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SCIENCE

Cover: View of the eastern side of the Florida Mountains, a fault-block uplift at the Basin and Range–Rio Grande rift boundary in southern New Mexico, USA. Photo taken by Jason W. Ricketts. For the related article, see pages 4–10.

FY21 ANNUAL PROGRAM REPORT

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The Origin and Tectonic Significance of the Basin and Range–Rio Grande Rift Boundary in Southern New Mexico, USA

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ABSTRACT

Cenozoic extension in the western United States occurred within two iconic domains: the Basin and Range and Rio Grande rift. These provinces merge in southern New Mexico to form an interconnected zone of extension, although the existence, location, and nature of the boundary between the two provinces are uncertain. In southern New Mexico, existing thermochronologic, geologic, and geophysical data sets, combined with thermal modeling of zircon (U-Th)/He (ZHe) data, define a subvertical, 30–40-km-wide boundary that extends through the lithosphere to depths of at least 100 km. Thermal modeling indicates Proterozoic basement in the upper crust of the southeastern Basin and Range exceeded 225 °C during Oligocene magmatism, resetting ZHe dates and creating a thermal boundary that coincides with independent geologic and geophysical data sets. Although many aspects of this boundary are transient, others may become permanent features to define a lithospheric-scale boundary prone to reactivation during future tectonism. This assessment of the boundary supports models in which the southern Rio Grande rift is a separate structural entity from the adjacent Basin and Range, and this region provides an exceptional case study for understanding how extensional lithospheric-scale boundaries evolve to become stable features of continents.

INTRODUCTION

The Rio Grande rift and Basin and Range Province are two of the most iconic extensional domains on Earth; the Basin and Range Province is the archetypal example of a wide rift, and the neighboring Rio Grande rift is one of the classic modern examples of a narrow continental rift (e.g., Buck, 1991). For most of its length, the Rio Grande rift is separated from the Basin and Range Province by the Colorado Plateau, and they exist as distinct structural entities, but in southern New Mexico, they merge to form an interconnected zone of extension that continues south into Mexico (Fig. 1). The existence of a discrete boundary between the two domains and the nature of this transition in southern New Mexico remain unclear, although understanding the transition is crucial for assessing how these two extensional provinces evolved through time. The physiographic expression of extension in southern New Mexico suggests an indistinct or nonexistent boundary, favoring models where the Rio Grande rift is the easternmost segment of the Basin and Range Province (Eaton, 1982). This view is contentious, however, because thermochronologic (Gavel, 2019) and geophysical (e.g., Keller et al., 1990; Averill and Miller, 2013; Feucht et al., 2019) data sets highlight important differences between the two provinces, supporting models where they exist as two separate, albeit contiguous entities. This nontrivial distinction has implications for the relative role of plate-boundary versus mantle processes driving extension in western North America (Dickinson, 2002).

A more complete understanding of the boundary requires diverse data sets at different scales to constrain its current characteristics and evolutionary history. Here we use thermochronologic data, including apatite fission-track (AFT), apatite (U-Th)/He (AHe), and zircon (U-Th)/He (ZHe), together with a synthesis of geologic and geophysical data from southwestern New Mexico to investigate the nature of the transition at a lithospheric scale. We then document a pronounced thermal boundary across the transition preserved in ZHe data sets. When viewed collectively, these independent data sets reveal a complex and dynamic tectonothermal boundary and reinforce the idea that the southern Rio Grande rift is a separate structural entity from the adjacent Basin and Range Province.

THE RIO GRANDE RIFT–BASIN AND RANGE BOUNDARY IN SOUTHERN NEW MEXICO

There are three models for how to assess the Rio Grande rift–Basin and Range Province boundary (Fig. 1): (1) The northern Rio Grande rift is a separate entity from the Basin and Range Province, and is distinguished by its narrow width (dark orange in Fig. 1); (2) the entire Rio Grande rift exists as a separate entity along its entire length (light and dark orange in Fig. 1); and (3) the two provinces are contiguous and coeval and thus the Rio Grande rift is just a localized term for the Basin and Range Province on its eastern margin adjacent to the Colorado Plateau (thick dark green line in Fig. 1). We investigate the nature of a possible boundary in southern New Mexico, and use "transition zone" to refer to a 40-km-wide zone that includes major differences in the crust and lithosphere. Physiographic maps, which are based on modern topography and drainage basins, lump the southern Rio Grande rift with the Basin and Range Province (Hammond, 1970). Most workers place the boundary at the eastern edge of the transition zone (e.g., Mack, 2004; van Wijk et al., 2018), which coincides with the western edge of the rift farther north, but it has not yet been clearly documented as to why this is a meaningful or geologically relevant location in southern New Mexico.

GEOLOGIC AND GEOPHYSICAL MANIFESTATIONS OF A BOUNDARY

In southern New Mexico, independent data sets highlight a subvertical boundary 30–40 km wide that extends to depths of at

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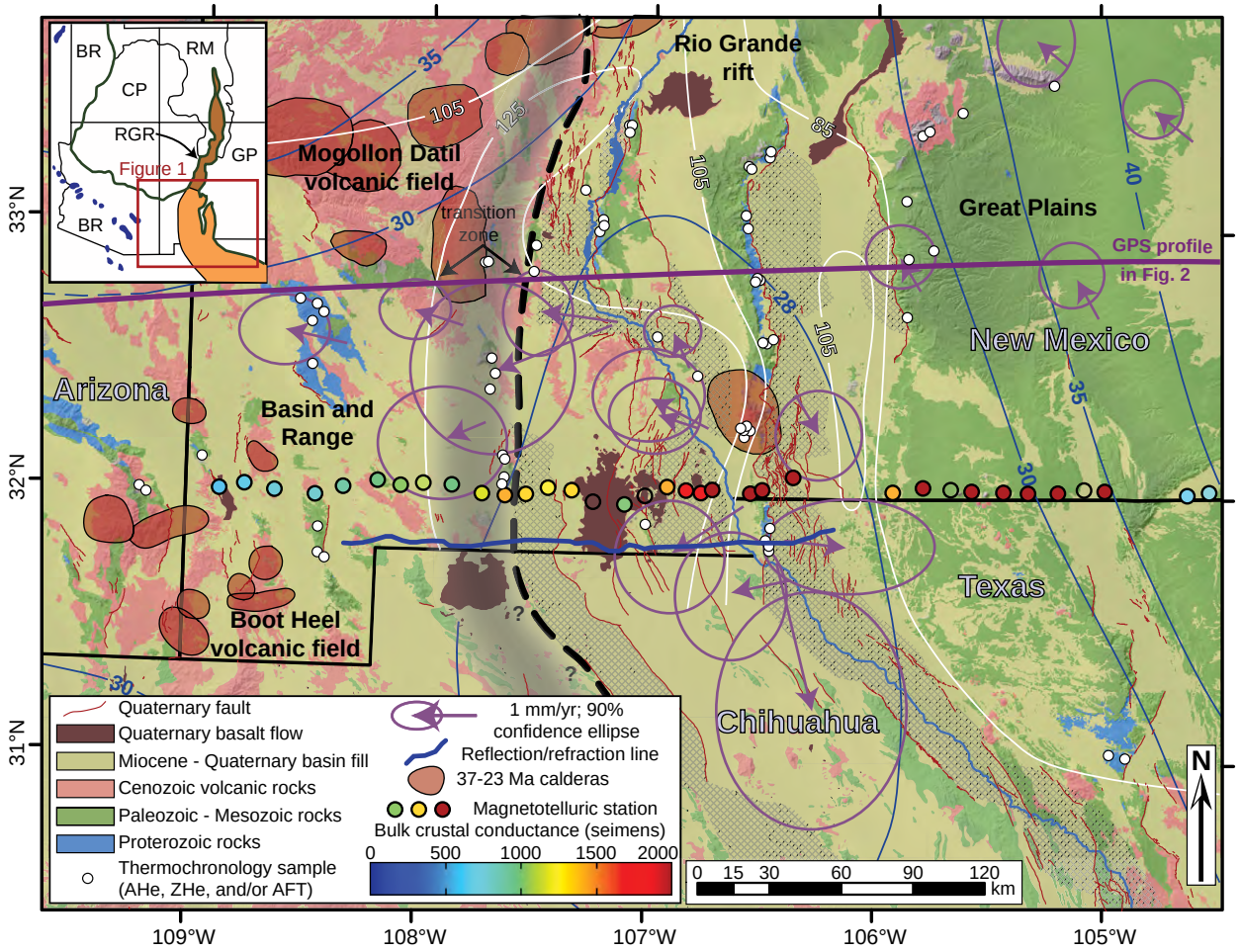

Figure 1. Geologic map of the southern Rio Grande rift (RGR)–Basin and Range Province transition. Map includes thermochronology data (Kelley and Chapin, 1997; Ricketts et al., 2016; Biddle et al., 2018; Gavel, 2019; Reade et al., 2020), global positioning system (GPS) data (Murray et al., 2019), reflection/refraction line (Averill, 2007; Averill and Miller, 2013), and magnetotelluric data recording bulk crustal conductance (Feucht et al., 2019). Thick dashed black line is the boundary of Mack (2004). Cross-hatched areas show deep basins of the RGR (Seager and Morgan, 1979). Blue lines show crustal thickness (km), and white lines show heat flow (mWm^{-2}) (Keller et al., 1990). AFT—apatite fission-track; AHe—apatite (U-Th)/He; ZHe—zircon (U-Th)/He. Inset shows metamorphic core complexes in blue and different models for the RGR–Basin and Range Province boundary, as discussed in the text. BR—Basin and Range; CP—Colorado Plateau; GP—Great Plains; RM—Rocky Mountains.

least 100 km (Figs. 1 and 2). Global positioning system (GPS) data show variable strain rates between the Great Plains and the Basin and Range Province (Fig. 2A; Murray et al., 2019). The Great Plains has low strain rates of 0.68 ± 0.17 nanostrains/year (nstr/yr), but strain rates are an order of magnitude higher in the Basin and Range Province and southern Rio Grande rift. Notably, there is a sharp transition from the highest strain rates of 8.54 ± 2.10 nstr/yr in the Rio Grande rift to lower rates of 1.45 ± 0.31 nstr/yr in the adjacent eastern Basin and Range Province. GPS results are consistent with a greater number of Quaternary faults in the southern Rio Grande rift, but these data also indicate that the rift is deforming at interseismic time scales.

AHe, AFT, and ZHe thermochronology, sensitive to temperatures of 30–90 °C, 60–120 °C, and 50–240 °C, respectively (Ketcham, 2005; Flowers et al., 2009; Guenthner et al., 2013), are compiled across the transition zone (Fig. 1; Kelley and Chapin, 1997; Ricketts et al., 2016; Biddle et al., 2018; Gavel, 2019; Reade et al., 2020). AFT and AHe dates show little variation across this region, and ages overlap with the time of Cenozoic extension. However, ZHe dates change drastically over short distances (Fig. 2B). West of the transition ZHe dates are similar to AFT and AHe dates, but east of the transition ZHe dates range from 2 to 731 Ma.

