Achievement Award will be made for outstanding contributions in the field of petroleum geology. The award will go to a GSA member that has had a career in petroleum geology and has made contributions to the discovery of petroleum reserves or the development of a new idea(s) and/or technology that increased petroleum resources. Considerations will be given for their publications and their contributions to geoscience societies and institutions. Petroleum geology is defined as the field of knowledge concerning the origin, occurrence, relationships, and geologic characteristics of petroleum reserves, resources, and exploration, including economic implications and petroleum technology. This new Division award honors two former GSA presidents who made outstanding contributions to petroleum geoscience: Doris Malkin Curtis and Hollis Hedberg. Learn more at **https://community.geosociety.org/energydivision/awards/curtishedberg.**

ENVIRONMENTAL & ENGINEERING GEOLOGY DIVISION

E.B. Burwell, Jr., Award

Nominations due 1 Feb.

Submit nominations to Jim McCalpin at mccalpin@geohaz.com.

The Edward Burwell, Jr., Award, established by the Division in 1968, honors the memory of one of the founding members of the Division and the first chief geologist of the U.S. Army Corps of Engineers. This award is made to the author or authors of a published paper of distinction that advances knowledge concerning the principles or practice of engineering geology or of the related fields of applied soil or rock mechanics where the role of geology is emphasized. The paper that receives the award must (1) deal with engineering geology or a closely related field, and (2) have been published no more than five years prior to its selection. There are no restrictions on the publisher or publishing agency of the paper. For more information, go to **https://community.geosociety.org/eegdivision/awards/burwell.**

Richard H. Jahns Distinguished Lecturer

Nominations due 28 Feb.

Submit nominations or questions to Stephen Slaughter at stephen.slaughter@dnr.wa.gov.

The Richard H. Jahns Distinguished Lectureship was established in 1988 by the Environmental & Engineering Geology Division and the Association of Environmental & Engineering Geologists to commemorate him and to promote student awareness of engineering geology through an annual series of lectures at academic institutions. The award is given to an individual who, through research or practice, has made outstanding contributions to the advancement of environmental and/or engineering geology. The awardee will speak on topics of earth processes and the consequences of human interaction with these processes, or the application of geology to environmental and/or engineering works. Award funds are administered by the GSA Foundation. For more information, go to **https://community.geosociety.org/eegdivision/awards/jahns.**

GEOARCHAEOLOGY DIVISION

Richard Hay Student Paper/Poster Award

Nominations due 1 Sept.

Submit nominations to gsa.agd@gmail.com.

At the 2006 Annual Meeting in Philadelphia, Pennsylvania, USA, the Division's management board elected to rename the student travel award for a distinguished scientist in archaeological geology. After consulting with his family, the award was officially named the Richard Hay Student Paper/Poster Award. Hay was a longstanding member of the Division and had a long and distinguished career in sedimentary geology, mineralogy, and archaeological geology. He is particularly well known for his work on the Olduvai Gorge and Laetoli Hominid-bearing sites and was awarded the Division's Rip Rapp Award in 2000. The Division is proud to have its student travel award bear his name. The award is a travel grant for a student (undergraduate or graduate) presenting a paper or poster at GSA's annual meeting. The grant is competitive and is awarded based on the evaluation of the scientific merit of the research topic and the clarity of an expanded abstract for the paper or poster prepared by a student for presentation in the Division's technical session at the meeting. For more information, go to **https://community.geosociety.org/geoarchdivision/awards/student/hay.**

Claude C. Albritton, Jr., Award

Nominations due 15 Mar.

Submit nominations to gsa.agd@gmail.com.

Under the auspices of the Geoarchaeology Division, family, friends, and close associates of Claude C. Albritton, Jr., formed a memorial fund in his honor through the GSA Foundation. The Albritton Award Fund provides scholarships and fellowships for

graduate students in the earth sciences or archaeology for research. Recipients of the award are students who have (1) an interest in achieving a master's or Ph.D. degree in earth sciences or archaeology; (2) an interest in applying earth-science methods to archaeological research; and (3) an interest in a career in teaching and academic research. Awards in the amount of US$650 are given in support of thesis or dissertation research, with emphasis on the field and/or laboratory aspects of the research. For more information, go to **https://community.geosociety.org/geoarchdivision/awards/student/albritton.**

Rip Rapp Award

Nominations due 15 Feb.
Submit nominations to gsa.agd@gmail.com.

In 1983, the Division established the "Archaeological Geology Division Award" for outstanding contributions to the interdisciplinary field of archaeological geology. In 1993, the award was officially renamed the "Rip Rapp Archaeological Geology Award" in honor of George "Rip" Rapp Jr. Rapp was one of the primary individuals responsible for establishment of the Division and generously established a Division award fund with the GSA Foundation. Nominations should include a biographical sketch, a statement of outstanding achievements, and a selected bibliography of the nominee. For more information, go to **https://community.geosociety.org/geoarchdivision/awards/riprapp.**

GEOINFORMATICS DIVISION

Outstanding Contributions in Geoinformatics Award

Nominations due 15 Feb.

The Outstanding Contributions in Geoinformatics Award will be made to an individual who has contributed in an outstanding manner to geology through the application of the principles of geoinformatics. The individual should be a member of GSA. For more information, go to **https://community.geosociety.org/geoinformaticsdivision/awards.**

GEOPHYSICS & GEODYNAMICS DIVISION

George P. Woollard Award

Nominations due 1 Feb.
Submit nominations to Carol A. Stein at cstein@uic.edu.

The George P. Woollard Award recognizes outstanding contributions to geology through the application of the principles and techniques of geophysics. A highlight of the presentation is the honorary George P. Woollard Technical Lecture by the recipient before the award ceremony. To submit a nomination, please provide the nominee's name, contact information, and a short paragraph stating the nominee's qualifications, including a short summary of their specific work or outcomes and how these have contributed to geology. A curricula vitae, if available, helps, but is not required. Please send as email attachments. Award funds are administered by the GSA Foundation. For more information, go to **https://community.geosociety.org/geophysicsdivision/awards/woollard.**

GEOSCIENCE EDUCATION DIVISION

Biggs Award for Excellence in Earth Science Teaching

Nominations due 15 Mar.
Submit nominations online.

The Biggs Award recognizes innovative and effective teaching in college-level earth science. Earth-science instructors and faculty members from any academic institution engaged in undergraduate education who have been teaching full-time for 10 years or fewer are eligible (part-time teaching is not counted in this requirement). Both peer- and self-nominations will be accepted. This award, administered by the GSA Foundation, is made possible by support from the Donald and Carolyn Biggs Fund, the GSA Geoscience Education Division, and GSA's education and outreach program. An additional travel reimbursement is also available to the recipient to enable him or her to attend the award presentation at the GSA Annual Meeting. For more information, go to **https://community.geosociety.org/gedivision/awards/biggsaward.**

HISTORY AND PHILOSOPHY OF GEOLOGY DIVISION

Mary C. Rabbitt History and Philosophy of Geology Award

Nominations due 15 Feb.
Submit nominations to Stephen G. Pollock at stephen.pollock@maine.edu.

The Mary C. Rabbitt History and Philosophy of Geology Award is presented annually to an individual for exceptional scholarly contributions of fundamental importance to our understanding of the history of the geological sciences. Achievements deserving of the award include, but are not limited to, publication of papers or books that contribute new and profound insights into the history of geology based on original research or a synthesis of existing knowledge. The award was established by the History of Geology Division in 1981 and renamed in 2005 in memory of Mary C. Rabbitt, whose bequest has made this award possible. Neither the nominator nor the nominee need be a member of the Division or of GSA. The nomination packet should include (1) a letter detailing the contributions that warrant the award; and (2) the nominee's current curriculum vitae, including name, title, affiliation, education, degrees, honors and awards, major career events, and contributions that warrant the award. Monies for the award are administered by the GSA Foundation. For more information, go to **https://community.geosociety.org/histphildiv/awards/rabbitt.**

Gerald M. and Sue T. Friedman Distinguished Service Award

Nominations due 15 Feb.
Submit nominations to Stephen G. Pollock at stephen.pollock@maine.edu.

The Gerald M. and Sue T. Friedman Distinguished Service Award, established in 2005, is presented for exceptional service to the advancement of our knowledge of the history and philosophy of the geological sciences. Neither the nominator nor the nominee need be a member of the Division or of GSA. The service to the history and philosophy of geology may include, but is not limited to, the discovery of and making available rare source materials; comprehensive bibliographic surveys; organizing meetings and symposia in

the history and philosophy of geology; and exceptional service to the Division. The nomination packet should include (1) a letter detailing the contributions that warrant the award; and (2) the nominee's current curriculum vitae including name, title, affiliation, education, degrees, honors and awards, major career events, and the contributions that warrant the award. The award is made possible by a bequest from the estate of Mary C. Rabbitt. Monies for the award are administered by the GSA Foundation. For more information, go to **https://community.geosociety.org/histphildiv/awards/dsa.**

History and Philosophy of Geology Student Award

Nominations due 15 June

Submit nominations to Stephen G. Pollock at stephen.pollock@maine.edu.

The History and Philosophy of Geology Division provides a student award in the amount of US$1,000 for a paper to be given at the GSA Annual Meeting. Awards may also be given for second place. The award, established in 2004, is made possible by a bequest from the estate of Mary C. Rabbitt. Oral presentations are preferred. Faculty advisors may be listed as second author, but not as the lead author of the paper. The proposed paper may be (1) a paper in the history or philosophy of geology; (2) a literature review of ideas for a technical work or thesis/dissertation; or (3) some imaginative aspect of the history or philosophy of geology we have not thought of before. Students should submit an abstract of their proposed talk and a 1,500–2,000-word prospectus for consideration. The awards committee will assist the winners with a review of the abstract, facilitating presentation according to GSA standards. Currently enrolled undergraduates and graduate students are eligible, as are students who received their degrees at the end of the fall or spring terms immediately preceding the GSA Annual Meeting. The award is open to all students regardless of discipline, provided the proposed paper is related to the history or philosophy of a geological idea/person. The award is made possible by a bequest from the estate of Mary C. Rabbitt, and monies for the award are administered by the GSA Foundation. For more information, go to **https://community.geosociety.org/histphildiv/awards/student.**

HYDROGEOLOGY DIVISION

O.E. Meinzer Award

Nominations due 1 Feb.

Submit nominations to gsa.hydro.nominations@gmail.com.

The O.E. Meinzer Award recognizes the author or authors of a publication or body of publications that have significantly advanced the science of hydrogeology or a closely related field. The nomination must cite the publication(s) on which the nomination is based and describe the role of the publication(s) in advancing hydrogeology or a closely related discipline. Inclusion of up to three additional third-party letters in support of the nomination is encouraged. If you have questions, please contact gsa.hydro.nominations@gmail.com. For more information, go to **https://community.geosociety.org/hydrodivision/awards/meinzer.**

George Burke Maxey Distinguished Service Award

Nominations due 1 Feb.

Submit nominations to gsa.hydro.nominations@gmail.com.

The George Burke Maxey Distinguished Service Award will be made in recognition of distinguished personal service to the hydrogeology profession and to the GSA Hydrogeology Division. The award is based on a history of sustained creditable service to the hydrogeology profession and to the Hydrogeology Division. Please submit a letter of nomination that describes the distinguished service that warrants the nomination. Supporting letters are helpful but not required. For more information, go to **https://community.geosociety.org/hydrodivision/awards/serviceaward.**

Kohout Early Career Award

Nominations due 1 Feb.

Submit nominations to gsa.hydro.nominations@gmail.com.

The Kohout Early Career Award will be presented to a distinguished early career scientist (35 years of age or younger throughout the year in which the award is to be presented or within five years of receiving their highest degree or diploma) for outstanding achievement in contributing to the hydrogeologic profession through original research and service and for the demonstrated potential for continued excellence throughout their career. The nomination package must include (1) at least one letter of nomination with a description of the significant contributions or accomplishments; (2) the nominee's curriculum vitae with complete bibliography; and (3) at least four supporting letters. For more information, go to **https://community.geosociety.org/hydrodivision/awards/kohout.**

Birdsall-Dreiss Distinguished Lecturer

Nominations due 1 Feb.

Submit nominations to gsa.hydro.nominations@gmail.com.

The Birdsall-Dreiss Distinguished Lecturer is selected based on outstanding contributions to hydrogeology or a closely related field through original research and public communication, and the potential for continued contributions to the profession. Include at least one letter of nomination, a copy of the nominee's curriculum vitae, and at least two supporting letters describing the significant contributions or accomplishments constituting the basis for the nomination. For more information, go to **https://community.geosociety.org/hydrodivision/birdsall/about2019.**

LIMNOGEOLOGY DIVISION

Israel C. Russell Award

Nominations due 15 Mar.

Submit nominations to David Finkelstein at finkelstein@hws.edu.

The Israel C. Russell Award is given for major achievements in limnogeology through contributions in research, teaching, and service. Nominations should consist of a letter describing the nominee's accomplishments in the field of limnogeology (broadly defined and including limnogeology, limnology, and paleolimnology), service to students and teaching, and contributions to GSA, as well as a curriculum vitae. For more information, go to **https://community.geosociety.org/limnogeologydivision/awards/russell.**

Kerry Kelts Research Award

Nominations due 30 June

Submit nominations to David Finkelstein at finkelstein@hws.edu.