Across this region, overall crustal thickness gradually increases from ~28–30 km beneath the axis of the Rio Grande rift to 35 km in southwestern New Mexico (Fig. 2C; Keller et al., 1990; Averill, 2007). Basins are typically deeper in the southern rift (2–4 km) and abruptly shallow toward the Basin and Range Province, which have typical depths of less than 1 km (Averill, 2007). Additional shallow expressions of this boundary include more voluminous Quaternary volcanism, active faulting (Seager and Morgan, 1979; Keller et al., 1990), and higher heat flow (Keller et al., 1990) in the southern Rio Grande rift (Fig. 1).

Gravity models are consistent with a welt of high-density material beneath the axis of the southern Rio Grande rift at depths of ~12–21 km (Fig. 2C; Averill, 2007). This welt thins to the west and becomes absent in the transition zone. Velocity and gravity models highlight decreased densities and upper mantle velocities within the southern Rio Grande rift (Averill, 2007), which is associated with higher Moho temperatures of 900–1000 °C (Hamblock et al., 2007).

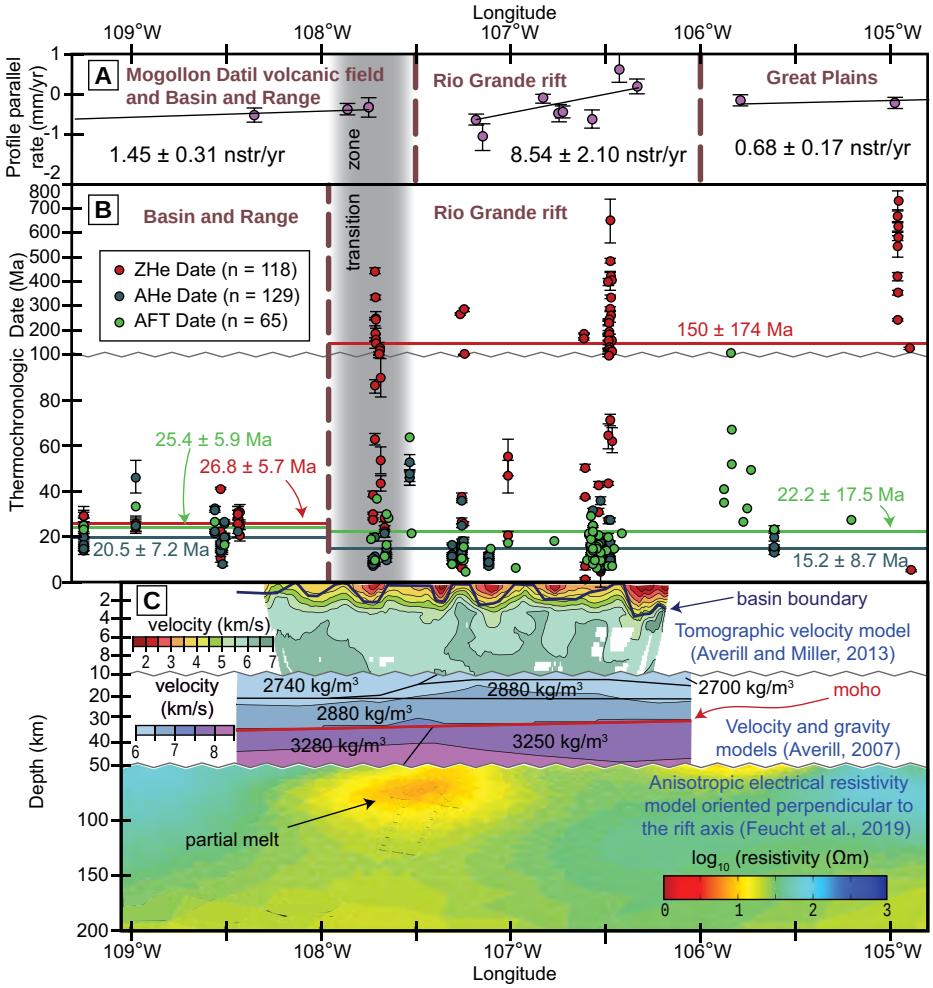

Figure 2. E-W cross section across the transition. (A) Global positioning system velocities across the profile line shown in Figure 1 (Murray et al., 2019). (B) Thermochronologic dates for all samples shown in Figure 1. Average dates are calculated for each data set in the Basin and Range Province and Rio Grande rift (±1 standard deviation). (C) Stacked geophysical models for the crust and upper mantle. Note changes in scale with depth. AFT—apatite fission-track; AHe—apatite (U-Th)/He; ZHe—zircon (U-Th)/He; nstr/yr—nanostrain/year.

Magnetotelluric data collected along an E-W transect through southern New Mexico show that the upper mantle is moderately resistive (30–100 Ωm; Feucht et al., 2019). The one exception is a zone age conductive material centered on 107.5°W at the eastern margin of the transition zone that is exceptionally pronounced at depths of 50–100 km and that may also extend to depths >200 km (Fig. 2C). This feature is interpreted to be a zone of lithospheric decompression melting (Feucht et al., 2019). Interestingly, this region of decompression melting is slightly asymmetric beneath the southern Rio Grande rift and skewed to the west, as opposed to more symmetric lithospheric thinning and mantle upwelling in central New Mexico (Wilson et al., 2005).

THE THERMAL IMPRINT OF A BOUNDARY

ZHe dates from the Basin and Range Province (Fig. 2B) largely overlap with ages of volcanic rocks in southwestern New Mexico, suggesting they were likely reset by magmatism (Gavel, 2019), and we use these data to model the heating effects of Oligocene magmatism in this region. Individual zircon grains from a single sample have variable closure temperatures due to accumulation of varying amounts of radiation damage that is proportional to eU (eU = U + 0.235Th), where low eU, high He retentivity grains typically correspond to oldest ZHe dates and high eU, low retentivity grains yield youngest ZHe dates (Guenthner et al., 2013). These properties allow for thermal modeling of ZHe data from 240 to 50 °C (Guenthner et al., 2013). Compiled ZHe dates (Biddle et al., 2018; Gavel, 2019; Reade et al., 2020) show dramatic differences across the transition zone with relation to eU (Fig. 3). In the Basin and Range Province, ZHe dates are consistent for all eU values. In contrast, east of and including the transition zone, ZHe dates have a wide range, where oldest ZHe dates are correlated with lowest eU and youngest ZHe dates have highest eU values. This observation suggests that radiation damage in zircon is a primary control on ZHe dates in this region.

Forward modeling allows for the calculation of ZHe date-eU curves from an input thermal history, and here it provides a means of testing the potential effects of reheating during magmatism (see supplemental material for complete modeling details[1]). We use a general thermal history of southern New Mexico that includes crystallization at 1.6 Ga and cooling to 350 °C at 1.45 Ga, based on $^{40}Ar/^{39}Ar$ muscovite data (Amato et al., 2011), 15 °C at 500 Ma based on the age of the overlying Bliss Formation, and maximum reheating to 150 °C at 80 Ma from accumulation of Paleozoic and Mesozoic sediment (Fig. 3A). We include two endmember Proterozoic cooling histories: multiple cooling pulses during assembly of Rodinia (path 1; Ricketts et al., 2021), and multiple pulses of cooling that coincide with assembly and then breakup of Rodinia (path 2; DeLucia et al., 2017). Resulting ZHe date-eU curves are roughly similar to observed ZHe dates for the southern Rio Grande rift regardless of the Proterozoic cooling history. Boot Heel volcanic field magmatism in southwestern New Mexico occurred from 37 to 26 Ma based on $^{40}Ar/^{39}Ar$ sanidine geochronology (McIntosh and Bryan, 2000), and we test the effects of this event on ZHe dates (Fig. 3B). Calculated ZHe date-eU curves only match the observed data for reheating temperatures of >225 °C and indicate that this thermal event did not affect ZHe dates in the southern Rio Grande rift. These results suggest that late Oligocene magmatism imprinted a major thermal boundary that coincides with independent geologic and geophysical data sets.

DISCUSSION

Age and Evolution of the Boundary

The collective data sets suggest that the southern Rio Grande rift is best explained

[1]Supplemental Material. Full description of zircon (U-Th)/He modeling, inputs, and assumptions. Go to https://doi.org/10.1130/GSAT.S.14794197 to access the supplemental material; contact editing@geosociety.org with any questions.

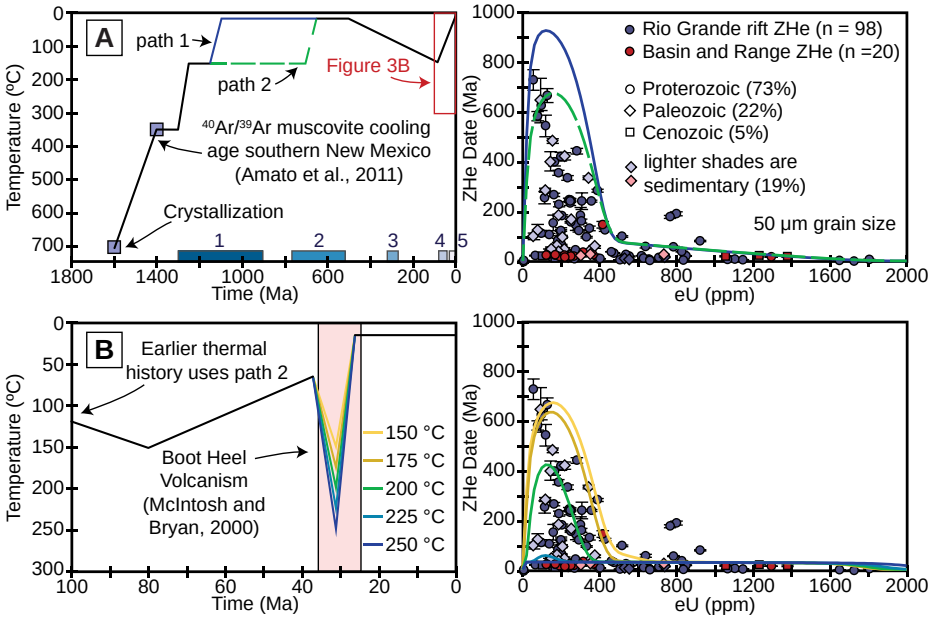

Figure 3. (A) Forward modeling and calculated zircon (U-Th)/He (ZHe) date-eU curves compared to a compilation of ZHe dates from the southern Rio Grande rift and Basin and Range Province (Biddle et al., 2018; Gavel, 2019; Reade et al., 2020), where Basin and Range Province data are west of 108°W longitude and Rio Grande rift data are east. ZHe date-eU curves are calculated from a thermal history using the helium diffusion model of Guenthner et al. (2013). 1—assembly of Rodinia; 2—breakup of Rodinia; 3—Ancestral Rocky Mountains; 4—Laramide orogeny; 5—Neogene exhumation. (B) Testing the effects of magmatic reheating in the Boot Heel volcanic field. Grain size used on modeling is the average of all zircon grains.

as an active extensional province that developed adjacent to the generally inactive southeastern Basin and Range Province (Fig. 1). The data do not support models where the northern Rio Grande rift is separate from the Basin and Range of southern New Mexico (dark orange in Fig. 1) or that the entire Rio Grande rift is the easternmost arm of the larger Basin and Range Province (dark green line in Fig. 1). Many of the observed manifestations of a boundary in southern New Mexico can be understood in the context of active extension in the southern Rio Grande rift and a relative lack thereof in the Basin and Range Province. Active lithospheric extension produces higher mantle conductance through partial melting, higher strain rates, active faulting, young volcanism, thinner crust, decreased upper mantle velocities and densities, and possibly deeper basins within the southern Rio Grande rift, where the westernmost expression of each of these features defines a 30–40-km-wide subvertical boundary that extends through the lithosphere (Fig. 2). At the surface, we place the boundary at the eastern edge of the transition zone, because this coincides with changes in basin depth, Quaternary faulting, volcanism, active strain rates, and bulk crustal conductance (Fig. 1). As active extension continues in the southern Rio Grande rift, the boundary will become more pronounced in independent data sets, suggesting that many of the differences across this boundary are controlled by differences in the timing of extension from the Basin and Range Province to the Rio Grande rift.