The Kerry Kelts Research Award is for undergraduate or graduate student research related to limnogeology, limnology, or paleolimnology. For more information, go to **https://community.geosociety.org/limnogeologydivision/awards/kerrykelts.**

MINERALOGY, GEOCHEMISTRY, PETROLOGY, AND VOLCANOLOGY (MGPV) DIVISION

MGPV awards emphasize achievements in geologic and multidisciplinary approaches. Geologic work is by nature generalistic and has an important field component, with Earth as the natural laboratory. For more information, go to **https://community.geosociety.org/mgpvdivision/home.**

MGPV Distinguished Geologic Career Award

Nominations due 31 Mar.
Submit nominations to J. Alex Speer at jaspeer@minsocam.org.

The MGPV Distinguished Geologic Career Award will go to an individual who, throughout his or her career, has made distinguished contributions in one or more of the following fields of research: mineralogy, geochemistry, petrology, volcanology, with emphasis on multidisciplinary, field-based contributions. Nominees need not be citizens or residents of the United States, and GSA membership is not required. The award will not be given posthumously. For more information, go to **https://community.geosociety.org/mgpvdivision/awards/dgca.**

MGPV Early Career Award

Nominations due 31 Mar.
Submit nominations to J. Alex Speer at jaspeer@minsocam.org.

The MGPV Early Career Award will go to an individual near the beginning of his or her professional career who has made distinguished contributions in one or more of the following fields of research: mineralogy, geochemistry, petrology, and volcanology, with emphasis on multidisciplinary, field-based contributions. Nominations are restricted to those who are within eight years past the award of their final degree. Extensions of up to two years will be made for nominees who have taken career breaks for family reasons or caused by serious illness. Nominees need not be citizens or residents of the United States, and GSA membership is not required. The award will not be given posthumously. For more information, go to **https://community.geosociety.org/mgpvdivision/awards/earlycareer.**

PLANETARY GEOLOGY DIVISION (PGD)

Eugene M. Shoemaker Impact Cratering Award

Nominations due 19 Aug.
Submit nominations online.

The Shoemaker Award is for undergraduate or graduate students, of any nationality, working in any country, in the disciplines of geology, geophysics, geochemistry, astronomy, or biology. The award, which will include US$2,500, is to be applied to the study of impact craters, either on Earth or on the other solid bodies in the solar system. Areas of study may include but are not necessarily limited to impact cratering processes; the bodies (asteroidal or cometary) that make the impacts; or the geological, chemical, or biological results of impact cratering. For more information, go to **https://community.geosociety.org/pgd/awards/shoemaker.**

Pellas-Ryder Award

Nominations due 31 Jan.
Submit nominations to Jon M. Friedrich at friedrich@fordham.edu.

The Pellas-Ryder Award, which is jointly sponsored by the Meteoritical Society and the GSA PGD, is awarded to an undergraduate or graduate student who is first author of the best planetary science paper published in a peer-reviewed scientific journal during the year prior to the award. Potential topics are listed on the cover of *Meteoritics & Planetary Science*, and include asteroids, comets, craters, interplanetary dust, interstellar medium, lunar samples, meteors, meteorites, natural satellites, planets, tektites, and origin and history of the Solar System. The award has been given since 2001 and honors the memories of meteoriticist Paul Pellas and lunar scientist Graham Ryder. For more information, go to **https://community.geosociety.org/pgd/awards/pellas-ryder.**

Ronald Greeley Award for Distinguished Service

Nominations due 30 June
Submit nominations to the PGD management board at https://community.geosociety.org/pgd/aboutus/officers.

In 2011, the PGD established the Ronald Greeley Award for Distinguished Service. This award may be given to those members of the PGD, and those outside of the Division and GSA, who have rendered exceptional service to the PGD for a multi-year period. The award is not open to currently serving members of the management board, but may be awarded to past members of the management board who have provided exceptional service to the PGD after their term on the management board has ended. Nominations for the award, which should include a description of what the nominee has given to the PGD community, may be made by any PGD member. For more information, go to **https://community.geosociety.org/pgd/awards/greeley.**

QUATERNARY GEOLOGY & GEOMORPHOLOGY DIVISION

Farouk El-Baz Award for Desert Research

Nominations due 1 Apr.
Submit nominations to Anne Chin at anne.chin@ucdenver.edu.

The Farouk El-Baz Award for Desert Research rewards excellence in desert geomorphology research worldwide. It is intended to stimulate research in desert environments by recognizing an individual whose research has significantly advanced the understanding of the Quaternary geology and geomorphology of deserts. Although the award primarily recognizes achievement in desert research, the funds that accompany it may be used for further research. The award is normally given to one person but may be shared by two people if the recognized research was the result of a coequal partnership. Any scientist from any country may be nominated. Because the award recognizes research excellence, self-nomination is not permitted. Neither nominators nor nominees need be GSA members. Monies for the award are derived from the annual interest income of the Farouk El-Baz Fund, administered by the GSA Foundation. Nominations should include (1) a statement of the significance of the nominee's research; (2) a curriculum vitae; (3) letters of support; and (4) copies of no more than five of the nominee's most significant publications related to desert research. Please submit electronically unless hardcopy previously approved. For more information, go to **https://community.geosociety.org/qggdivision/awards/el-baz.**

Distinguished Career Award

Nominations due 1 Apr.

Submit nominations to Sarah Lewis at sarah.lewis@oregonstate.edu.

The Distinguished Career Award is presented annually to a Quaternary geologist or geomorphologist who has demonstrated excellence in their contributions to science. Because the award recognizes research excellence, self-nomination is not permitted. Neither nominators nor nominees need be GSA members.

Nominations should include (1) a brief biographical sketch; (2) a statement of no more than 200 words describing the candidate's scientific contributions to Quaternary geology and geomorphology; (3) a selected bibliography of no more than 20 titles; and (4) a minimum of four letters from colleagues supporting the nomination. Please submit electronically unless hardcopy previously approved. For more information, go to **https://community.geosociety.org/qggdivision/awards/distinguished-career.**

Kirk Bryan Award for Research Excellence

Nominations due 1 Feb.

Submit nominations to Sarah Lewis at sarah.lewis@oregonstate.edu.

The Kirk Bryan Award is bestowed upon the author or authors of a published paper of distinction advancing the science of geomorphology or some related field, such as Quaternary geology. The paper constituting the basis of the award must fulfill the following requirements: (1) the paper will deal with geomorphology or with a bordering field, and (2) the paper will have been published not more than five years prior to its selection for the award. Nominations should include (1) a letter (1–3 pages long) by the chief nominator outlining the significance and importance of the nominated publication; (2) a copy of the publication; (3) reviews of the publications that have appeared in journals, newsletters, or books (if any); and (4) one or more letters from other supporters of the nomination. Please submit electronically unless hardcopy previously approved. For more information, go to **https://community.geosociety.org/qggdivision/awards/kirkbryanaward.**

SEDIMENTARY GEOLOGY DIVISION

Laurence L. Sloss Award for Sedimentary Geology

Nominations due 15 Feb.

Submit nominations to Brett McLaurin at bmclauri@bloomu.edu.

The Laurence L. Sloss Award for Sedimentary Geology is given annually to a sedimentary geologist whose lifetime achievements best exemplify those of Larry Sloss—i.e., achievements that contribute widely to the field of sedimentary geology and service to GSA. Submit (1) a cover letter describing the nominee's accomplishments in sedimentary geology and contributions to GSA; (2) a curriculum vitae; and (3) any additional supporting letters electronically. Nomination materials remain active for three years. Monies for the award are derived from the annual interest income of the Laurence L. Sloss Award for Sedimentary Geology Fund, administered by the GSA Foundation. For more information, go to **https://community.geosociety.org/sedimentarygeologydiv/awards/sloss.**

Sedimentary Geology Division *and* Structural Geology and Tectonics Division Joint Award: Stephen E. Laubach Structural Diagenesis Research Award

Nominations due 1 Apr.

Submit nominations to Timothy Byrne at timothy.byrne@uconn.edu.

The Stephen E. Laubach Structural Diagenesis Research Award Fund promotes research combining structural geology and diagenesis and curriculum development in structural diagenesis. This award addresses the rapidly growing recognition that fracturing, cement precipitation and dissolution, evolving rock mechanical properties, and other structural diagenetic processes can govern recovery of resources and sequestration of material in deeply buried, diagenetically altered and fractured sedimentary rocks. The award highlights the growing need to break down disciplinary boundaries between structural geology and sedimentary petrology, exemplified by the work of Dr. Stephen Laubach and colleagues. The award alternates between being awarded by the Sedimentary Geology Division on odd-numbered years and the Structural Geology and Tectonics Division on even-numbered years, reflecting the focus of the award on this cycle. Graduate students, postgraduates, and faculty-level researchers are eligible. For information and application requirements, go to **https://community.geosociety.org/sedimentarygeologydiv/awards/laubach** or **https://community.geosociety.org/sgt/awards/laubachaward.**

STRUCTURAL GEOLOGY & TECTONICS DIVISION

Career Contribution Award

Nominations due 1 Mar.

Submit nominations to Jeff Amato at amato@nmsu.edu.

The Career Contribution Award is for an individual who throughout his or her career has made numerous distinguished contributions that have clearly advanced the science of structural geology or tectonics. Nominees need not be citizens or residents of the United States, and GSA membership is not required. Nominations should include the following information: (1) name of nominee, present institutional affiliation, and address; (2) summary statement of nominee's major career contributions to the science of structural geology and tectonics; (3) selected key published works of the nominee; and (4) name and address of the nominator. For more information, go to **https://community.geosociety.org/sgt/awards/careercontribution.**

Outstanding Publication Award

Nominations due 1 Mar.

Submit nominations to Julie Newman at newman@geo.tamu.edu.

The Outstanding Publication Award is given annually for a published work (paper, book, or map) of exceptional distinction that clearly advances the science of structural geology or tectonics. Nominations include: (1) a full citation; (2) nomination (as short as a paragraph; letters or reviews may also be included); and (3) the name and address of the nominator. For more information, go to **https://community.geosociety.org/sgt/awards/outstandingpublication.**

2020 Graduate Student Research Grants

The primary role of the GSA research grants program is to provide partial support of master's and doctoral thesis research in the geological sciences for graduate students enrolled in universities in the United States, Canada, Mexico, and Central America. In 2019, the program awarded US$812,000 to 392 graduate students (~52% of the 748 who applied), with an average grant of US$2,071.

GSA strongly encourages women, minorities, persons with disabilities, and other groups that are underrepresented in the geosciences to participate fully in this program. Apply online (**www.geosociety.org/gradgrants**) starting 1 Dec. 2019. Submissions must be completed by 3 Feb. 2020, at 5 p.m. MST.

Folarin Kolawole used a 2018 research grant to fund a study of pre-existing structures in the Precambrian basement rocks in the Arbuckle Mountains, Oklahoma, USA, to assess their implications for induced seismicity.

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GSA FOUNDATION

www.geosociety.org/gradgrants
researchgrants@geosociety.org
+1-303-357-1025

More Research Grants for Graduate Students and Others

GSA provides members with additional opportunities to apply for research funding. Applications for these programs will be accepted starting 1 Dec. 2019. Submissions must be completed by 3 Feb. 2020, at 5 p.m. MST.

- Farouk El-Baz Student Research Grant—*Desert studies*
- Awards for Geochronology Student Research2 (AGeS2) Program—*Geochronology*
- ZEISS-GSA Research Grant—*Microscopy*

Call for GSA Fellowship Nominations

Deadline: 1 Feb.

Nominate a deserving colleague with the honor of GSA Fellowship. GSA members are elected to Fellowship in recognition of distinguished contributions to the geosciences. See election requirements by visiting **www.geosociety.org/Fellowship.**

How to Nominate

The primary nominator, who must be a GSA member *and* Fellow:

1. Writes a letter of support;

2. Collects two additional letters of support (one must be from a Fellow; both must be GSA members);

3. Obtains nominee's current CV or résumé (2-page limit); and

4. Completes the online nomination form and uploads letters and CV at **www.geosociety.org/FellowNoms.**

Travel Awards to 2020 Southeastern-Northeastern Joint Section Meeting

Application deadline: 5 Feb.

Students nationwide who work full-time, care for dependents, or are considered non-traditional are eligible to apply for a travel award to attend the Southeastern and Northeastern Joint Section Meeting, 20–22 March, in Reston, Virginia, USA. Funding will cover meeting registration, lodging, transportation, food, and dependent care. Send questions to Tahlia Bear, tbear@geosociety.org. Learn more at **https://www.geosociety.org/gsa/about/sections/GSA/Sections/se/students.aspx#travel** for the Southeastern Section and **https://www.geosociety.org/gsa/about/sections/gsa/Sections/ne/home.aspx** for the Northeastern Section.

Jeng Hann Chong, 2019 Field Camp Scholar Awardee in Ermont, Montana, USA.

J. David Lowell Field Camp Scholarships

GSA and the GSA Foundation are proud to announce that J. David Lowell Field Camp Scholarships will be available to undergraduate geology students for the summer of 2020. These scholarships will provide students with US$2,000 each to attend the field camp of their choice. Applications are reviewed based on diversity, economic/financial need, and merit. Application deadline: 27 March. Learn more at **https://www.geosociety.org/field-experiences.**

Questions? Contact Jennifer Nocerino, jnocerino@geosociety.org.

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GSA FOUNDATION

GSA-ExxonMobil Bighorn Basin Field Award

Field dates: 19–26 July 2020

This all-expenses–covered field seminar in the Bighorn Basin of north-central Wyoming emphasizes multidisciplinary integrated basin analysis. Undergraduate students, graduate students, and faculty are invited to apply. Applications will open in early February. Deadline: 27 March.

Questions? Contact Jennifer Nocerino at jnocerino@geosociety.org.

https://www.geosociety.org/field-experiences

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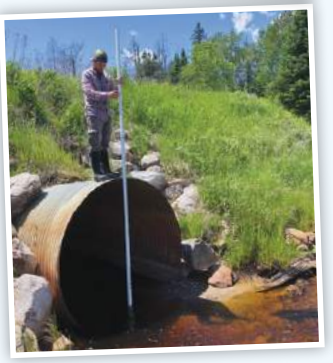
ExxonMobil

Explore amazing geoscience opportunities on America's public lands

GSA GeoCorps™ America Program

Summer 2020 GeoCorps Positions—Apply by 2 Feb.

GeoCorps provides dozens of exciting geoscience opportunities on federal public lands. Project areas include a wide variety of topics, such as paleontology, hydrology, geohazards, caves/karst, GIS/mapping, and more.



www.geosociety.org/geocorps

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Aerotek

Bureau of Land Management (BLM)

Forest Service Department of Agriculture

Geological Society of America Foundation (GSAF)

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Spend next summer serving in a National Park

National Park Service Geoscientists-in-the-Parks (GIP) Opportunities

Summer 2020 GIP Positions—Apply by 13 Jan.

The National Park Service (NPS) GIP program places college students and early career professionals in National Park Service units for three months to one year to assist with geology and integrated science projects.
This program is a partnership between NPS, the Geological Society of America, and the Stewards Individual Placement Program.

www.geosociety.org/gip

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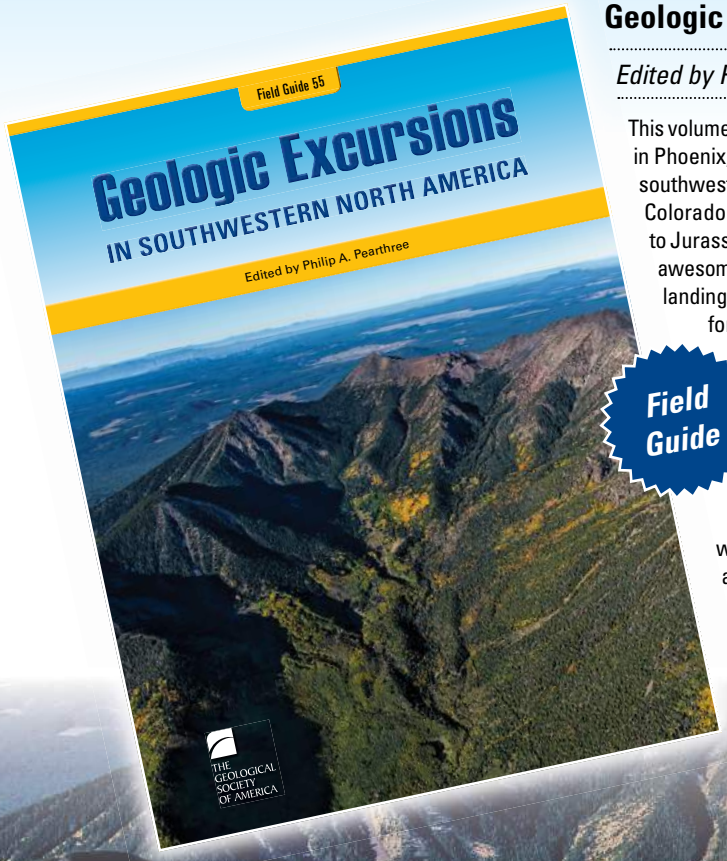
National Park Service

Stewards Individual Placement Program

Geological Society of America Foundation (GSAF)

DISCOVER
the Spectacular Southwest



Field Guide

Geologic Excursions in Southwestern North America

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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CALL FOR COMMITTEE SERVICE

Make an Impact by Serving on a GSA Committee

Deadline: 15 June
Terms begin 1 July 2021 (unless otherwise indicated)

If you are looking for the opportunity to work toward a common goal, give back to GSA, network, and make a difference, then we invite you to volunteer (or nominate a fellow GSA member) to serve on a Society committee or as a GSA representative to another organization.

Learn more and access the nomination form at **https://rock.geosociety.org/Nominations/CS.aspx.** Use the online form to make a nomination or self-nomination. Open positions and qualification information is online at **https://rock.geosociety.org/forms/viewopenpositions.asp.** GSA headquarters contact: Dominique Olvera, P.O. Box 9140, Boulder, CO 80301-9140, USA; +1-303-357-1060; dolvera@geosociety.org.

Academic and Applied Geoscience Relations Committee

One member-at-large vacancy (industry-related field) (three-year term; E, M)

This committee is charged with strengthening and expanding relations between GSA members in applied and academic geosciences. As such, it proactively coordinates the Society's effort to facilitate greater cooperation between academia, industry, and government geoscientists.

Qualifications: Committee members must work in academia, industry, or government and be committed to developing a better integration of applied and academic science in GSA meetings, publications, short courses, field trips, and education and outreach programs. Professional interests: environmental and engineering geology, hydrogeology, karst, Quaternary geology and geomorphology, structural geology and tectonics, sedimentary geology. Members must also be active in one or more GSA Division.

Annual Program Committee

Three vacancies: two members-at-large (four-year term; B, E, M); one student member-at-large (two-year term; B, E, M)

This committee is charged with developing a plan for increasing the quality of the annual and other society-sponsored meetings in terms of science, education, and outreach; evaluating the technical and scientific programs annually to identify modifications necessary for accomplishing the Society's long-range goals; conducting short- and long-range planning for Society meetings as a whole; and developing a long-term logistical plan/strategy for the technical programs of all GSA meetings and other society-sponsored meetings. One member-at-large should have previous meeting experience.

Arthur L. Day Medal Award

Two member-at-large vacancies (three-year term; E, T)

This committee selects candidates for the Arthur L. Day Medal.

Qualifications: Members should have knowledge of those who have made "distinct contributions to geologic knowledge through the application of physics and chemistry to the solution of geologic problems." All of the committee's work will be accomplished during the months of February and March; committee decisions must be made by 1 April.

Diversity in the Geosciences Committee

Three member-at-large vacancies (three-year term; E, M)

This committee provides advice and support to GSA Council and raises awareness and initiates activities and programs that will increase opportunities for diverse groups in the geosciences, particularly along the dimensions of race, ethnicity, gender, and physical abilities. The committee is also charged with stimulating recruitment and promoting positive career development.

Qualifications: Members of this committee must have professional or experiential knowledge of issues relevant to the goals of the committee. GSA strongly encourages nominations of members who are from the communities for which this committee is expected to serve.

Education Committee

Member-at-large vacancy (four-year term; E, M); two-year-college faculty representative vacancy (four-year term; E, M); pre-college educator (K–12) representative vacancy (four-year term; E, M); graduate student representative vacancy (two-year term; B, E, M)

This committee works with GSA members representing a wide range of education sectors to develop informal, pre-college (K–12), undergraduate, and graduate earth-science education and outreach objectives and initiatives.

Qualifications: Members of this committee must have the ability to work with other interested scientific organizations and science teachers' groups.

Geology and Public Policy Committee

Two member-at-large vacancies (three-year term; E, M)

This committee provides advice on public-policy matters to GSA Council and leadership by monitoring and assessing international, national, and regional science policy; formulating and recommending position statements; and sponsoring topical white papers. This committee also encourages active engagement in geoscience policy by GSA members.

Qualifications: Members should have experience with public-policy issues involving the science of geology; the ability to develop, disseminate, and translate information from the geologic sciences into useful forms for the general public and for GSA members; and familiarity with appropriate techniques for the dissemination of information.

B—meets in Boulder or elsewhere; **E**—communicates by phone or electronically; **M**—meets at the Annual Meeting; **T**—extensive time commitment required during application review period.

GSA International

Two member-at-large vacancies (four-year terms; E, M)

Serve as GSA's coordination and communication resource seeking to promote, create, and enhance opportunities for international cooperation related to the scientific, educational, and outreach missions shared by GSA and like-minded professional societies, educational institutions, and government agencies. Build collaborative relationships with GSA Divisions and Associated Societies on international issues, and serve as a channel for member-generated proposals for international themes.

Joint Technical Program Committee

Two members-at-large: marine/coastal geology (two-year term: 1 Dec. 2020–30 Nov. 2022; B, E)

Members of this committee help finalize the technical program for GSA's annual meetings by participating in the Web-based selection and scheduling of abstracts, as well as topical session proposal review.

Qualifications: Members must be familiar with computers and the Web, be a specialist in one of the specified fields, and be available in late July–mid-August for the organization of the annual meeting technical program.

Membership and Fellowship Committee

Member-at-large vacancy: industry (three-year term; B, T)

This committee contributes to the growth of the GSA membership, enhances the member experience, and serves a vital role in the selection of Fellows, with the goal of fostering a membership community as pertinent and global as our science. Committee members should understand what various segments of members want from GSA and should be familiar with outstanding achievers in the geosciences worthy of fellowship.

Qualifications: Committee members should have experience in benefit, recruitment, and retention programs.

Nominations Committee

Member-at-large vacancy: industry (three-year term; B, E)

This committee recommends nominees to GSA Council for the positions of GSA Officers and Councilors, committee members, and Society representatives to other permanent groups.

Qualifications: Members must be familiar with a broad range of well-known and highly respected geoscientists.

North American Commission on Stratigraphic Nomenclature

GSA representative (three-year term; E, M)

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

Qualifications: Members must be familiar with the fields of paleontology, biostratigraphy, and stratigraphy.

Penrose Conference and Thompson Field Forum Committee

Two member-at-large vacancies: early career scientist (three-year term; E)

This committee reviews and approves Penrose Conference and Thompson Field Forum proposals and recommends and implements guidelines for the success of these meetings.

Qualifications: Committee members must be early career scientists/professionals.

Penrose Medal Award Committee

Two member-at-large vacancies (three-year term; E, T)

Members of this committee select candidates for the Penrose Medal. Emphasis is placed on "eminent research in pure geology, which marks a major advance in the science of geology."

Qualifications: Members should be familiar with outstanding achievers in the geosciences worthy of consideration for the honor. All of the committee's work will be accomplished during the months of February and March; committee decisions must be made by 1 April.

Professional Development Committee

Member-at-large vacancy (three-year term; E)

This committee directs, advises, and monitors GSA's professional development program; reviews and approves proposals; recommends and implements guideline changes; and monitors the scientific quality of courses offered.

Qualifications: Members must be familiar with professional development programs or have adult-education teaching experience.

Publications Committee

Member-at-large vacancy (four-year term; B, E, M)

The primary responsibilities of the committee are nomination of candidates for editors when positions become vacant; reviewing the quality and health of each Society publication; and providing an annual report to Council that includes recommendations for changes in page charges, subsidies, or any other publishing matter on which Council must make a decision. To carry out this charge, headquarters will provide the committee with all necessary financial information.

Research Grants Committee

Fifteen member-at-large vacancies with various specialties (three-year term; B, T)

The primary function of this committee is to evaluate approximately 800 graduate student research grant applications and award specific grants to chosen recipients, including some named grants supported by funds within the GSA Foundation.

Qualifications: Members may come from any sector (academia, government, industry, etc.) and should have experience in directing research projects and in evaluating research grant applications. GSA strongly encourages nominations of geoscientists from diverse backgrounds and institutions, particularly from minority serving institutions. **Extensive time commitment required 15 Feb.–15 Apr.**; each member reviews approximately 40 applications. More information: **www.geosociety.org/gradgrants.**

Young Scientist Award (Donath Medal) Committee

Member-at-large vacancy (three-year term; E, T)

Committee members investigate the achievements of young scientists who should be considered for this award and make recommendations to GSA Council.

Qualifications: Members should have knowledge of young scientists with "outstanding achievement(s) in contributing to geologic knowledge through original research which marks a major advance in the earth sciences." All of the committee's work will be accomplished during the months of February and March; committee decisions must be made by 1 April.

Committee, Section, and Division Volunteers: Council Thanks You!

GSA Council acknowledges the many member-volunteers who, over the years, have contributed to the Society and to our science through involvement in the affairs of the GSA. Your time, talent, and expertise help build a solid and lasting Society.