Constraining the timing of extension across the transition zone provides context for how and when the boundary evolved. Regionally, the easternmost metamorphic core complexes in southern Arizona are the Pinaleño, active from 29 to 19 Ma (Long et al., 1995), and the Catalina-Rincon, active from 27 to 20 Ma (e.g., Davy et al., 1989). Post-detachment extension in the region persisted until the onset of seafloor spreading in the Gulf of California at 6 Ma (e.g., Lizarralde et al., 2007). The sedimentary record of extension in southwestern New Mexico is relatively unexplored compared to the central and northern segments of the Rio Grande rift because there are few outcrops of Miocene and older basin strata. Available data suggest that initial Basin and Range Province extension in this region was under way during the Oligocene based on thickness of sedimentary basin fill and sparse age control from interbedded volcanic rocks (Mack, 2004). Although main extension is thought to have ceased by 6 Ma, minor Quaternary extension is evident by short fault segments that offset young alluvium (Mack, 2004). In the southern Rio Grande rift, the timing of initial extension was inferred by Amato et al. (2019) to have begun by ca. 27 Ma when the voluminous Uvas basalts were erupted (Clemons, 1979), which was coeval with deposition of the Thurman Formation (Boryta, 1994). Extension was active through the late Quaternary as evidenced by long fault scarps that bound major rift flank uplifts.

Thermochronologic data from the study area offer an opportunity to further constrain the times of extension and compare to the sedimentary record and regional tectonic history. Inverse thermal history modeling of AHe, AFT, and ZHe data in southern New Mexico suggests that main cooling in the southeastern Basin and Range Province was from 35 to 14 Ma (Gavel, 2019). In contrast, thermal modeling documents distinctly younger cooling from 25 to 5 Ma in the southern Rio Grande rift east of the transition (Fig. 1) to create a complex and highly dynamic lithospheric boundary that formed during diachronous pulses of extension. Initial Cenozoic development of the boundary occurred from 35 to 25 Ma when the southeastern Basin and Range Province experienced voluminous magmatism in the Boot Heel volcanic field and coeval extension (Fig. 4; McIntosh and Bryan, 2000; Gavel, 2019), and extension had not yet initiated in the Rio Grande rift. Evolution of the boundary dramatically slowed from 25 to 14 Ma when extension in both provinces occurred. Thermochronologic data indicate that the main phase of rapid extension ended at 14 Ma in the Basin and Range Province, although slower extension likely continued until 6 Ma. During this time, formation of the boundary may have continued again as Rio Grande rift extension outpaced Basin and Range Province extension. However, a crucial difference at this stage is that continued formation of the boundary was due to active extension to the east of the boundary (Rio Grande rift) rather than extension to the west (Basin and Range Province). Formation of the boundary accelerated again at 6 Ma when Basin and Range Province extension dramatically decreased and continued to the present. Thermochronology is thus consistent with the available sedimentary record and, when viewed within the context of the regional tectonic framework, reveals important differences in the timing of extension across the transition zone, where boundary evolution occurred in two discrete pulses and continues today.

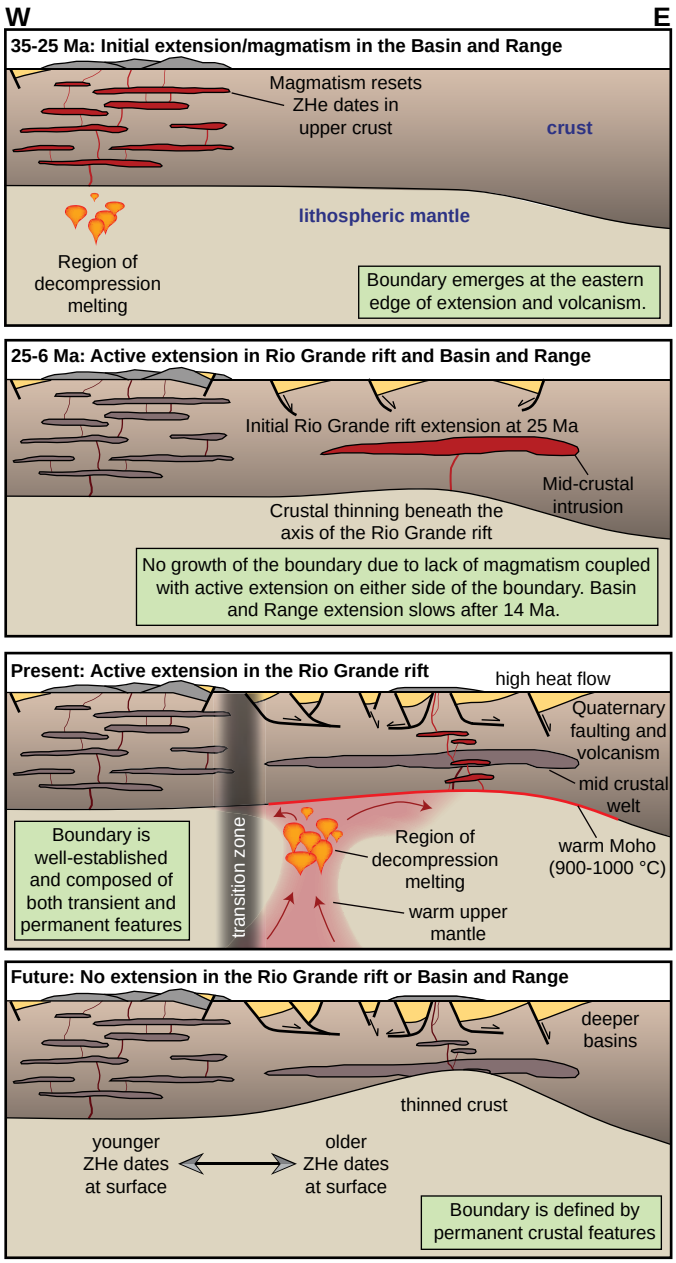

Figure 4. Schematic W-E cross sections showing the evolution of the Basin and Range Province–Rio Grande rift boundary. ZHe—zircon (U-Th)/He.

These independent data sets document the timing of formation of a near-vertical, lithospheric-scale boundary in southern New Mexico, but do not address the origins of this feature. It may have emerged during Oligocene magmatism in the Boot Heel volcanic field, which modified the chemical structure of the lithosphere and created a sharp thermal gradient that influenced extensional tectonism on either side. This model may indicate separate driving mechanisms, where mantle processes are responsible for Rio Grande rift extension and magmatism (Ricketts et al., 2016) and the Basin and Range Province was more influenced by plate boundary effects (Bird, 2002). Cenozoic development of the boundary may also have been superimposed upon N-S–trending or NW-trending extensional Neoproterozoic structures that likely formed within an overall convergent tectonic setting during Grenville orogenesis (e.g., Karlstrom and Humphreys, 1998; Timmons et al., 2001). However, evidence for their existence or history is cryptic in southwestern New Mexico, and such structures have been more thoroughly documented in central and northern New Mexico (Karlstrom et al., 2004). Our analysis in southern New Mexico is essentially a 2D cross-sectional view of the boundary, and further data sets to the south are needed to test whether the transition zone has an overall NS or NW trend and coincides with major Proterozoic boundaries. Based on available data, we therefore suggest that initial development of the boundary occurred during the late Eocene with Basin and Range Province extension and resulted from separate driving mechanisms from the Basin and Range Province to the Rio Grande rift.

Preservation Potential in the Geologic Record

If active extension is the underlying cause for most of the observed differences across the transition, then some boundary features are transient, such as differences in heat flow, conductance, and upper mantle velocities and densities on either side of the boundary. These features will likely vanish when extension ceases. In contrast, permanent boundary features include changes in basin depth, changes in the style of extension (presence or absence of metamorphic core complexes), different patterns in volcanism, differences in the timing of faulting, and the thermal imprint on thermochronologic data sets (Fig. 4). These permanent features will become more pronounced as Rio Grande rift extension continues. Permanent and transient boundary features are similar to the Rio Grande rift boundary in central New Mexico. In this well-defined segment of the rift, the boundary is demarcated by differences in mantle velocities (West et al., 2004), crustal thickness (Wilson et al., 2005), surface heat flow (Reiter et al., 2010), and extensional basins bounded by normal faults. The transition from thinned lithosphere with these characteristics to adjacent unaffected lithosphere over short distances is a classic and definitive description of a continental rift boundary, and this has been documented in other rifts worldwide (e.g., Achauer and Masson, 2002; Corti, 2009).

Lithospheric-scale boundaries are long-lived features of continents that can form through a multitude of major tectonomagmatic events. Once established, these features are prone to reactivation (e.g., New Madrid fault zone; Hurd and Zoback, 2012) and are therefore influential in guiding the style and geometry of future deformation (Karlstrom and Humphreys, 1998). Across the Colorado Plateau, Rocky Mountains, and Midcontinent regions, there are numerous examples of Ancestral Rocky Mountain and

Laramide basement uplifts that reactivated inherited structures (Soreghan et al., 2012; Bader, 2019), including Proterozoic extensional fault systems (Marshak et al., 2000; Timmons et al., 2001). These events attest to the longevity of extensional structures in continental lithosphere and their susceptibility for reactivation. We propose that after extension in the Basin and Range Province and Rio Grande rift ceases, this boundary will persist as a stable feature of North American lithosphere, possibly guiding future tectonic structures through reactivation of normal faults.