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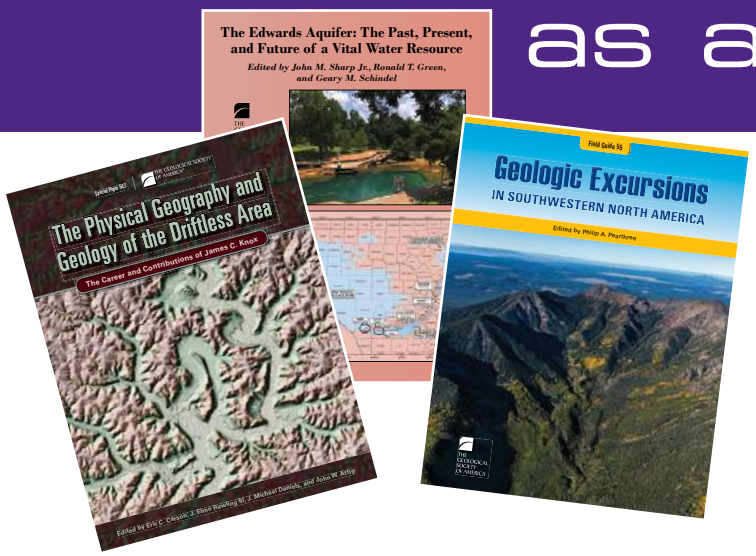

SPECIAL PAPERS are state-of-the-art treatments of rapidly evolving subjects; most symposium-based volumes fall into this category.

MEMOIRS are likely to remain the authoritative reference on a subject for a number of years.

FIELD GUIDES feature field trips held primarily at GSA meetings. Well-illustrated papers include detailed road logs and maps.

- **PROPOSE A BOOK YOU HAVE AUTHORED (not compiled):** Include the table of contents, the background and significance of the proposed book, and the abstract.
- **PROPOSE AN EDITED VOLUME:** Include a list of chapter titles and authors with affiliations, the background and significance of the proposed volume, and any available chapter abstracts.
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Welcome New GSA Members!

The following new members joined between 7 March and 24 July 2019 and were approved by GSA Council at its fall meeting.

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Hoori Ajami
Stephanie Anagnoson
Ricardo Araujo
Kevin James Bell
Ann Elizabeth Benbow
Kristen Benchley
Gilbert Bernhardt
Steven Bill
Marcus P. Borom
Suzanne Bourret
Stephen Joseph Boyer
Charles Michael Brehm
Walter C. Burt
James Callegary
Hanlin Chen
Jianbo Chen
David Chew
Elizabeth Cochran
Douglas Coleman
Roger Cooper
Robert E. Criss
Stephen John Culver
Robert S. Detrick
Kara R. Dotter
Lynne Drakos
Veronica Bray Durfey
Allison Daun Elzer
Nick Engdahl
Mingshi Feng
Nels Forsman
Cecylia Fortunska
Sean Patrick Fox
Ernest Chi Fru
Al Garand
Ian Glasspool
Terry Gulliver
Mehmet Hacihanefioglu
Lawrence Hamilton
Kristen Jean Hannon
Robert George Hatfield
Joanna Hodge
Corey James Holton
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Joel P.L. Johnson
Miroslav Kalinaj
Clay R. Kelleher
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Linda Kennedy
Thiago Kersting
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James King
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Taylor Lee
Xiubin Lin
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Liliana Marin
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Sara Post
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Cari Roughley
James Nicholas Samson
Tapabrato Sarkar
Aya Schneider
Daniel G. Schwartzberg
Gary R. Scott
Elena Victoria Sherriff
Michal Skiba
Heather F. Smith
Samantha Smith
Dongfang Song
Christy Swann
Ryoya Takahashi
Andrew Tekle-Cadman
Zachary D. Tessler
Larry Thrasher
Virginia Trimble
Katerina Tsakiri
Shane Tyrrell
Victor Van Beuren
John Vanregenmorter
Jill VanTongeren
Brent James Voorhees
Matt Wilson
Weerachat Wiwegwin
Jessica Wold
Sergey V. Yudintsev
Qinglu Zeng
Nicolaus Zentner
Mingzhi Zhang

EARLY CAREER PROFESSIONALS

Mehrdad Sardar Abadi
Mansour H. Al-hashim
Marco A. Altamirano
Baterdene Baatarjav
Carly Marie Bader
JP Bauer
Cecilia Benavente
Kathryn Boyd
Marc Campeny
Chance Isaac Carantes
Kewei Chen
Xinming Chen
Laurel B. Childress
Babita Rani Choudhary
William Classon
Erica Conorozzo
Duncan Cook
Katherine Crabill
Andrew Crabtree
Nick Crouch
Piyush Dahal
Mana Dembo
Joel D. Despain
Elizabeth Diaz
Will Earle Dingee
Katherine Dobson
Carlie Duda
Dennis Eck
Sedona Kay Edgar
Lauren D. Ehlers
Dave Eibert
Funmilayo M. Ekundayo
Cody James Paul Fauth
Michael Andrue Fina
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Caitlin Gionfriddo
Jian Gong
Samuel Graf
Victoria Grix
Victor E. Guevara
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Christen Helou
Matthew Herman
Isidro Hernandez
Margaret Anne Holahan
Jahangeer Jahangeer
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Nick Karl
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Joseph Kemper
Taylor Kenyon
Matthew Khargie
Tessa King
Michael H. Knez
Alexander Thomas Koch
Codyann Angela Kolp
Kimberly Megan Kramer
Matthew E. Kruse
Brett LaCoy
Justin Lashley
Yang Li
Kyle Andrew Lind
Elizabeth K. Loesch
Michael Joseph Loya Jr.
Xiaocong Luan
Kayla Maze
Caitlin McHugh
Hannah McIlwain
Kimber Lea McLennan
Julie Menard
Buyanzaya Munkhjargal Jr.
Madison Myers
Leigh Grann Oden
Jason W. Pearl
Alexander M. Peck
Jacob Petersen-Perlman
Esther Pischel
Chloe Plet
Anwar Qadir
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Megan Riccobono
Susan Richmond
Irmaris Rivera-Llavona
Corrine Rojas
Cat Samson
Loren Paul Secor
Alicia Sendrowski
David Shemtov
Cody Stanley
Adam Stoutenburgh
John Thornton
Burenjargal Ulziiburen
Marissa Anne Vara
Denise Ana Viana

Elizette Viramontes
Duo Wang
Zhou Wang
Lei Wu
Ying Zhou

STUDENTS
(*by area of interest*)

Archaeological Geology
Audra Darcy
Mary Margaret Hagen Erlick
Jayde Hirniak
Charlotte Holt
Simon Krane
Victoria C. Pagano
Colleen Marie Ranieri
Sarah Caldwell Steele
Paula Carolina Ugalde

Biogeosciences
Hannah Paulina Boelts
Diana Petrova Bojanvoa
Rao Nargis Jahan
Jennifer Mills
Ingemar Ohlsson
Cecilia Rose Thomas
Omotinuolawa Vincent
Qiong Wu

Climatology/Meteorology
Kimberly Coral Bowman
Nicole Czwakiel
William Downs
Andrew Daniel Everett
Kristen Joyse
Christina Nicole Lizzo
Tyler Michael Miller
Yasiri Nunez
Erika Ornouski

Economic Geology
William Benedict
Max Britt
Juan Carlos Cuellar Quispe
Stephanie C. Evans
Joshua A. Hardt
William Rexton Jarvis
Kelsey Jensen
William Laaker
Richard Fointein Lung
Taylor A. McPherson
Evangelia Marie Murgia
Sodnom Oyungerel
Edward Curtis Vogler Ruger
Patrick Sweeney
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Mario G. Velazquez
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Energy Geology
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Peter Kwame Boateng
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Sitney Elizabeth Day
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Priya Patel
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Joseph Franklin Spendlove
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Zhen Wang
Stephanie Jane White
Jason Witzel
Zhongrui Wu

Engineering Geology
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George M. Barth III
Raja Das
David A. De Guzman
Caila M. Holley
Hans Hubble Naake
Izabella Anastassja Ogilvie
Angelica Melissa Preciado
Anton Joseph Reed
Ethan Ernest Rogers
Hannah Smith
Cory S. Wallace

Environmental Science
Xavier Y. Abdullahi
Marissa Acosta
Rene C. Aerts
Briana Allison
Joseph Anthony Baldus
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Ailing Chen
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Sarah Jean Combs
Laura E. Dickson
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Erin Evans
Jackson Joseph Galloway
Laura Glaser
Kailee Gokey
Colby Alan Gouge

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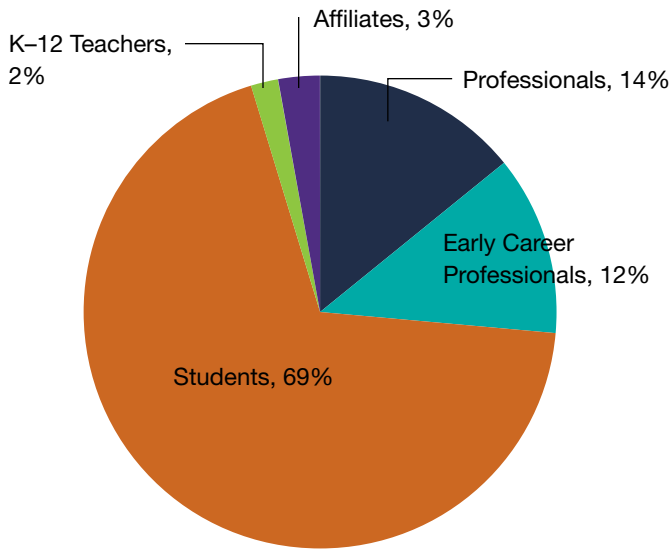

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W. Matthew Hintz
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Sabrina Koetter
Abigail Lambert
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Mckayla Lynn Meier
Miyako Lee Yoneko Namba
Tammy Phrakonkham

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Jalen Cox
Thomas Rossetter

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Fahad Alshehri
Jillian M. Ashton
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Eleana Joy Brumage
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Kaylin A. Tunnell
Claire Villanueva
Haley Danielle Mosher Webb
Zachary W. Williams
Walter K. Zimmerman

Quaternary Geology/ Geomorphology
Kelly Margret Brown
Samantha Cargill
Dan Duran
Haggai Eyal
Kausik Ghosh
Amy Gilliland
Carl Steven Jung
Anisah Kabbara
Sarina Mazzone
Anna Paulding
Nick Rodgers
Peter Tereszkiewicz
Gabriel West
Landon Williamson
Zequn Wu

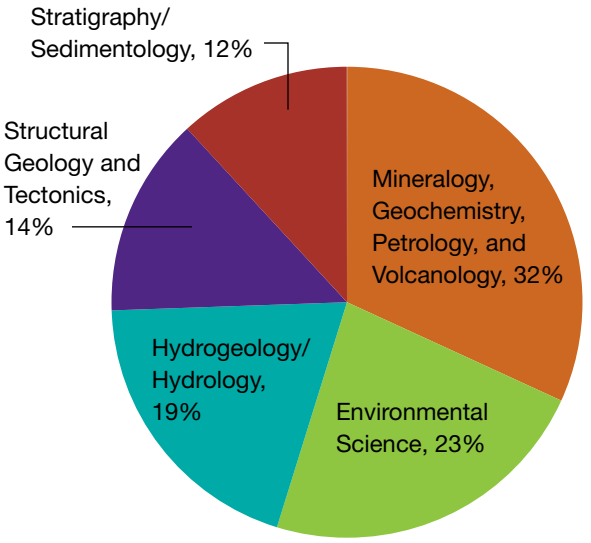
Seismology
Tracy Butler
Jazzy M. Graham-Davis
Cheryl A. Jones

Soil Science
Hayley Christine Anderson
Jennifer Angela Bass
Emily Rose Gelbart
Ian Peters
Sintra Reves-Sohn
Anna R. Schwyter
Misa Yasumiishi

Stratigraphy/Sedimentology
Omonde Sitou Akakpo
Raed Badr
Andrew James Bays
Yixin Dong
Allie Jean Ellis
Chin Chai Huan
Michael Naylor Hudgins
Daniel Vincent Kelly
Melanie Kling
Levente Laisz
Jerry Lei
Sen Li
Kunyuan Ma
Cole Alexander McCormick
Austin James McGlannan
Ziyuan Meng
Eduardo Luiz Menozzo da Rosa
Carlie Maize Mentzer
Hunter William Morris
Konstantin Nikashin
Jessica Raff
Christopher Rupe
Jan Schönig
Anthony Paul Shillito
Caitlin C. Sifuentes
Jourdan Marie Speessen
Alexandra Elise Thompson
Leah L. Topping
Lijun Wang
Lucy Webb
Lelia Mae Weiland
Liguo Zhai

Structural Geology/Tectonics
Shreya Agrawal
Harisma Andikagumi
Simone Bello
Ryan M. Bessen
Jessica Taylor Bivens
Hallie Rebecca Bruce
André F. Brunette
Adam J. Cawood
Eric Robert Dinter
Oliver James Dixon
Dripta Dutta
Will Sparhawk Fisher
Noah Aaron Fleischer
Micah Hernandez
Noah Frederick Hobbs
Benjamin Lewis Howard
Valeria Jaramillo
William R. Kersey