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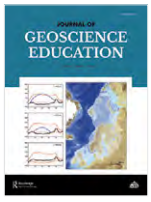

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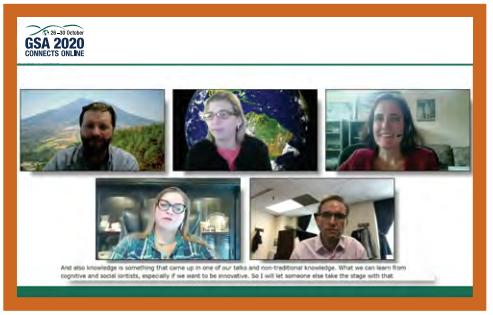
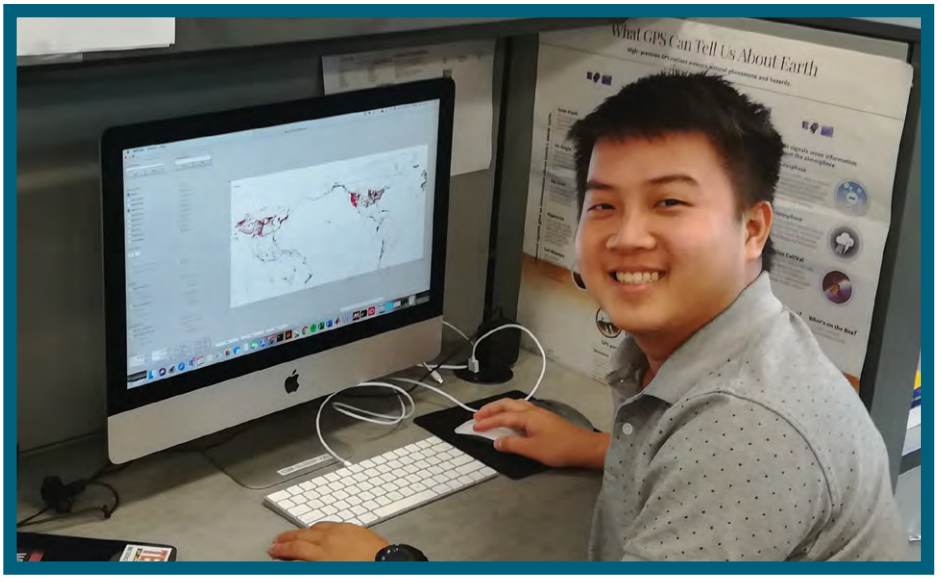
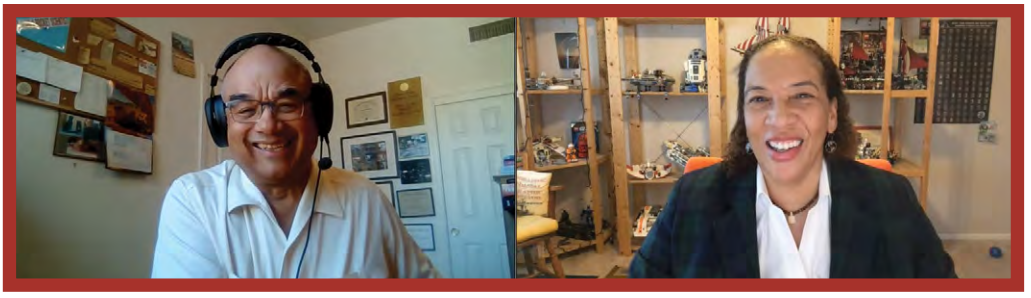
Zooming in on GSA's Past Year

FY21 Annual Program Report







THE GEOLOGICAL SOCIETY OF AMERICA®

Table of Contents

We are pleased to submit this report of GSA's fiscal year 2021 program activities, accomplishments, challenges, and innovations. Our mission is to provide the best service possible for you and your profession.

GSA's financial statements will be included in the report pdf on GSA's website when the FY21 audit is complete.

Opposite, clockwise from top: Quentin Burgess, a J. David Lowell Field Camp Scholarship awardee attended the University of Nevada, Reno's, virtual field camp; a Pardee Symposia session from GSA 2020 Connects Online; Chong Jeng Hann, a graduate student research grant recipient; Wes Ward and Dawn Wright in conversation during GSA's Bromery Awardees Series webinar; the Zeiss grant recipient, Tshering Lama Sherpa; Jazmin Helzer, a Geoscientists-in-the-Parks participant in the field; the 2020 Randolph W. "Bill" and Cecile T. Bromery Award recipient, Martha Gilmore.

Our Mission

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

Our Vision

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

Our Values

Collaboration

Scholarship

Accountability

Stewardship

Integrity

Respect

Relevance

Inclusion

Stay Connected to GSA

Follow GSA @geosociety on **Twitter** and **Instagram**.

Facebook—Join GSA fans worldwide at www.facebook.com/GSA.1888.

YouTube—Learn more about GSA and careers in the geosciences at www.youtube.com/user/geosociety.

LinkedIn—Network and stay connected to your professional peers at https://www.linkedin.com/groups/1298547/.

A Year of Renewal, Exploration, and Affirming Values

The members of the Geological Society of America (GSA) have had a long and challenging year. I hope you came through it well. This year we faced a twin set of pandemics. The first was COVID-19 and the second was an acute awareness of and reflection on systematic racism in our country. Both were met by the membership, leadership, and the professional staff of GSA, with members, leaders, and staff emerging stronger and more vital than before. We had numerous opportunities to make the organization stronger, and I hope that these will be felt for a long time.

THE IMPACT OF COVID-19

The workings of GSA had to change almost completely owing to the dangers of the COVID-19 pandemic. We canceled Section Meetings, changed the annual meeting, which was to have been held in Montréal, to an online format, and continued to modify our spring 2021 Section Meetings as dictated by local and national conditions. Did the lack of in-person meetings kill off meetings? No. Although somewhat smaller, GSA Connects Online 2020 went well. There were a few growing and adjustment pains, of course, but overall, the experience was good for our members and students and increased the presence of international participants. The technical challenges were there, but no worse than a projectionist dropping a carousel of slides or a speaker talking much longer than allowed.

The other enormous impact was on GSA operations. The headquarters building in Boulder was mainly empty, and staff worked remotely. This was a trend that was already starting with some folks but greatly accelerated. The staff adjusted well and without incident, and business mainly ran as expected. But a lot of GSA is done by volunteer committee chairs and members, continuing an ongoing trend, and this work moved to 100% online. The adjustment was amazing, and all the work of the Society got done. Helping with this was the training most folks got from their work environments on working online and remotely.

Although it was a somewhat confusing year for meetings, our scholarly publications shined brightly for our members. Submissions were up this year across the board, and the profile of our journals gained significantly (as measured in independently compiled impact factors). As a big supporter of geologic mapping, I was delighted to see a submission and publication process using *Geosphere* appear for membership.

REDOUBLING OUR EFFORTS ON DIVERSITY, EQUITY, AND INCLUSION

GSA has been involved in diversity, equity, and inclusion (DEI) efforts for almost 40 years. Last spring's events, starting with the murder of George Floyd, made us rethink and amplify our efforts. Executive Director Vicki McConnell and I organized the annual leadership retreat in August to focus on DEI. We engaged a professional facilitator, Nita Mosby Tyler of The Equity Project, to lead a group of 35 geoscientists through a workshop. Out of this effort, we established new goals and evaluated our existing processes.

There were several action items defined at the workshop, and we have nearly completed all of them. First, we had a working group of the GSA Council, the voice of membership in our leadership, define goals and definitions for our efforts. This group came up with several recommendations the rest of GSA leadership embraced. This included embedding DEI in GSA's governance structure and operations; institutionalizing culture change and responsibility for action, beginning with GSA leaders; enhancing orientation, training, and expectations for GSA elected and appointed leaders, including the GSA Executive Committee and Council, Section and Division leaders, and editors; increasing funding for diversity staff, programs, and service-leadership, including funding a full-time diversity officer; redoubling our efforts to make meetings and publications diverse and inclusive; charging the Annual Program Committee and other applicable committees with promoting diversity among conveners and presenters when organizing panels, keynotes, and other invitational sessions; forming a standing GSA DEI advisory group to help advise GSA staff, Council, committees, leaders, and other groups; and cultivating diversity among future GSA leaders. GSA unanimously adopted these recommendations during its spring council meeting.

Second, we formed an ad hoc committee to evaluate the awarding of fellowships by GSA. The group did not find any disparities between our membership profile and the awarding of fellowships with any basis on race or background. Still, it did recommend changes to ensure that future Fellows are likewise fairly chosen. Again, this was adopted unanimously at the Council meeting.

Last, we are looking at how GSA awards its medals of distinction and recruits leadership at all levels. This is being done by another ad hoc committee, which reported its results over the summer, to be discussed and implemented at the Council meeting this fall.

HELPING MOVE INTO THE ONLINE WORLD

GSA firmly moved to the online world last year with its meetings. As president, I had hoped to foster moving more of the Society's publication activities online and to promote GSA to the stature of defining standards for data reporting and data products related to the earth sciences. I tried to challenge the Divisions to take intellectual ownership of publication standards for their domains. Unfortunately, this effort fell short. The other events last year took precedence in keeping our meeting afloat and our organization moving toward fairness and fostering DEI. I will try to take up this effort by working with GSA leadership in the future.

There was stormy weather this year, but the GSA flotilla of members, leaders, and staff navigated the heavy seas and treacherous shoals with alacrity and aplomb. We took the required steps to create a new and better course to follow over the next few years.

Doug Walker,
GSA President
July 2020–June 2021

Dear friends, colleagues, and all GSA members:

I think that President Walker has summarized our conflicts, challenges, and successes of the past year very well in his letter. I will add some context to some of our actions. Please take a moment to read through the entire report for more detail on our programs and our work this past year, from geoscience policy to publications.

Certainly, one of the primary aspects of our actions was in response to listening, really listening, to our members and the geoscience community about equity and accessibility of our science. You can find GSA's commitment statements to diversity, equity, and inclusion (DEI) in our diversity webpage (https://www.geosociety.org/diversity.aspx) as well as multiple resources and references for your use. We are making a sincere and genuine effort to increase DEI in positive and productive ways both internally at GSA and throughout the geoscience community. Here are two examples: GSA staff assembled a pod participating in the Unlearning Racism in Geoscience (URGE) program to develop recommendations for me that would bolster justice, equity, diversity and inclusion (JEDI) into the workplace culture for staff and examined how staff at professional societies can help counteract the effects of racism. GSA is a co-principal investigator on a National Science Foundation research coordination network project: Geosciences Associated Societies Committed to Embracing and Normalizing Diversity Research Coordination Network (Geosciences ASCEND RCN). This will be an action-based network dedicated to advancing and accelerating cultural change in the geosciences to achieve broad inclusion of diverse identities. This is a four-year project, and we are just beginning. We are working with many of GSA's Associated Societies to initiate changes across the geosciences.