PERCENTAGES OF TOP FIVE PROFESSIONAL INTERESTS OF NEW STUDENT MEMBERS



Caje Antonius Kindred
Tshering Zangmu Lama Sherpa
Logan Leinbach
Carter Lewis
Bing Li
Joshua S. Love
Ming Ma
Jared Kyle Meharg
Prasanta Kumar Mishra
Alexander B. Neely
David Alexander Poplin V
Mark Raftrey
Colleen Grace Rankin
David E. Soules
Ana Milena Suárez Arias
Yajie Tian
Adam Edward Trzinski
Ryan Timothy Walter
Hanqing Zhao

Other
Faisal Torbu Adams
Nicole Aikin
Akin Oyetayo Akinniranye
Akilah Alwan
Eliza Amber
Alyssa Anderson
Carlos A. Arambula
Jennifer Archer
Morelia Ayala
Bailey Bergman
Danesha Byron
Tiffani Canez
Peter Holden Chao
Alexandra M. Cohen
Cory Couture
D'Maia Curry
Audria Faith Dennen
Tineill Kapuaonaonaokalani Dudoit
Diane Yvette Escobedo
Luis Alberto Espada
Iremar Fernandez
Tatiana Isabel Fernandez-Perez
Alysa Fintel
Emily Fischer
Ashley Forrest
Merhawi Gebremichael
David Antonio Giovannetti-Nazario
Greta Margarita Ramirez Guerrero
Jessica Hall
Taylor M. Hogue
Mingsun Hsiao
Ryssa Elaine Keeto
Ku'i Keliipuleole
Nicole K. LeRoux
Benjamin R. Marosites
Alice Martin
Danika Mayback
Blayne McAnally
Lisette Elena Melendez
Maya Mendez
Teodora Mitroi
Jeremy Montes
Kacey Rianne Morgan
Bridget M. Murray
Oluwatosin Isaac Obe
James Anthony Padilla
Ava Jane Palmo
Madison Ann Pancake
Rudra Mohan Pradhan

Kainalu Steward
Brian Frank Swilley
Nicolas Vanderzyl
Ashton Vonnahme
Oscar A. Wilkerson V
Brittan Wogsland
Jonnathan M. Zuna

K–12 TEACHERS
Norov Baigalmaa
Daniel K. Edwards
Maria Finizio
Ariel Goerl
Phil Harrison
Olga S. Jarrett
Joanna R. Latham
Jason Lees
Joanmarie McCann
Kathleen Miller
Stephanie Moses
Candice C. Newman
Veronica Thompson
Ryan E. Turner
Roberto Zamora Sr.

AFFILIATES
Habeeb Akorede
Thomas Bates
Gunnar Biggs
Dean Culwell
Richard A. Doyle
Charles Ellingburg
Dennis A. Fenton
Harold Haupt III
Roy Hornaday
Bill Jacobs
Nicki Janus
David W. Kay
Ernest A. Klatt Jr.
Michael Lee
Paul McBurnett
Eric F. Paule
David Pineda-Huezo
Amber Richards
Henry Rose III
Jeff Scott
Chetan Sharma
Fred Stockbauer
Gerald Tremblay

2020 GSA Section Meetings

THE GEOLOGICAL SOCIETY OF AMERICA®

South-Central

9–10 March
Fort Worth, Texas, USA
Chairs: Omar Harvey, omar.harvey@tcu.edu; Arne Winguth, awinguth@uta.edu
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; Patrick Burkhart, patrick.burkhart@sru.edu
www.geosociety.org/se-mtg

Great Falls Park. Photo by Visit Fairfax.

Rocky Mountain

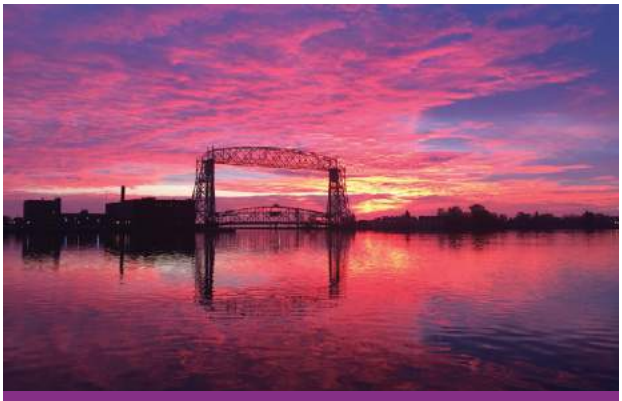
4–5 May
Provo, Utah, USA
Chair: Daniel Horns, hornsda@uvu.edu
www.geosociety.org/rm-mtg

Mount Timpanogos. Photo by Hike395 via Wikimedia Commons.

Cordilleran

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

City Hall. Photo by Pasadena Convention & Visitors Bureau.



North-Central

18–19 May
Duluth, Minnesota, USA
Chair: Karen Gran, kgran@d.umn.edu
www.geosociety.org/nc-mtg

Aerial Lift Bridge at sunrise. Photo by Visit Duluth.

The Geological Society of America®
GEOCAREERS

GeoCareers Programs at the 2020 Section Meetings

Career Workshops

Geoscience Career Workshop Part 1: Career Planning and Informational Interviewing
Your job-hunting process should begin with career planning, not when you apply for jobs. This workshop will help you begin this process and will introduce you to informational interviewing. This section is highly recommended for freshmen, sophomores, and juniors. The earlier you start your career planning the better.

Geoscience Career Workshop Part 2: Geoscience Career Exploration
What do geologists in various sectors earn? What do they do? What are the pros and cons of working in academia, government, and industry? Workshop presenters and professionals in the field will address these issues.

Geoscience Career Workshop Part 3: Cover Letters, Résumés, and CVs
How do you prepare a cover letter? Does your résumé need a good edit? Whether you are currently in the market for a job or not, learn how to prepare the best résumé possible. You will review numerous examples to help you learn important résumé dos and don'ts.

Mentor Programs

Enjoy a free lunch while meeting with geoscience mentors working in applied sectors. The popularity of these programs means that space is limited, so plan to arrive early, because lunch is first-come, first-served. For further information, contact Jennifer Nocerino at jnocerino@geosociety.org.

South-Central Section: Fort Worth, Texas, USA
Shlemon Mentor Luncheon: Monday, 9 March
Mann Mentors in Applied Hydrology Luncheon: Tuesday, 10 March

Joint Meeting: Southeastern and Northeastern Sections: Reston, Virginia, USA
Shlemon Mentor Luncheon: Friday, 20 March
Mann Mentors in Applied Hydrology Luncheon: Saturday, 21 March

Rocky Mountain Section: Provo, Utah, USA
Shlemon Mentor Luncheon: Monday, 4 May
Mann Mentors in Applied Hydrology Luncheon: Tuesday, 5 May

Cordilleran Section: Pasadena, California, USA
Shlemon Mentor Luncheon: Tuesday, 12 May
Mann Mentors in Applied Hydrology Luncheon: Wednesday, 13 May

North-Central Section: Duluth, Minnesota, USA
Shlemon Mentor Luncheon: Monday, 18 May
Mann Mentors in Applied Hydrology Luncheon: Tuesday, 19 May

Ads (or cancellations) must reach the GSA advertising office no later than the first of the month, one month prior to the issue in which they are to be published. (Note: Combined March/April issue releases on March schedule.) Print ads will also appear on the Geoscience Job Board to coincide with the month of print issue. **Contact: advertising@geosociety.org,** +1-800-472-1988 ext. 1053, or +1-303-357-1053. Email correspondence should include complete contact information (including phone and mailing address). Rates are in U.S. dollars.

Classification	Per Line for 1st month	Per line each addt'l month (same ad)
Positions Open	$9.40	$9.35
Fellowship Opportunities	$9.40	$9.35
Opportunities for Students		
First 25 lines	FREE	$5.00
Additional lines	$5.00	$5.00

POSITIONS OPEN

Faculty Position, Sedimentary Processes, Bowling Green State University

The School of Earth, Environment, and Society (SEES) at Bowling Green State University (BGSU) invites applications for a tenure-track Assistant Professor position in Sedimentary Processes beginning August 2020. SEES includes programs in Geology, Geography, and Environment and Sustainability and offers multiple undergraduate degrees in these areas and two M.S. degrees in Geology and Applied Geospatial Science.

We seek an individual who will develop a productive, collaborative, externally funded research program at BGSU in the broad area of sedimentary processes.

The candidate will be expected to teach introductory undergraduate courses, a required course in Sedimentology and Stratigraphy for geology undergraduates, and upper-level undergraduate and graduate level courses in their area(s) of expertise. The candidate will also have the opportunity to contribute to the summer Field Geology course. Mentoring of undergraduate and graduate student research is expected.

SEES has up to date research and teaching facilities in sedimentology and sedimentary geology. For more information about SEES and the position, visit http://www.bgsu.edu/arts-and-sciences/earth-environment-and-society.html or email the Sedimentary Processes Search Committee Chair, Dr. Peg Yacobucci, mmyacob@bgsu.edu.

BGSU is a high-research, residential university located in northwest Ohio approximately 20 miles south of Toledo, Ohio, 30 miles from Lake Erie, and 70 miles from Ann Arbor, Michigan, and the Detroit airport. BGSU offers more than 200 undergraduate majors and programs, 47 master's degree programs, and 17 doctoral degree programs. U.S. News and World Report names BGSU as one of the top public universities nationwide with a strong commitment to first-year programs that lead to success. Approximately 20,000 students (including 2900 graduate students) attend BGSU. BGSU's enrollment includes 23% first-generation college students. Over 17% of our students identify as persons of color, and nearly 5% are international students. Of BGSU's 1200 faculty members, 13% identify as persons of color and 4% hail from different countries. BGSU is the recipient of a National Science Foundation ADVANCE award to promote gender equity in STEM faculty, led by SEES faculty (see http://www.bgsu.edu/allies). The Division of Diversity and Belonging coordinates affinity groups for faculty and staff who identify as persons of color, Latinx, LGBTQ+, and as persons with disabilities. The University is fully accredited by the Higher Learning Commission and is a member of the North Central Association. For more information, please visit: www.bgsu.edu.

For a complete job description and application instructions, visit https://bgsu.hiretouch.com/ or contact the Office of Human Resources at BGSU. All applications are accepted and processed through the HireTouch website. In compliance with the ADA Amendments Act (ADAAA), if you have a disability and would like to request an accommodation in order to apply for a position with Bowling Green State University, please call +1-419-372-8421. Minimum qualifications for the position are: a Ph.D. in geosciences or a closely related field such as environmental science or geography (ABDs will be considered as long as the requirements for the degree are completed by August 2020); a demonstrated record of research in sedimentary processes (e.g., publications in peer-reviewed journals, conference presentations); and teaching experience at the collegiate level (e.g. course instructor, teaching assistant, guest lecturer).

For an application to be considered complete, applicants must include the following materials in their application: a letter of application, curriculum vitae, statements of research and teaching interests, statement of past and anticipated contributions to advancing diversity and inclusion, the names and contact information of three references who will be invited to provide a current (dated within the past year) letter of reference, and copies of or links to up to five publications.

Applicants should describe how their research will leverage existing assets and expertise including a growing focus in watershed processes within SEES, how they would collaborate with colleagues in hydrology, geochemistry, paleobiology, geospatial science, environmental science or environmental policy, and how their work supports BGSU's mission of contributing to the public good.

Application deadline: January 15, 2020.

A background check and official transcripts showing highest degree earned are required for employment.

BGSU is an Affirmative Action/Equal Opportunity Educator and Employer. We are committed to fostering a diverse and inclusive environment and strongly encourage applications from women, minorities, veterans, and individuals with disabilities regardless of age, gender identity, genetic information, religion, or sexual orientation.

Faculty Position in Tectonic Petrochronology, University of Arizona

The Department of Geosciences at the University of Arizona seeks to hire a tenure-track assistant professor in petrochronology—an emerging field that explores the power of minerals to serve as time capsules that yield information about pressure, temperature, deformation, and interaction with fluids during their evolution. The appointee is expected to develop a high-profile, externally funded research program and teach courses in solid-Earth aspects of geology.

This position has excellent opportunities for collaboration given existing strengths in igneous petrology/geochemistry, U-Th-Pb geochronology (Arizona LaserChron Center), noble gas geochemistry/geochronology (Arizona Noble Gas Laboratory), TIMS-based geochronology and petrogenesis, and fission-track geo/thermochronology.

Review of applications will begin January 6, 2020, and will continue until the position is filled. Details about the position and application materials can be found at: https://uacareers.com/postings/43205. Equal Opportunity Employer Minorities/Women/Vets/Disabled.

Visiting Assistant Professor of Geology, Dept. of Geology, Washington and Lee University

The Department of Geology at Washington and Lee University invites applications for a one-year Visiting Assistant Professor of Geology, beginning July 1, 2020, and with potential for renewal. This position carries a 6-course teaching load distributed over Fall and Winter terms (12 weeks each), and the university's signature 4-week Spring Term. The position is open to candidates with expertise in any area of geoscience, although preference may be given to those able to teach one or more of GIS, geomorphology, oceanography, planetary geology, or water resources. Courses taught by the visitor will include Physical Geology and other courses at the introductory or advanced level as needed for our curriculum and dependent upon the successful candidate's expertise. Preferred candidates will hold a Ph.D. or have ABD status.

Washington and Lee University promotes a dynamic and inclusive environment that allows students and employees of multiple backgrounds, cultures, and perspectives to learn, work, and thrive together. Successful candidates will contribute to that environment and exhibit potential for excellence in teaching and for vigorous scholarship. In keeping with the University Strategic Plan, we welcome applications from underrepresented minority candidates and members of other communities that are traditionally underrepresented in academia.

Washington and Lee University is a highly selective, independent, co-educational, liberal arts college of approximately 1850 undergraduate and 400 law students and located in Lexington, VA, three hours southwest of Washington, DC. W&L is consistently ranked among the top 12 national liberal arts colleges. The Geology Department (https://www.wlu.edu/geology-department) has excellent facilities and resources, makes great use of the Appalachians in field courses and labs, and is a member of the Keck Geology Consortium.

Review of applications will begin on January 30. Candidates should submit: a letter of application demonstrating the ability to work with a diverse student population, a CV, a statement of teaching interests and philosophy, a research statement, and

contact information for three references. All materials should be submitted via Interfolio at http://apply.interfolio.com/71264. For more information, you may contact Jeffrey Rahl at rahlj@wlu.edu.

Assistant Professor of Sedimentology, Colorado Mesa University

The Geosciences Program in the Department of Physical and Environmental Sciences at Colorado Mesa University (CMU) invites applications for a full-time, tenure-track Assistant Professor position to begin August 2020. The successful candidate will have a Ph.D. in Geological Sciences (by August 31, 2020) and a strong background in field-based siliciclastic sedimentary geology. Experience or at least a strong interest in energy resources is desirable. The geology faculty at CMU have a unified core pedagogy involving year-round field-based education, and due to Grand Junction's spectacular proximal geological exposures, field-based course activities will be highly encouraged & supported. The Assistant Professor will be expected to develop & incorporate undergraduate research opportunities as part of CMU's campus-wide teacher-scholar model. Success in the position will include four components: (i) teaching 12 credit hours per semester; (ii) offering research opportunities to undergraduate students; (iii) advising; and (iv) participation in service to the program, university, and broader geological community. Upper-division undergraduate course teaching responsibilities will include Sedimentology and a course in the candidate's area of expertise. Participation in our summer Field Camp course is desirable. Introductory course teaching responsibilities may come through our existing courses in Physical Geology, Field-based Physical Geology, Historical Geology, and Geology of Colorado. Demonstrated teaching and research experience with undergraduate students is desirable.

The Geosciences Program at Colorado Mesa University consists of ~70 undergraduate majors, 6 tenure-track faculty, and 1 full-time instructor. More information about the Geosciences Program and faculty can be found at http://www.coloradomesa.edu/geosciences/index.html

Direct inquiries to Andres Aslan at +1-970-248-1614 or at aaslan@coloradomesa.edu.

To apply, go to https://coloradomesa.csod.com/ats/careersite/search.aspx?site=2&c=coloradomesa.

Review of applications will begin January 21, 2020, and will continue until the position is filled.

AA/EOE, committed to a culturally diverse faculty, staff and student body.

Assistant Professor of Geology, California State University, Bakersfield

The Department of Geological Sciences at California State University, Bakersfield (CSUB) invites applications for two tenure-track Assistant Professor positions to start in Fall 2020. We seek two broadly trained geologists with applied research and teaching interests including (but not limited to) basin analysis, aqueous geochemistry, groundwater, hydrology, and geophysics. Teaching responsibilities will include introductory-level courses along with upper-level undergraduate and graduate courses in the faculty member's specialty. Review of applications will begin January 1, 2020, and continue until the position is filled. CSUB fosters and appreciates ethnic and cultural diversity among its faculty and students, and is committed to increasing the diversity of its faculty to reflect the diversity of the campus community. Applications from women, ethnic minorities, veterans, and individuals with disabilities are welcome. The full announcement and instructions on how to apply can be found at: http://www.csub.edu/Geology/; email: geologysearch@csub.edu.

Metal Earth PDF/Research Associate Positions, Laurentian University

The Mineral Exploration Research Centre at Laurentian University, Canada, seeks applicants for two postdoctoral positions with Metal Earth, a CAD $104 million project which seeks to identify and understand the processes responsible for Earth's differential metal endowment during the Precambrian. The first position addresses the differential VMS endowment of Archean greenstone belts. It will undertake a comprehensive review and compilation of geological, geochemical, geophysical and geochronological data at the assemblage scale in the Abitibi Greenstone Belt, followed by post- and pre-deformation reconstruction of volcanic assemblages and analysis of its deposits, to identify a common set of geological predictors of mineral endowment. As part of an integrated geological-geophysical team, the second position will involve detailed geological mapping along a transect that cut across precious metal endowed and less endowed ancestral faults in greenstone belts of the western Superior craton. Research will establish the stratigraphic and structural architecture of the belts, and the timing and relationship between precious metal systems and the evolution of the greenstone belts. The positions are funded for 2 to 4 years beginning in February-May, 2020. Reviews of application will start in January. For more information on the positions and application process, see https://merc.laurentian.ca/careers. Laurentian University especially welcomes and encourages applications from members of visible minorities, women, Aboriginal persons, members of sexual minorities and persons with disabilities. Applicants may self-identify as a member of an employment equity group.

Associate Professorship in Resource Geoscience and Geotechnics, Simon Fraser University

The Department of Earth Sciences at Simon Fraser University invites applications for an Endowed Chair in Resource Geoscience and Geotechnics at the Associate Professor level, commencing as early as January 2021. A Ph.D. is required as is previous professional (e.g. academic or industry) experience.

The Endowed Chair will provide academic leadership in support of British Columbia's resource industry, through training and research in geological engineering and engineering geology and geotechnics. The Department has state-of-the-art remote sensing and 3D visualization facilities, and geomechanical software upon which the candidate will ideally capitalize.

Candidates with expertise in soil and rock mechanics, and who currently lead field- and computationally-based research examining geohazards related to the resource sector and natural hazards are encouraged to apply. The successful candidate will develop an internationally recognized, externally funded research program, and supervise both Masters- and Doctoral-level graduate students. Teaching responsibilities will include undergraduate and graduate level courses that support the environmental geoscience curriculum, specifically Introduction to Soil and Rock Engineering and Resource Geotechnics.

The candidate is expected to become a registered Professional Engineer or Geoscientist in British Columbia.

For additional information about this position, see http://www.sfu.ca/earth-sciences/frbc-chair.html.

All qualified candidates are encouraged to apply; however, Canadian citizens and permanent residents will be given priority. SFU is an equity employer and encourages applications from all qualified individuals including women, persons with disabilities, visible minorities, Indigenous Peoples, people of all sexual orientations and gender identities, and others who may contribute to the further diversification of the university. Under the authority of the University Act personal information that is required by the University for academic appointment competitions will be collected. For further details see: http://www.sfu.ca/vpacademic/Faculty_Openings/Collection_Notice.html. The University acknowledges the potential impact of career interruptions on a candidate's record of research productivity, and encourages candidates to explain such interruptions.

Applicants are requested to submit a curriculum vitae, a statement of research and teaching interests, and the names, titles, affiliations and contact information (including phone numbers and email addresses) of three referees. Electronic applications are mandatory. Review of applications will begin January 20, 2020. Applications should be directed to:

Dr. Brent Ward, Chair, Department of Earth Sciences, Simon Fraser University, Burnaby, BC. Email: eascsec@sfu.ca.

One-Year Visiting Assistant Professor, Paleoclimate/Global Change, Colby College, Waterville, Maine

The Colby College Department of Geology invites applications for a one-year Visiting Assistant Professor specializing in paleoclimate, paleoceanography, global environmental change, or a related field to begin September 1, 2020. The successful candidate will teach a sophomore-level undergraduate course on Earth's climate and paleoclimate history with a lab, as well as an introductory geology course and an upper-level elective in their area of specialty (a total of four course equivalents). Our ideal candidate will be able to offer both field- and lab-based study of past environmental change in Maine to give students hands-on experience with paleoclimate research. The successful candidate will have access

to instrumentation and facilities in the Departments of Geology and Chemistry for research and teaching. These include a powder-XRD, micro-XRF, SEM-EDS, CHNSO Elemental Analyzer, ICP-OES, petrographic and binocular microscopes, and sediment-sieving equipment. The search committee is especially interested in candidates with a demonstrated ability to teach and mentor a diverse student population. A Ph.D. at the time of appointment is preferred, but ABD candidates will be considered.

Complete applications will include: (1) a brief cover letter, (2) a curriculum vitae, (3) a statement of teaching philosophy illustrating commitment to diversity and inclusive teaching, and (4) three confidential letters of recommendation. Please submit all materials via Interfolio at: apply.interfolio.com/69710. Applications received by January 6, 2020, will receive full consideration, but applications will be reviewed until the position is filled. Inquiries may also be directed to paleoclimate20@colby.edu.

Colby is a private, coeducational liberal arts college that admits students and makes employment decisions on the basis of the individual's qualifications to contribute to Colby's educational objectives and institutional needs. Colby College does not discriminate on the basis of race, color, gender, sexual orientation, gender identity or expression, disability, religion, ancestry or national origin, age, marital status, genetic information, or veteran's status in employment or in our educational programs. Colby is an Equal Opportunity employer, committed to excellence through diversity, and encourages applications from qualified persons of color, women, persons with disabilities, military veterans, and members of other under-represented groups. Colby complies with Title IX, which prohibits discrimination on the basis of sex in an institution's education programs and activities. Questions regarding Title IX may be referred to Colby's Title IX coordinator or to the federal Office of Civil Rights. For more information about the College, please visit our website: www.colby.edu.

OPPORTUNITIES FOR STUDENTS

Lindahl Ph.D. Scholarships. The University of Alabama Department of Geological Sciences seeks Ph.D. students with specializations that complement faculty research interests. Exceptional students will receive Research or Teaching Assistantships and a Lindahl Scholarship totaling at least $22,000 for a nine-month appointment, and the cost of non-resident tuition is covered. Funding is renewable for 4 years if expectations are met. Other fellowships are available from the Graduate School. Further details are at http://www.geo.ua.edu/. Applicants should contact Dr. Geoff Tick (gtick@ua.edu) to express interest. Review of applications for Fall 2020 admission will begin January 15, 2020.

Ball State University. The Department of Environment, Geology & Natural Resources at Ball State University in Muncie, Indiana, invites applications for full-time Ph.D., master of science and/or master of arts students starting in August 2020. We seek highly motivated students with excellent written and analytical skills. Graduate assistant positions are available on a competitive basis. Faculty research covers the spectrum of environmental and geological sciences, and natural resource management. Please contact Dr. K. Nicholson, knichols@bsu.edu, for details. Additional information can be found at https://www.bsu.edu/academics/collegesanddepartments/environment-geology-natural-resources.

Doctoral Student Opportunities, Duke University. The Division of Earth and Ocean Sciences at Duke University invites intellectually engaged and motivated students to apply to our doctoral program. We particularly seek applicants in the fields of biogeochemical oceanography, geochemical hydrology, coastal processes and geomorphology, atmospheric dynamics, climate change, and energy and resources. As part of Duke's Nicholas School of the Environment, our graduate students interact with faculty and students in diverse fields related to the earth, oceans, atmosphere, biosphere and environment. We offer 5 years of financial support through research and teaching assistantships and fellowships. For more information, please visit https://nicholas.duke.edu/academics/doctoral-programs/earth-ocean-sciences-eos or email our Director of Graduate Studies at abmurray@duke.edu.

MSc and Ph.D. Student Opportunities, Mineral Exploration Research Centre, Laurentian University. Funded MSc and Ph.D. projects are available through Metal Earth at Laurentian University. Metal Earth is a CAD $104 million project that seeks to identify and understand the processes responsible for Earth's differential metal endowment during the Precambrian. This research initiative aims to transform our understanding of Earth's early evolution and how we explore for metals. Specific projects include: (1) Sedimentology, detrital zircon geochronology, and geochemistry of the Archean Ament Bay assemblage, Sturgeon Lake greenstone belt, western Ontario (MSc); (2) Structural geology and stratigraphy of the Archean Steep Rock Group, Atikokan, western Ontario (MSc); (3) Gold metallogeny of the Archean Steep Rock and Finlayson greenstone belts, Atikokan, western Ontario (MSc); (4) Greenstone belt Assemblage Boundaries (Ph.D.); and (5) Metallogeny of the Archean VMS Sturgeon Lake greenstone belt, western Ontario (Ph.D.). Mapping experience, particularly in volcanology, structural geology, and sedimentology is an asset. The projects are fully funded for two years (MSc) and four years (Ph.D.) through a stipend of CAD $30K/yr (includes a Laurentian Graduate Assistantship). All field and analytical costs are covered. For more information on the projects and application process, see https://merc.laurentian.ca/careers. Laurentian University especially welcomes and encourages applications from members of visible minorities, women, Aboriginal persons, members of sexual minorities and persons with disabilities. Applicants may self-identify as a member of an employment equity group.