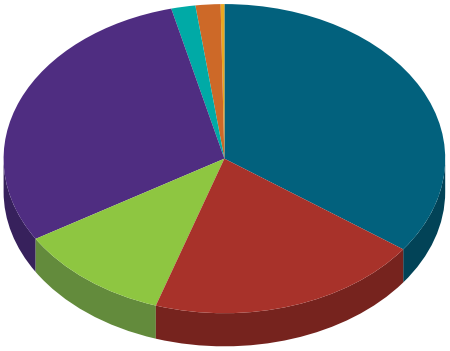
We continue to focus on implementing the Decadal Strategic Plan adopted in 2019. Covid-19 response slowed down some of our task implementation and forced us to re-prioritize other tasks. Fortunately, the plan is flexible enough to accommodate those changes. Two areas that had already been on our task list but required us to "pivot" in response to the pandemics were (1) increasing our professional development offerings via webinars, and (2) exploring options for more virtual meetings venues. While we didn't expect to have to drop everything to make those changes, we did, and have been very successful. We have learned and adjusted. These activities are integral to our Center for Professional Excellence as we work to provide you, the GSA members, the information, tools, and skills to thrive in your career.

Each year I end my letter with a thank you to the amazing GSA staff and I certainly want to extend kudos again this year. As with all of you, GSA staff has had to deal with adjusting to new work environments, pandemic uncertainties including illness and losses, and family crises, but they never lost sight of the mission of GSA to serve the geosciences and the geoscientists. Please join me in applauding each one of them for their hard work, innovation, and fortitude.

Vicki S. McConnell,
GSA Executive Director

Membership Demographics

Membership as of 31 Dec. 2020 = 20,075



- **35%** Professional
- **30%** Student
- **20%** Senior
- **11%** Early Career Professional
- **2%** K-12 Teacher
- **2%** Affiliate
- **<1%** Honorary Fellow

GSA members represent more than 27 scientific specialties and interests and have the option to belong to one or more of GSA's 22 scientific Divisions, six regional Sections, and GSA International.

Did you know?

- Lifetime Membership is now an option—Support GSA and receive membership benefits for life.
- Individuals in non–high-income countries/territories qualify for reduced membership dues.
- The GSA/GSA Foundation Membership Assistance Program and Fund enables those who cannot afford the cost of membership—or who experience difficulty in transferring funds from their country to the USA—to become members.
- GSA members can receive 15%* off dues if they renew their 2022 membership before 1 November.

* applies to those in high-income country/territories

Communication

PRESS RELEASES

Supporting its strategic aspiration to link geoscience to society, GSA engages in media relations activities to enlarge the footprint of member research and publications. GSA issued 58 press releases in FY21, highlighting peer-reviewed research published in the Society's top-rated, geoscience journals, presenting new findings from GSA meetings, and providing Society news. These are distributed to an extensive list of science journalists and posted on the American Association for the Advancement of Science (AAAS) online science news service, EurekAlert!. In addition, GSA encourages and assists public information officers at universities and government agencies to write their own releases about their GSA-published research or presenting authors and then augments distribution of those releases for wider reach. GSA invites journalists to attend annual and Section Meetings with complimentary registration and hosted an online newsroom at the GSA 2020 Connects Online meeting. Go to www.geosociety.org, click on the "News" tab, and select "GSA in the News" to read some of the latest coverage.

SCIENCE COMMUNICATION FELLOWSHIP

Rebecca Dzombak served as GSA's 2020–2021 Science Communication Fellow. Accomplishments from her term include crafting press releases on a variety of topics from microplastics and PFAS chemicals to planetary science and the origins of life. Rebecca helped advance GSA's diversity and equity goals by compiling a GSA Anti-Racism Resource Guide (https://www.geosociety.org/GSA/About/Diversity/GSA/About/reading.aspx) for members and by contributing numerous blogs on the Society's guest blog *Speaking of Geoscience* highlighting the work of underrepresented members of our community. She also worked closely with several GSA graduate student research grant recipients, helping them translate their research for non-technical audiences.

MEMBER BENEFITS INCLUDE:
- Communicate and collaborate with fellow members in GSA's online member community and discussion forum.

SPEAKING OF GEOSCIENCE™

In FY21, GSA posted 23 blogs on this channel, sharing ideas and dissecting issues ranging from geoscience policy to climate change to the state of geoscience education during the COVID-19 pandemic. In FY21, *Speaking of Geoscience* had a readership of more than 1,900 visitors per month, with a total of 31,210 blog views.

"GSA membership provides an opportunity to connect, reconnect, get inspired, and inspire others."

WEBSITE

Fiscal year 2021 brought continued investment in our website and online presence as a key tool to connect with, inform, and empower our members and the general public.

Most noticeably, we redesigned the GSA homepage to better communicate our values and mission, to engage new visitors and potential members more effectively, and to provide accessible calls to action and updated news about the society and vour programs. We also modernized our job board and added dynamic search and filter features. Similarly, we simplified and renovated our Scientists in Parks pages—some of our most-visited resources this year.

In line with organizational priorities, we have leveraged our main site as a tool to communicate ongoing diversity, equity, and inclusion efforts and to archive our progress on these important initiatives.

Beyond our main site, we developed a new theme for our scientific Divisions' sites that offers a modern feel and closer ties to GSA's brand.

GSA web traffic is up more than 14% year-over-year. Visit us at https://www.geosociety.org.

Top website page views in FY2021
1. GSA Homepage (139k)
2. Geologic Time Scale (138k)
3. Scientists in Parks (96k)
4. GSA Job Board (66k)
5. Field Experiences Home (43k)

FY21 HIGHLIGHTS:
- 116,995 issues of *GSA Today* sent
- 23 blogs posted on GSA's blog *Speaking of Geoscience™*
- The redesigned website homepage had 139K page views

COMMUNICATING THE VALUE OF GSA TO NEW MEMBERS

A new member email campaign was created to welcome and educate those joining the Society. The series includes nine messages about the programs and member benefits at GSA.

EARTH TO ECONOMY: ACCELERATING INNOVATION FOR CLIMATE CHANGE SOLUTIONS AND TRANSLATIONAL RESEARCH

With a grant from the National Science Foundation (NSF), GSA gathered input from the geoscience community to identify bold and creative ideas for translating scientific research to climate change solutions that can be implemented within a two- to three-year timeframe.

GSA used email and multiple social media platforms to inform the public about this opportunity and solicit feedback from its broad membership during the two-week comment period. A web platform was created to submit text and video answers to questions designed to elicit requested information. GSA also conducted targeted outreach to ensure the project received responses from students, early career professionals, groups underrepresented in the geosciences, multiple sub-disciplines and other stakeholders who might not be GSA members. Additionally online brainstorming sessions provided opportunities for in-person interactions and idea development. The final report can be found at https://www.geosociety.org/climate-solutions.

Publications

GIVING VOICE TO GSA VALUES

GSA journals and books offer geoscientists across the globe the opportunity to publish peer-reviewed cutting-edge and authoritative science. Actively seeking diversity among editors, authors, reviewers, and topics, GSA publications provide a respectful and inclusive experience as we work together to deliver relevant, collaborative scholarship with a foundation in scientific accountability and Earth stewardship. One hundred and four countries and 120 disciplines and subdisciplines were reflected in the 7,638 pages published by GSA throughout fiscal year 2021.

"I am very grateful for the access to peer reviewed literature and the chance to connect with fellow researchers."

BUILDING COMMUNITY THROUGH PUBLICATIONS

In March 2021, the GSA member discount on publication and open-access fees was increased, and GSA members receive free access to *Geology* online. Student, early career, and K–12 teacher members also get free access to *GSA Bulletin* online. *Geosphere* is in its fourth year of gold open access, and GSA participates with the gold open access community journal, *Lithosphere*, published with GSA's colleagues at GeoScienceWorld. A variety of content on relevant subjects was made freely available in the GSA Store during FY21, including resources on the geology of Canada, pioneering women geologists, and impact topics. Hundreds of previously unavailable or out-of-print publications, such as the complete suite of Decade of North American Geology volumes and maps, are easily discoverable and affordable in the GSA Store.

For the past eight years, GSA science editors have offered a free workshop for students and early career professionals that explains how to prepare and submit research to scholarly journals and the importance of contributing as a reviewer. In October 2020, this workshop was held virtually, making it more accessible and doubling the number of attendees.

Publication policies, such as the ethical guidelines, created to support a fair and open publishing process, are examined and updated annually as needed. A newly formalized name-change policy, implemented this year, states, "GSA supports the right of authors to update the name associated with their publications because of life changes including (but not limited to) marriage, divorce, gender transition, religious conversion, or adoption of a new name for personal reasons, and GSA staff will work with individuals to accommodate any such change on request."

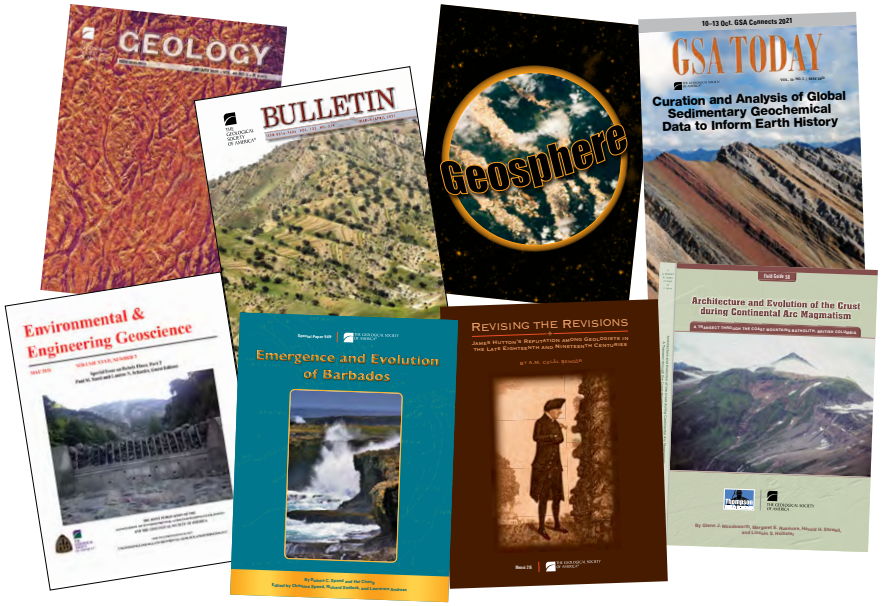
Thank you to everyone who worked with us to uphold GSA values and made FY21 another successful year for publications.

FY21 HIGHLIGHTS:

- GSA member discount on publication and open-access fees was increased
- 18 science editors • 144 associate editors & editorial board members • 2,263 reviewers • 3,195 authors

MEMBER BENEFITS INCLUDE:

- All members get free online *Geology*. Student and early career professional members also get free online *GSA Bulletin*.
- Supercharge your research with GSA Millennium Edition of Geofacets—a web-based tool to access thousands of georeferenced maps—included with membership.
- Subscribe to premier publications at member-only rates when you renew your 2022 membership.