Recent Digital Technology Trends in Geoscience Teaching and Practice

Kellen L. Gunderson, R. Chadwick Holmes, *Chevron Energy Technology Company, 1500 Louisiana Street, Houston, Texas, 77044, USA;*
Julie Loisel, *Department of Geography, Texas A&M University, Eller O&M Building, Room 810, College Station, Texas 77843, USA*

ABSTRACT

Digital technology advances are rapidly altering the landscape of geoscience teaching and practice. Although geoscience has readily embraced new digital technologies in the past, the simultaneous emergence of innovations like open online courses and machine learning toolkits has greatly steepened the learning curve for geoscientists of all experience levels. Here, we discuss how these technologies are affecting the jobs of geoscience teachers and practitioners by highlighting a few technology-related trends in these areas. We also note the potential challenges of this new technological environment. A holistic view of digital technology trends can help geoscientists position themselves for success in a future where technological advancements will presumably continue to occur at an even more rapid pace.

INTRODUCTION

Digital advances have been transforming society for several decades, as exemplified by the advent and proliferation of prominent technologies like personal computers, the Internet, and smart phones. In just the past few years, there has also been a rapid expansion in cloud computing, high-performance computing, the Internet of things, massive open online courses (MOOCs), and machine learning (ML) (Fig. 1). These simultaneous changes have the potential to act as a force multiplier, creating even more rapid societal change than previous relatively isolated advances. Recent progress in artificial intelligence (AI), when coupled with advancements in high-performance computing and the proliferation of cloud storage, have brought powerful tools that were once accessible to only a few researchers with supercomputers within the grasp of everyday software developers. This acceleration in society's digital transformation has the potential to change every industry and field of study (Frey and Osborne, 2017), including geoscience. Here, we synthesize recent trends in digital technology applications to geoscience teaching and practice and discuss some challenges associated with the dynamically changing technological environment.

DIGITAL TRENDS IN GEOSCIENCE TEACHING

The digital technology trends in geoscience education can be grouped into two themes: (1) new information delivery methods in the classroom, in the field, and online; and (2) updated curriculum content that caters to state-of-the-art research and practice. Virtual field trips and augmented reality tools are increasing student exposure to field locations with reduced costs (De Paor, 2016). MOOCs are providing students with cost-effective, flexible education options to choose from, thereby competing with the classical higher-education campus life model (Deming et al., 2018).

The demand for more "digitally fluent" graduates has accelerated changes in geoscience curricula. Some schools now offer specialized computer programming courses and workshops, which often include robust statistical reviews. New majors, minors, and certificates, such as geographic information system (GIS) or data science, are emerging as alternatives to a traditional geoscience degree. Employers need graduates who can adapt to a quickly changing technological landscape. Geoscience educators must focus on providing well-rounded and up-to-date course content, with expanded opportunities to strengthen the technical competencies of their students.

DIGITAL TRENDS IN GEOSCIENCE PRACTICE

Many practical geoscience disciplines, like petroleum exploration, are trying to capitalize on improvements in AI and the vast quantities of available subsurface data. Petroleum geoscientists showed early interest in AI, leveraging their pattern recognition capabilities to help detect hydrocarbon-associated anomalies in seismic data (Widrow et al., 1994) and define facies based on log patterns (Neri, 1997). Broader adoption of AI technologies has only recently accelerated, in part due to university partnerships to tackle key technical challenges, business alignments with tech companies, and competitive crowd-sourcing to supplement in-house research and development.

Most of the ML applications in petroleum geoscience have focused on seismic interpretation. Seismic interpretation software packages have historically provided semi-automated tools like signal auto-trackers or interpolation and gridding routines. Newer approaches are utilizing ML to interpret faults (Zheng et al., 2014), define salt boundaries (Di et al., 2018), or delineate geobodies based on labeling routines (Alaudah and Al Regib, 2016). With the growing popularity of neural network solutions and access to high-performance computing resources, advances in image segmentation and classification routines are now setting the stage for interpretation as a full-volume machine-assisted analysis.

CHALLENGES AND CAUTIONS

The incorporation of computational geoscience skills into academic curricula remains a major challenge. Additional resources are needed to train existing faculty in the newest technology and/or hire new faculty whose research uses emerging technologies. Advocating for the inclusion of rigorous computational geoscience courses that include programming elements, beginning in the undergraduate curriculum, seems imperative.

While online education has many advantages, one drawback is the potentiral loss of

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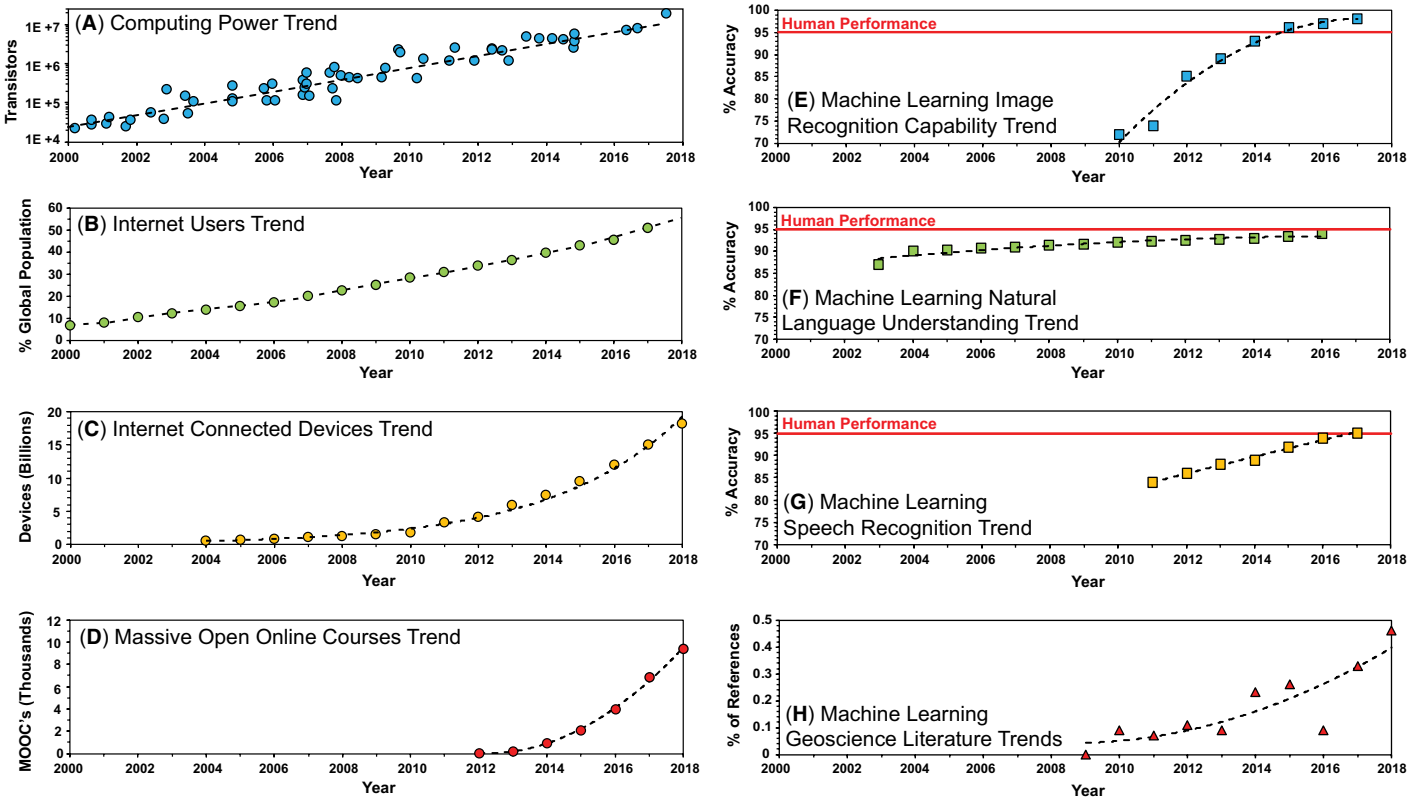

Figure 1. (A) Number of transistors in an integrated circuit (Rupp, 2018). (B) Worldwide Internet users (World Bank, 2018). (C) Number of global Internet-connected devices (Mercer, 2017). (D) Number of massive open online courses (MOOC's) offered (Shah, 2018). (E) Machine learning image recognition capability (Russakovsky et al., 2015). (F) Machine learning natural language from text understanding (Zilly et al., 2016). (G) Machine learning speech recognition (Saon et al., 2017). (H) Percentage of geoscience publications with machine learning in the abstract, title, or keyword.

future students who become exposed to the geosciences through on-campus classes. General education geoscience courses, taught by passionate faculty and often supplemented with field trips, are an important tool to recruit new geoscience students. We think it is important that universities not lose their emphasis on field and lab work or their commitment to undergraduate research. These unique, high-impact learning experiences can only happen in person and are essential to mentoring students in our discipline.

Another point of caution is the potential erosion of key geoscience skills from an over-reliance on digital technology. This has been recognized as a potential risk in petroleum geology for more than a decade (Yeilding, 2005), as subsurface interpreters began to rely heavily on workstation-produced maps that often provide geologically unrealistic solutions. If virtual field trips and digital map-making become students' primary exposure to geologic mapping, the problem may grow even worse.

ML applications in geoscience present some unique challenges. Insufficient training data and poor experimental designs can lead to erroneous conclusions. Open-source data or black box algorithms used in an analysis may be of questionable quality. Until skilled geoscientists can "crack" the codes and truly understand algorithm mechanics and limitations, this problem will remain. In response, a growing number of journals are reinforcing new best practices, such as publishing codes and raw data. We assert that it is the role of the geoscience community to establish standard techniques and other best practices to solidify the correct use of popular new technologies.

CONCLUSIONS

The geoscientists that are most likely to thrive in this new technological environment are those willing to be agile and remain in a state of continuous learning. Maintaining static methods of teaching and practice will be insufficient. Paradoxically, despite the need for digital comprehension and capability, the most important functional knowledge and skills that any geoscientist should possess will likely remain the same. These include a deep understanding of fundamental Earth processes, an ability to creatively integrate data from various sources, the clarity to communicate difficult concepts, and a passion for their work. Technological dexterity will certainly bring additional value to our field, but we believe it will be the combination of deep fundamental geoscience knowledge and digital fluency that will be the foundation for the next era of geoscience innovation and discovery.

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Academic Program Prioritization: An Existential Threat to Geoscience Departments

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INSTITUTIONAL AND DEPARTMENTAL BACKGROUND

On 31 December 2016, the Department of Geosciences at Indiana University–Purdue University Fort Wayne (IPFW) was closed, and admission to the bachelors of science in geology degree program was suspended. I was serving as Vice Chancellor for Academic Affairs at the time, so it was my job to make the necessary changes. Having been a member of the department for more than 20 years, managing the processes that lead to that decision was extremely difficult. The following review of the events that led to department closure is intended to provide a framework for understanding the context and process of program prioritization. By implementing the proactive countermeasures described, other at-risk geoscience programs may hope to survive future economic oscillations and the increasingly common application of private sector models of organizational efficiency within the academy.

Because of its significant service function, the Department of Geosciences at IPFW experienced fluxuations in credit-hour production that were closely linked to the broader enrollment patterns of the university. Maximum enrollment occurred in fall of 2011 (Table 1). Subsequently, there was a failure to recognize the possibility of, or adequately plan for, a post-recessionary decline in total campus enrollment. Declining tuition revenue resulted in significant budget shortfalls from 2012 through 2017. In response, a campus-wide hiring freeze, voluntary early retirement programs, and non-voluntary reduction-in-force programs were all implemented. However, even these divestment plans could not keep pace with declining revenue.

The department had historically been a small undergraduate program with faculty teaching a 3/3 load. Some 40% of instructional capacity was dedicated to upper division courses for majors and accounted for between 3% and 5% of the departmental total credit hours. while some 60% of instructional capacity was dedicated to general education courses heavily enrolled by non-majors (Drummond and Markin, 2008). The Department of Geosciences served an average of 31 majors and graduated four students per year (Table 1).

THE CHALLENGES OF PRIORITIZATION

In March 2014, a small team of IPFW administrators attended a conference sponsored by the higher education consulting organization Academic Impressions where the ideas of Robert Dickeson, former president of Colorado State University, were presented. Dickeson is an advocate for institutional efficiency, and the conference was intended to provide the training and tools necessary to launch a process of program prioritization and elimination (Dickeson, 2010). This approach involves the identification of a suite of performance metrics, the ranking of the institution's programs into quintiles, and investment or divestment in programs according to their ranking. The participants in the training process supervised a task force of faculty and staff who were asked to develop assessment methods, analyze data, and craft recommendations both at the unit and the university level that would guide resource prioritization.

The IPFW task force recognized a series of systemic challenges concerning the prioritization process. The first was the absence of an accurate cost accounting protocol. Departmental data that should have informed academic performance metrics were both poorly defined and incompletely recorded. Additionally, revenue generated by online courses was isolated from and independent of the general fund. Faced with an inability to access accurate department financial data, the task force could not proceed with establishing financially based metrics.

In response to these challenges, a survey was developed that required departments to report on their mission, accomplishments, accreditations, inefficiencies, academic and budget data, and departmental goals. The task force members then provided written responses to these reports.