Geology
2021 impact factor: 5.399;
five-year: 6.079

GSA Bulletin
2021 impact factor: 4.799;
five-year: 5.197

Geosphere
2021 impact factor: 3.298;
five-year: 3.571

GSA Today
100% open access;
Mails free to GSA members

Environmental and Engineering Geoscience
Published jointly with AEG
2021 impact factor: 0.736;
five-year: 0.758

Special Papers
Three volumes in FY21;
In Web of Science Group Book Citation Index

Memoirs
One volume in FY21;
In Web of Science Group Book Citation Index

Field Guides
Two volumes in FY21

Education & Outreach

EXPLORE CAREERS

GeoCareers & Networking

GSA 2020 Connects Online brought students the same programming they have enjoyed while in person, including the Early Career Panel, Networking Event, and the Women in Geology Panel. Additionally, six workshops were offered on cover letters, the Geoscience Workforce Outlook, creating a résumé for industry, an introduction to USAJOBS, creating a curriculum vitae, and creating a résumé for non-traditional employment. These workshops have all been added to GSA's growing webinar library (https://www.geosociety.org/webinars) as a resource for students.

Mentoring

GSA continued to offer an array of mentor programs in an online format. Each of the 2021 Section Meetings featured a Roy J. Shlemon Mentor Program in Applied Geoscience, John Mann Mentors in Applied Hydrogeology Program, and a career workshop that covered career planning and exploration along with résumé assistance. GSA 2020 Connects Online paired mentors and mentees for both drop-in mentoring and help with their résumés. Additionally, panels of geoscientists from a wide variety of careers were featured: industry, government, academia, and non-traditional career paths were covered. These panels provide a fantastic resource for students and are included in GSA's webinar library. Finally, throughout the year, GSA members had access to Mentoring365, a virtual three-month mentoring program.

"I really appreciated the mentor sessions. I learned so much and I valued the mentor's advice." —Caleb DeAbreu

MEMBER BENEFITS INCLUDE:
- Student and early career professional members qualify for reduced membership and reduced Division dues. Student members get one free Division.

- Webinars, mentor programs, research grants, and more!

TRAVEL GRANTS AND SCHOLARSHIPS

On To the Future Program (OTF)

Thirty-nine diverse students were selected to participate in 2020; they will join the 2021 OTF cohort at GSA Connects 2021 in Portland, Oregon.

Expanding Representation in the Geosciences Scholarships (ERG)

Six diverse undergraduate students were each provided a US$1,500 scholarship, a GSA student membership, and full meeting registration for GSA Connects 2021.

Northeast Urban Travel Award

Six non-traditional students attending urban universities in GSA's Northeastern Section were provided financial assistance to attend the online 2021 Northeastern Section Meeting.

J. David Lowell Field Camp Scholarships

In May 2021, 16 undergraduate students were each provided US$2,000 to attend the field camp of their choice. This year, Brunton gifted each awardee with a Brunton Compro Transit in a personalized leather case.

"Thank you so much for this scholarship! I am very grateful to GSA for the opportunity to go to field camp; thank you for helping me get there!" —Lauren Livers

FIELD AND RESEARCH OPPORTUNITIES

GeoCorps™ America and The National Park Service (NPS) Scientists in Parks (SIP) Program

GSA continued its longstanding partnerships with federal agencies to place students and early career professionals into enriching geoscience and interdisciplinary science projects in public lands. These programs received financial support from the GSA Foundation and Sally and Bob Newcomb.

GSA/ExxonMobil Field Camp Excellence Award

In May 2021, this US$10,000 award went to James Madison University in recognition of its commitment to safety awareness, diversity, and technical excellence.

FY21 HIGHLIGHTS:

- Six GeoCareers webinars were offered at GSA 2020 Connects Online
- GSA's mentor programs engaged 1,315 mentees and 340 mentors.
- Six diverse undergraduate students were each provided an Expanding Representation in the Geosciences Scholarships (ERG)
- Sixteen J. David Lowell Field Camp Scholarships were awarded to 25% of people from underrepresented groups
- >140,000 hours of service were contributed by 187 GeoCorps & SIP participants at 114 public land sites
- US$2,351 average graduate student research grant amount
- 14 AGeS2 proposals funded
- The deepest EarthCache™ was developed on Challenger Deep

Graduate Student Research Grants

GSA continued to support graduate-level research by using funds from GSA, the GSA Foundation, and a three-year (2020–2022) award from the National Science Foundation (NSF). The NSF award is aimed at supporting GSA's efforts to increase the level of diversity among the students who apply for and receive grants.

This material is based upon work supported by the National Science Foundation under grant no. 1949901.

AGeS2 (Awards for Geochronology Student Research 2) Program

As one of the AGeS2 partners, GSA played a role in increasing graduate student access

to geochronology data and techniques while also fostering new relationships between labs and other disciplines.

This material is based upon work supported by NSF under EAR-1759200, EAR-1759353, and EAR-1759201 awards to R.M. Flowers (University of Colorado Boulder), J.R. Arrowsmith (Arizona State University), and V. McConnell (GSA).

GSA/ZEISS Research Grant

This US$10,000 research grant was provided to Tshering Lama Sherpa, a Ph.D. student at the University of Arizona, for a research proposal titled "Elucidating the tectonic history of the western Nepalese Himalaya using in-situ monazite petrochronology."

The EarthCache™ Program

Some highlights of recent collaborations with Geocaching.com include encouraging the geocaching community to create a series of more than 70 EarthCache sites that teach lessons in planetary geology; cross-publishing blog posts relating to planetary geology; and developing the deepest EarthCache site on earth, which lies at Challenger Deep within the Marianas Trench.

"As a young scientist, I can look to GSA members for advice and inspiration."

PROFESSIONAL DEVELOPMENT

Webinars

Six career-focused webinars were offered in collaboration with GSA's scientific Divisions and Associated Societies, covering topics such as hydrogeology, GIS, professional licensure, graduate school, and leadership opportunities. More than 2,800 individuals viewed these webinars.

In early 2021, Dawn Wright, 2015 GSA Bromery Awardee and current chief scientist at the Environmental Systems Research Institute was the featured speaker in the first edition of the "Conversations with GSA's Bromery Awardees Series." This webinar engaged 465 viewers.

Short Courses

GSA 2020 Connects Online and each Section Meeting offered short courses, which are taught by professional geoscientists and enable attendees to learn new topics, build skills, and network.

K–12 Education and Two-Year Colleges

GSA staff worked with member volunteers, GSA's Education Committee, the National Earth Science Teachers Association (NESTA), and the Next Generation Science Standards–Earth and Space Science (NGSS-ESS) Working Group on offering a GeoTeach workshop for 20 educators at GSA 2020 Connects Online; planning a two-part "Virtual Contexts" workshop and various outreach events for GSA Connects 2021; submitting an educational activity to the 2021 American Geosciences Institute Earth Science Week calendar; and overhauling GSA's K–12 webpages and online resources.

Student Advisory Council

Fiscal year (FY) 2021 chair Rebecca Taormina (Baylor University) reports that the Student Advisory Council (SAC) was busy working on a number of different initiatives over the past year.

After the annual business meeting (held during GSA 2020 Connects Online), members discussed how to help students find opportunities within GSA. As a result, FY21 SAC chair-elect Yueyi Che (University of California, Berkeley) created a survey on the topic of undergraduate research grants to find out who is taking advantage of the available funds and how students hear about them. Results of the survey were reported to GSA Council at their spring meeting and a follow-up article by Yueyi, FY21 past-chair Alexandra Nagurney (Virginia Tech) and Rebecca Taormina, is published in this issue of *GSA Today* (p. 52).

Plans to better connect with students were difficult to implement due to COVID-19; however, SAC hosted its first virtual social hour with great success.

In May, members of SAC played a key role in GSA's participation in NSF's Earth to Economy: Accelerating Innovation for Climate Change Solutions and Translational Research project by facilitating online brainstorming sessions for students, early career professionals, and On To the Future program participants.

The SAC plans to continue its efforts to connect with and share geoscience opportunities with GSA student members in the coming year, beginning with GSA Connects 2021 in Portland, Oregon, USA.

Meetings

GSA CONNECTS ONLINE

In fiscal year 2021 (FY21), GSA re-branded the annual meeting to GSA 2020 Connects Online and hosted its first 100% online meeting in October 2020. There were more than 6,000 attendees with an increase in international attendees up to 17%. For the first time, four field trips ran 100% online and 17 short courses also were held online before the meeting. More than 50 companies, organizations, and universities exhibited.

Hundreds of volunteers participate yearly in the GSA annual meeting—from local organizing committee members and the Joint Technical Program Committee to the hundreds of session conveners from every geoscience discipline. There is something for everyone at the annual meeting.

"GSA is my primary professional home. It's where I turn to for data, networking, and information."

ONLINE SECTION MEETINGS

GSA Section Meetings are unique venues for interdisciplinary science and are an important hub for discussing and presenting current research. They provide an excellent opportunity for both professionals and students to attend and participate in technical sessions, field trips, and short courses close to home.

In 2021, GSA continued with hosting Section Meetings online due to the ongoing pandemic. The Northeastern Section kicked off the spring Section Meetings on 14–15 March and had 515 attendees. Southeastern was next, on 1–2 April, and had 376 attendees. They used a new online platform call Spatial Chat to allow for live networking. North-Central and South-Central held a joint meeting from 18–20 April with 294 attendees and also used Spatial Chat for their networking and business meeting. Finally, Cordilleran ran their meeting from 12–14 May with 391 attendees and, following Southeastern and the Joint Meeting, also used Spatial Chat for networking and as a poster hall for presenters to be available to chat and answer questions. The Rocky Mountain Section decided to postpone their 2021 meeting originally scheduled for Fort Collins, Colorado, moving it to 2023.

GSA PENROSE CONFERENCES AND THOMPSON FIELD FORUMS

GSA Penrose Conferences and Thompson Field Forums are GSA's premiere small-group meeting and field-trip venues for collaborative research around the world. In FY21, GSA planned to host a Penrose Conference titled "The Geological Fingerprints of Slow Earthquakes" on Santa Catalina Island, California. Due to the pandemic, the conveners pushed it back first to the summer of 2021 and then looked at the fall of 2021 but ultimately decided to host the conference 1–5 April 2022. A Thompson Field Forum has been awarded to run in spring/summer of FY22 and another Penrose Conference will also run in the spring/summer of FY22.

FY21 HIGHLIGHTS:

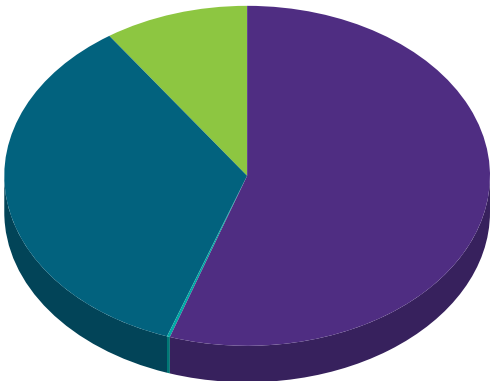
- The first 100% online annual meeting was held in October
- International attendance increased to 17%
- 786 GSA 2020 Connects Online short course participants
- More than 1,500 people attended the online spring Section Meetings

MEMBER BENEFITS INCLUDE:

- Members enjoy reduced meeting registration rates.
- Special opportunities for student members, including mentor luncheons and volunteer opportunities to offset the cost of attending GSA meetings.
- One complimentary Section affiliation is included with membership. Choose others when you renew to expand your geographic interests.
- Join one or more scientific Divisions when you renew your membership.