PROGRAM CLOSURE

On 6 May 2016, the task force issued a second report. Although a total of 41 recommendations touching all aspects of university operations were presented, the core of the report consisted of three recommendations that fell within the broad heading of "Evaluate Academic Program Efficiencies." Recommendation 2.1 called for the creation of a set of academic performance metrics, while recommendations 2.2 and 2.3 called for the review of academic programs and administrative organization at the departmental level.

In late August 2016 a response to recommendation 2.1 was issued by the administration that defined the concepts of

TABLE 1. SUMMARY OF PERSONNEL, CREDIT HOURS DELIVERED, AND STUDENT HEADCOUNTS FOR THE DEPT. OF GEOSCIENCES DURING ACADEMIC YEARS 2010–2011 THROUGH 2014–2015

Academic Year	Faculty		Credit Hours			Head Count	
	Tenured/ Tenure Track	Continuing Lecturer	100–200	300–400	%	Majors	Graduates
14–15	5	1	3938	236	5.7	29	4
13–14	5	1	4781	150	3.0	32	3
12–13	5	1	5394	215	3.8	29	7
11–12	5	1	5868	168	2.8	36	4
10–11	5	1	5680	183	3.1	33	3

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programmatic and departmental viability. Utilizing accurate academic performance data, three metrics were established. *Program demand*—number of students new to a program; *student participation*—number of declared majors; *productivity*—number of graduates. In addition, three metric ratios were calculated: *graduation efficiency*—number of students who graduate divided by the number of majors; *student attrition*—number of students who stop out divided by the number of majors; *growth trend*—number of students entering the program divided by the number of students graduating, changing to a new major, or stopping out. Values of each metric were calculated for the five year period 2011–2012 through 2015–2016, and on 19 September 2016 a document was issued that reviewed all academic programs and departments and included recommendations and expectations.

From the quantitative analysis, it was clear the Department of Geology's performance metrics were dismal. However, the department had extensively documented the scholarly and engagement activities of both students and faculty. An initial recommendation to maintain the B.S. in geology program was based on the recognition that those contributions would wane if the department was closed. Three departmental goals were established: restructure the geosciences program through faculty replacement, build connections to high school students, and build connections to local industries to increase student employment placement. In addition to those recommendations, continuous monitoring of departmental metrics, development of curricular pathways to attract students to the major, and collaboration with the civil engineering program were expected.

During a meeting on 13 October 2016, the trustees of Purdue University made clear that the prioritization process was to be completed more rapidly than the timetable described in the September plan. This acceleration had its origin in the impending realignment of academic programs between Indiana University and Purdue University. A revised response to recommendations 2.2 and 2.3 was issued on 18 October 2016. Along with the B.S. in geology, admissions to degree programs in French, German, and philosophy were also suspended. The departments of geology and philosophy were closed and four departmental mergers impacting eight additional programs were also implemented. The faculty of the department found new academic homes in the departments of biology, chemistry, and physics. These changes were projected to create an immediate cost savings of US$200,000, followed by about US$1.1M in annually recurring savings.

LESSONS LEARNED

While recognizing that no two sets of institutional circumstances are identical, and accepting that many different factors can lead to a department's elevated risk of closure, the experiences and lessons learned from the IPFW events are valuable examples for other departments. The Department of Geosciences had been viewed by the administration as a small, but successful, academic program. A concern regarding the number of majors was frequently considered during departmental reviews but was overlooked because of the efficient delivery of total credit hours. As such, the department felt, and largely was, protected from critical review. However, the department failed to recognize how an institutional shift from valuing credit hour production to student completion could create a threat. Adjustment of department priorities in recognition of the significance of these institutional changes and an understanding of how performance metrics were calculated would have been a necessary but not sufficient step in staving off closure.

Due to the demographics of the department's faculty, a series of three retirements were planned between 2014 and 2018. The opportunity existed, at the time of the first retirement, to realign the composition of the faculty in a way that would support a transition to an applied geotechnical curriculum. Although there was no guarantee that the department's fate would have been different, a curricular shift would have, at least in principle, provided a path to sustaining the department. Typically, if opportunities for changes in personnel are well-aligned with strategic curricular evolution (Ulanski, 1995), a department is demonstrating the capacity to meet the needs of future students.

The Department of Geosciences had a short time in which to establish a client relationship with civil engineering. Only by building curricular linkages, and by populating upper-division courses with students from outside the geology major, can at-risk programs build safeguards against future closure (Anderson et al., 2006; Renshaw, 2014). Likewise, establishing meaningful relationships with regional business and industry had been a departmental goal. However, a pipeline for the employment of graduates was never achieved. With no clear post-graduation pathway, with no collaboration between employers and the department in recruiting prospective students, and without a strong alumni base, there was no viable mechanism to increase student participation in the department.

The Department of Geosciences at IPFW is not the first geosciences program to be closed and almost certainly will not be the last. The department fell victim to an academic program prioritization process in large part because it failed to consider and implement existing strategies, many of which are available through the Carleton College Science Education Resource Center's *Building Strong Departments* resources (https://serc.carleton.edu/departments/index.html). The IPFW experience has shown that the most critical characteristics of a department that is resistant under the pressures of program closure are progressive and engaged department leadership coupled with a collective willingness to accept and positively respond to opportunities for change. By reviewing the combination of structural weaknesses and missteps described above, at-risk departments can take actions that will reduce their vulnerability.

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GSA depends on the volunteer efforts of many science editors, associate editors, and editorial board members to ensure the timeliness and quality of its publications.

GSA thanks the editors whose terms ended 31 Dec. 2019 for their service to the Society and to the science: **Judith Totman Parrish,** *Geology*; **Mark C. Quigley,** *Geology*; and **R. Damian Nance,** *Lithosphere*. Thanks also go to **Laurent Godin** and **Sarah Roeske** for their service to *Lithosphere*. With the journal moving to GeoScienceWorld this year, their editor terms with GSA also end.

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GSA FOUNDATION Update

John W. (Jack) Hess, *GSA Foundation President*

Experience GSA's Annual Meeting from One On To the Future Perspective!

Do you remember your first GSA Annual Meeting? Were you excited for the great science and new connections you would find? Were you overwhelmed by the scope of the meeting and legendary geologists you might meet? Did it make an impact on your career decisions? These questions were at the forefront for many of the 2019 On To the Future (OTF) participants who attended their first GSA Annual Meeting in Phoenix, Arizona, USA. We took an opportunity to talk with Jazzy Graham-Davis, a 2019 graduate of Portland State University and OTF participant, before the annual meeting to learn their hopes and expectations for the program, as well as after the meeting to learn about the impact their OTF experience made.

Before the 2019 GSA Annual Meeting, Jazzy was excited to be immersed in the atmosphere of a professional meeting, attending it with an open mind but, admittedly, few expectations—other than to be overwhelmed by the variety of events, presentations, and people who would be present. They were particularly interested in meeting individuals from different backgrounds who did not represent traditional geologists, and who could be future collaborators in promoting diversity within the geosciences—one of Jazzy's professional goals. Most importantly, Jazzy hoped that "OTF connects me to people now and in the future that I can look to for advice should I encounter any issues, and who will support me as a geologist regardless of who I am. It is so important to find people who support you for being you, and I hope that I can provide that support to others as well and find a community of people similar to me. I would love to support OTF in the future as a professional to help up-and-coming geologists find their place within the field."

Jazzy Graham-Davis, a 2019 On To the Future participant, with their service dog, Jack.

How did Jazzy summarize their experience after the meeting?

"I had a great time at GSA! OTF exceeded my expectations." For Jazzy, the annual meeting was incredibly productive, providing opportunities to work with mentors at various early career workshops to receive résumé, cover letter, and career path advice—important feedback for recent graduates who are seeking jobs or applying to graduate schools. Further, meeting individuals of different backgrounds was empowering, allowing Jazzy to feel comfortable sharing their own struggles within geology and GSA meetings, and discussing how the community can work to address and improve these issues, particularly in making geology more accessible to people with disabilities. Most importantly, for Jazzy, "It was amazing to hear from lifelong members of GSA that people like us OTF scholars are the future of GSA. It made a huge impact on my goals for future GSA meetings and the ways that I would like to be involved. I definitely will be active in GSA throughout my career and would like to do what I can to further improve diversity at these events." Lastly, Jazzy told us they would love to come back and serve as a mentor in the future.

Jazzy is just one of the many OTF students you have helped. On the GSAF News & Events page, we are sharing the before-and-after reflections of five other OTF participants as part of our "Community of Support" series. Visit us at **https://gsa-foundation.org/news-events/** to see how your support for OTF has made an impact on these participants' lives. You can support this community at **https://gsa-foundation.org/donate/#fund_name=on-to-the-future-fund,** or contact Clifton Cullen at +1-303-357-1007 or ccullen@geosociety.org.

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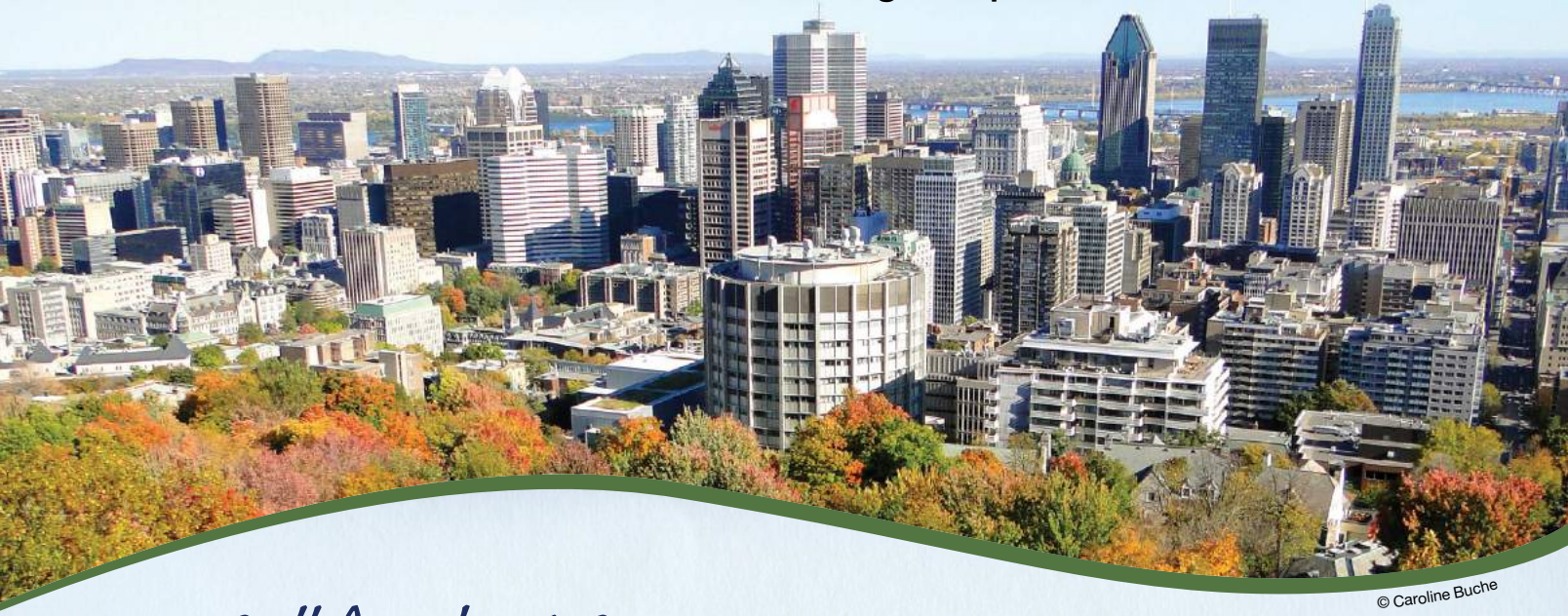

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Call for Short Course and Technical Session Proposals

It's time to plan for our 2020 Annual Meeting in Montréal, Québec, Canada. We look forward to highlighting the geology in the area. We challenge you to propose a short course and/or a technical session that will teach your colleagues and promote discussion about the incredible regional geology.

Exchange the geology by organizing and chairing a Technical Session.

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A MESSAGE FROM THE GSA EXECUTIVE DIRECTOR

Dear Colleagues,

GSA is committed to the ideal of scientific discovery, rigor, diversity, and integrity.

I invite you to prepare a proposal for a technical session for the 2020 Annual Meeting that reflects your expertise and research but also pushes the boundaries of the discipline. Without expanding our horizon, we will not move the geosciences forward and keep our relevance. I also challenge you to broaden your reach with whom you collaborate by including diversity in all ways—discipline, career progression, and individuals.

Thank you for considering sharing your science and work at the GSA Annual Meeting.

Vicki S. McConnell

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A SUCCESSFUL EDITOR WILL HAVE:

- a broad interest and experience in geosciences, including familiarity with new trends;
- experience as an editor or associate editor for a geoscience journal (experience with a GSA publication is preferred but not required);
- international recognition and familiarity with many geoscientists and their work;
- a progressive attitude and a willingness to take risks and encourage innovation;
- ability to make timely decisions; and
- a sense of perspective and humor.

GSA encourages applications from all qualified persons and is committed to diversity.