2020 Meeting Attendees

Total = 6,007



- **3,313** Student
- **2,105** Professional
- **577** Early Career Professional
- **12** K-12 Teacher

Thank You FY2021 Sponsors

GSA and the GSA Foundation collaborate in a range of sponsorships supporting the annual meeting and more: Field camp excellence recognition, geoscience students' field camp attendance, diversity programs, and a number of in-kind services and member benefits are all made possible thanks to partners and sponsors. We are pleased to include companies in a more integrated way: Technical sessions, short courses, and field camps are searchable by four different industry tracks, and applied geoscience sessions are part of the annual meeting. Additionally, representatives from our corporate partners have served on proposal teams, strategic planning task forces, and our careers program committee.

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

We thank the companies and organizations that join us in the meaningful impacts of partnership.

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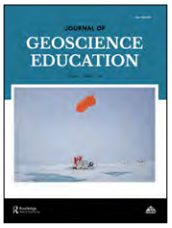


Journal of Geoscience Education

SOAR

Government Affairs and Public Policy

GSA HOSTS FIRST-EVER VIRTUAL GEOSCIENCE CONGRESSIONAL VISITS DAY

GSA provides opportunities for its members to meet with members of Congress and their staff by holding Geoscience Congressional Visits Days (GeoCVDs) and associated training sessions.

Due to the COVID-19 pandemic, the annual GeoCVD was held virtually for the first time. On 15–16 September 2020, more than 85 previous GeoCVD attendees responded to invitations to attend two webinars that provided legislative and budget updates and best practices for virtual meetings. Overall, GSA received positive feedback on its first virtual GeoCVD, with one of the participants reflecting, "I enjoyed getting fellow scientists involved for the first time and was fascinated to get a bit of the behind-the-scenes look at what is going on with some bills."

GSA PROVIDES NEW RESOURCES TO HELP MEMBERS ENGAGE WITH POLICYMAKERS

GSA and other geoscience societies held a series of webinars to help members effectively engage in policy remotely:

- New Year, New Congress! What You Need to Know about Getting Involved.
- Concise & Memorable: Creating an Effective Policy One-Pager.

GSA also launched a new members-only online toolkit featuring the webinars, short videos, and other resources to help members start their involvement in policy: https://www.geosociety.org/policy-toolkit.

GSA LETTERS AND TESTIMONY

GSA submitted testimony requesting increased funding for the U.S. Geological Survey (USGS), National Science Foundation (NSF), and National Aeronautics and Space Administration (NASA) for fiscal year 2022.

Your Society is an active member of coalitions that submit testimony and letters in support of these and other geoscience agencies, including the Coalition for National Science Funding, the Coalition for Aerospace and Science, the USGS Coalition, the Energy Sciences Coalition, and the Task Force on American Innovation, during both the regular appropriations process and response to COVID-19.

GSA submitted letters to policymakers on topics such as

- priorities for the transition team;
- open access of scientific publications;
- climate change research needs; and
- visa and immigration policy.

"Becoming a member of GSA changed my life. From field camp to the halls of the U.S. Capitol, my journey as a professional earth scientist was made possible by the opportunities and the people of GSA."

GSA SCIENCE POLICY FELLOW

Despite the COVID-19 pandemic, GSA continued its commitment to its science policy fellowship program and welcomed Connor Dacey to begin a one-year term as the "in-house" Fellow in August 2020, working as part of GSA's Washington, D.C., office. Connor worked remotely throughout the entirety of his fellowship term, but that did not stop him from helping to bring science and scientists into the policy process. Connor helped organize and participate in the first virtual GeoCVD, worked with GSA's Geology and Public Policy Committee, represented GSA at virtual coalition meetings, attended nearly 30 virtual hearings on relevant geoscience legislation and programs, and helped develop resources for GSA members to engage in policy.

GSA-USGS CONGRESSIONAL SCIENCE FELLOW

Each year, GSA and the USGS jointly sponsor a geoscientist to spend a year working in the office of a member of Congress or congressional committee. Charles Gertler began a one-year term in the office of Senator Edward Markey (D-MA) as the GSA-USGS Congressional Science Fellow in September 2020. Gertler earned his Ph.D. at MIT, where his doctoral work focused on the extratropical storm tracks and their response to climate changes. Gertler wrote, "My time on Capitol Hill so far has been spent entirely on Zoom, save one in-person press conference. In all this time, I have nonetheless drawn deeply on the lessons, skills, and ways of thinking I developed while training to become a scientist—understanding uncertainty, project iteration, navigating complexity, and structured analysis, to name a few—to contribute to the policy-making process."

GSA ADOPTS SEVEN NEW AND UPDATED POSITION STATEMENTS

Over the past year, GSA Council adopted one new position statement: U.S. Flood Risk Management. Minor revisions to the following six position statements were also approved: Public Investment in Earth Science Research; Role of Government in Energy and Mineral Resources Research; Visas for Foreign Scientists and Students; Importance of Teaching Earth Science; Expanding and Improving Geoscience in Higher Education; and Diversity in the Geosciences Community.

FY21 HIGHLIGHTS:

- Geoscience Congressional Visits Days was held virtually for the first time
- Two webinars were held to make policy more accessible remotely
- An online toolkit was created to help members start their involvement in policy
- GSA adopted seven new and updated Position Statements

Geological Society of America Foundation

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

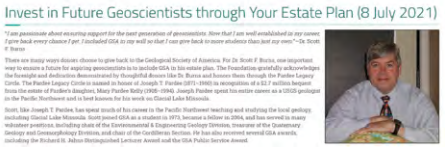
The responsibilities of the Foundation are twofold: (1) to support GSA programs, and (2) to preserve the Foundation's assets for the future.

HOW MEMBERS CAN GET INVOLVED:
- Support students, research, and education through a contribution to the GSA Foundation when you renew your 2022 membership.
- Help others be part of our GSA member community. The Membership Assistance Program and Fund enables those who cannot afford the cost of membership, or who experience difficulty in transferring funds from their country to the USA, to become members. Support and spread the word.

2020–2021 HIGHLIGHTS

In a unique year of challenging, uncertain circumstances across the globe, donors to GSA through the Foundation made an extraordinary showing of support: in FY2021, GSAF received annual campaign contributions of nearly US$1.5M from individual GSA members and corporations. There were 7,643 separate gifts at all levels, a testament to the dedication of steadfast supporters.

Surprisingly, 1,500 students humbled us with their determination to help in any way possible—an increase of almost 400 students from the prior year. We recognize the awareness in giving back that was demonstrated by this aptly named donor group: Tektonikos—Building the Future.



We are deeply appreciative of those who include the Foundation in their estate plans; Legacy Circle gifts are vital to unrestricted funding. More than US$400,000 in bequests were part of the year's contributions. It is inspiring that we continue hearing from donors making new legacy gift commitments. You may have read testimonials from some of them in our articles and updates divulging why this is such an important personal commitment.

Our spring mini-campaign focused on GSA's Greatest Needs, a vital fund to sustain the very programs that define GSA. We were delighted when a longtime donor offered a matching challenge to help raise more for this important source of funding—and even more surprised to see the friendly challenge raised a notch when a second donor added to the original match

Your dollars and impact doubled! GSA's policy work is one example of an area that can benefit from the Greatest Needs fund. Science Policy Fellows Ryan Haupt (2019–2020) and Laura Szymanski (2018–2019).}

amount. These two donors compelled many of you to give, knowing your dollars would be doubled; US$74,000 was raised for Greatest Needs. We hope this will inspire others to help us put the power of a matching challenge to work in support of GSA.

While the world was on lockdown, the GSA Foundation sought creative ways to maintain contact and engagement with our donors, particularly in thanks for their continued generosity. We found virtual gatherings to be a welcomed, temporary substitute for our usually in-person visits, and early in FY21 we began a series of virtual chats and events that covered topics including research grants; diversity, equity, and inclusion; field camps; Greatest Needs; and policy.

We held a virtual conversation with the first GSA-Zeiss Research Award

John (Jack) F. Shroder Jr. and Tshering Zangmu Lama Sherpa.

recipient, Tshering Zangmu Lama Sherpa, interviewed by GSA Foundation Trustee Dr. John (Jack) F. Shroder Jr., who has spent much of his life working in the same region as the recipient. Links to these events, as well as extensive Community of Support blog interviews with past GSA Science Policy Fellows, Congressional Science Fellows, and Field Camp Scholarship recipients conducted throughout the year, can found on GSAF's News & Events tab of the Foundation website (https://gsa-foundation.org).

Our Giving Tuesday campaign coincided with year-end giving and included a virtual chat series discussing the changing landscapes of field camps. The director of the country's longest-running field camp, which received the GSA Field Camp Excellence Award years ago, helped bring the dialogue full-circle from early history to current-day issues.

GSAF board vice-chair Jeff Oslund led the initial conversation with GSA past-president George Davis on GSA's commitment to supporting fieldwork. Miriam Barquero-Molina, director of University of

Missouri's geology field program, talked about the importance of in-person fieldwork, and we heard from a fully virtual Indiana University field camp attendee, Michael Hanna-Wilson.

Our donors remain committed to helping students obtain vital field experience, and in addition to the grants carried over from the previous year's J. David Lowell Field Camp Scholarship program (deferred due to COVID-19), we were able to fund another 16 scholarships for GSA student members to attend field camps.

In April, the GSA Foundation Board of Trustees announced the promotion of Debbie Marcinkowski to the newly created

position of executive director of the Foundation. This action combined the leadership position of president with the operational and strategic position of director of development.

The Foundation is pleased to help donors support GSA programs and priorities important to them. Looking forward, GSAF is eager to maintain the increased annual funding level achieved in FY21 and to work with GSA in identifying engaging and effective resource-building strategies. With your help we will shape a strong future for your Society.

We encourage every member to avail themselves of the opportunity to serve GSA and to support the Foundation in our combined efforts to ensure the dynamism and strength of the geosciences. Please visit the Foundation's website (https://gsafoundation.org) for information regarding ways you can make a philanthropic impact for GSA and the geosciences.

Jeffrey Oslund, Chair of the Foundation Board of Trustees

Debora B. Marcinkowski, Executive Director of the GSA Foundation

Thank You GSA Volunteers!

Looking back each year at all the work we have done together and the goals we have accomplished, we are reminded that the "secret ingredient" in the success of our Society is the wealth of dedicated and hardworking members who give generously of their time and talents. From planning meetings, to editing journals, to reviewing grants and awards applications, to serving on committees, running our scientific Divisions, serving students as mentors and campus reps… the list goes on. A huge "thank you" goes out to all of them.

To members who are not currently active but who might like to engage more deeply with GSA, please know that there is a myriad of ways to further your personal goals as well as the aims of the Society through service. We invite you to join a scientific Division, self-nominate for a committee, or let us know how you'd like to get involved. Email gsaservice@geosociety.org with questions.

Diversity, Inclusion, and Ethics

As a premier professional society, GSA has taken concrete steps to improve diversity, inclusion, and ethics within its ranks. Examples include investing in On To the Future, adopting an enforceable code of ethics, prohibiting alcohol at poster sessions, and increasing representation of women and diverse scientists on GSA Council. Despite such actions, there is a persistent lack of diversity in the geosciences, and GSA recognizes the need to do more to change our own institution and lead change in the geoscience profession. This update shares selected accomplishments we have made over the past year in accordance with the goals set forth in our decadal strategic plan, as well as our outlook for the future.

SELECTED ACCOMPLISHMENTS

Training and Awareness

GSA published an anti-racism guide (https://www.geosociety.org/GSA/About/Diversity/GSA/About/reading.aspx) to help individuals focus on the steps they may choose to take to begin tackling systemic racism. GSA hosted several implicit bias workshops facilitated by ADVANCEgeo to give members tools to evaluate their behavior and identify ways to knock down systemic barriers relating to the recruitment and selection of leaders, committee members, grantees, and others. GSA also engaged Dr. Nita Mosby Tyler of The Equity Project to facilitate an all-staff development workshop on diversity, equity, and inclusion.

GSA Staff URGE Pod

Several GSA staff members formed a learning group, or pod, as part of the Unlearning Racism in Geoscience (URGE) initiative. The pod has met regularly over the past several months to discuss and assess how to promote a culture of diversity, equity, and inclusion (DEI) at GSA's headquarters and to identify areas where staff can take action to work against the effects of racism and support the participation and retention of Black, Indigenous, and People of Color (BIPOC) in the geosciences. The pod continues to meet and is working on specific recommendations, which will be presented to GSA's executive director.

NSF Grant to Support Diversity and Inclusion

GSA, in partnership with the University of Arkansas, University of Florida, James Madison University, and the University of Texas at Austin, was awarded a National Science Foundation grant known as the Geosciences Associated Societies Committed to Embracing and Normalizing Diversity Research Coordination Network (Geosciences ASCEND RCN). This will be an action-based network with three primary objectives: (1) to advance and accelerate cultural change in geosciences, (2) to broaden participation of diverse identities in geoscience, and (3) to create a more inclusive discipline in which all people are invited to participate and contribute.

2020 Annual Ethics Report

(https://www.geosociety.org/documents/gsa/about/ethics/2020-annual-ethics-report.pdf). GSA published this annual report to provide our members and others in the geoscience community with transparent information about our ethics policies, the types of concerns being raised, and how GSA has resolved them. Charts in the report highlight information and trends involving the concerns that have been brought to GSA's attention since 2017. The report also discusses the disciplinary action GSA has taken to enforce ethics policy violations, including banning offenders from GSA meetings and terminating the membership and fellowship status of members found to have violated GSA's Code of Ethics for misconduct at their home institutions.

Events Code of Conduct

(https://www.geosociety.org/GSA/Events/EventConductCode/GSA/Events/Conduct.aspx). GSA is committed to fostering a respectful, inclusive environment at all GSA events from small gatherings, committee meetings, and field trips to large in-person and online meetings. We recently revamped the events code to improve awareness of the behaviors we encourage and those we will not tolerate.

OUTLOOK

GSA will continue to make justice, equity, diversity, and inclusion (JEDI) a priority in the coming year. GSA Council recently approved a report by an ad hoc committee comprised of GSA staff and members—the GSA Diversity Working Group—to distill the Society's goals for diversity and inclusion and to provide a road map of key tangible actions and success metrics to guide GSA in meeting those goals. Based on that report, Council approved several recommendations that will be operationalized over the next 12 months. One such recommendation includes increased funding for a new full-time diversity officer, who will be charged with developing and implementing a comprehensive JEDI strategy.

FY21 HIGHLIGHTS:

- Several GSA staff participated in the learning pod "Unlearning Racism in Geoscience" (URGE)
- GSA was awarded an NSF grant known as the Geosciences Associated Societies Committed to Embracing and Normalizing Diversity Research Coordination Network (Geosciences ASCEND RCN)
- GSA hosted implicit bias workshops and an equity workshop
- GSA published an Annual Ethics Report
- The Events Code of Conduct was updated

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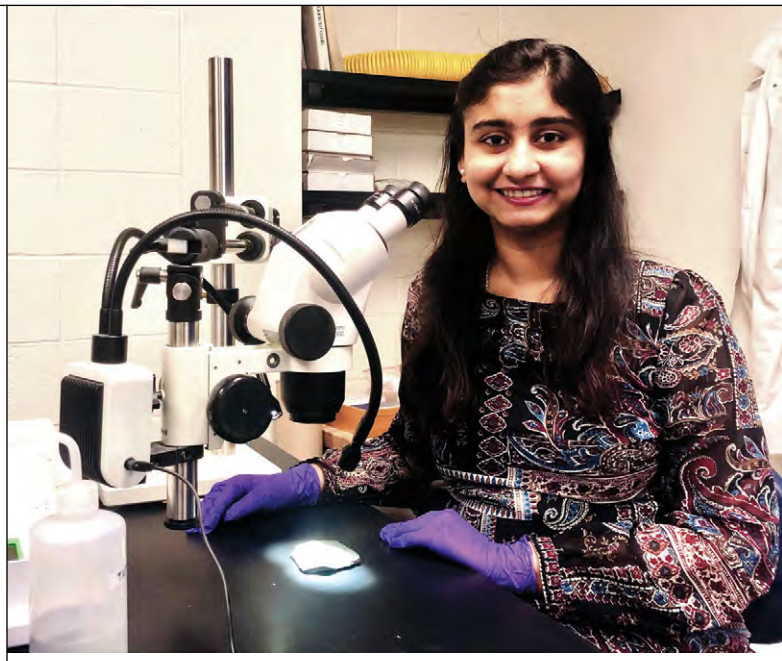
- **Expand Your Knowledge**
  Peer-reviewed publications, free online *Geology*, Geofacets, and *GSA Today*
- **Enrich Your Skillset**
  Career guidance & lifelong learning opportunities—tech sessions, short courses, career workshops
- **Advance Scientific Discovery**
  Publish & present research, travel & research grants, and field experiences
- **Be Recognized**
  Honors & awards for outstanding contributions to science and the community
- **Support the Next Generation**
  Mentoring, advocacy, volunteer & leadership opportunities
- **Connect with the Geoscience Community**
  20,000 worldwide member community, scientific Divisions, geographic Sections



"GSA is full of opportunities for everyone; it does not matter if you are a student, early career researcher, academic, or industry professional. Never underestimate the scope of networking, and GSA is a great place for that."
—Sinjini Sinha, member since 2017

"Those early experiences—the financial support, the mentorship by established members of the earth-science community, and the shared love of geology—were fundamental to my development as a geologist. And for that, I am forever grateful to the GSA."
—Stephen Johnston, member since 1986

Renew Your 2022 GSA Membership Today

"GSA has provided me with the opportunity to give back to my GSA community in various ways, including chairing sessions, serving on the ad hoc ethics community, and facilitating social media training for scientists."
—Wendy Bohon, member since 2002

"GSA is an excellent example of a society that supports multidisciplinary fields that come together to further knowledge and inspire future generations of scientists."
—Fabian Hardy, member since 2014

Renew by 1 Nov. & save 15% off dues*

*Applies to those in high-income countries/territories

www.geosociety.org/members

THE GEOLOGICAL SOCIETY OF AMERICA®
CONNECTS 2021
10–13 October
Portland, Oregon, USA

Registration and Other Need-to-Know Information

YOU STILL HAVE TIME TO REGISTER FOR GSA CONNECTS 2021!

You can register at **https://community.geosociety.org/gsa2021/registration** throughout the meeting.

Badges will be available at the "On Demand Registration Desk" in pre-function lobby C of the Oregon Convention Center starting at 7 a.m. on Sat., 9 Oct.

Onsite Registration Desk Hours
Sat., 7 a.m.–7 p.m.
Sun., 6:30 a.m.–6:30 p.m.
Mon.–Wed., 7 a.m.–4:30 p.m.

Ribbons are available near the GSA information desk during onsite registration hours in the Oregon Convention Center.

We support Respectful Inclusive Scientific Events and are committed to ensuring a safe and welcoming environment for all participants.

By registering for this meeting, you agree to abide by the GSA Events Code of Conduct in all venues at our meetings, including ancillary events, field trips, and official and unofficial social gatherings.

STUDENT VOLUNTEERS

The Student Volunteer Program is open for GSA student members in good standing to sign up. Earn complimentary registration when you volunteer to work for at least ten hours, plus get an insider's view of the meeting. Information and sign up links can be found on the GSA Connects 2021 website, **https://community.geosociety.org/gsa2021/registration/volunteers.**

CAMPUS CONNECTION

Bringing Students and Schools Together

GSA's Campus Connection, located in the Resource & Innovation Center, provides an excellent opportunity for students to meet face to face with representatives from top geoscience schools. This four-day event saves students time and travel expenses, giving the schools a chance to meet with some of the best student geoscientists in the world in a relaxed, informal setting. For a preliminary list of schools, go to **https://community.geosociety.org/gsa2021/showcase/exhibitors.**

GSA SECTION TRAVEL GRANTS

Recipients of the GSA Student Travel Grants will need to check in at the GSA Annual Meeting Office, Room C120/C121, in the Oregon Convention Center, show identification, verify their address, and sign the check-in sheet to receive their check. The checks will be mailed to the recipient after GSA Connects 2021.

Enroll in a Short Course Today!

https://community.geosociety.org/gsa2021/program/short

As scientists, our learning is never done. Take advantage of cutting-edge courses as part of your GSA Connects 2021 experience.

ADD a new skill to your résumé or CV;

ENRICH your meeting experience;

IMPROVE your ability to reach professional goals;

CONNECT with colleagues who share your research interests and passions;

NETWORK with potential employers, mentors, and collaborators; and

KEEP your skills relevant in a rapidly changing world.

This is a great opportunity to earn continuing education credits!

Be a Mentor and Make a Difference

- Drop-in Mentor
- Résumé or CV Mentor
- On To the Future Mentor
- Networking Event Mentor
- Women in Geology Mentor

Learn more and sign up.
https://forms.gle/bZeKibPue7BXEsyQ9

The Geological Society of America®
GEOCAREERS

Connect with colleagues who share your research interests and network with mentors and potential employers. Plan to attend one or more of the events below.

ONLINE GEOCAREERS PROGRAMS

Go to **https://community.geosociety.org/gsa2021/connect/student-ecp/geocareers** for event details. You must be registered for the meeting to attend these events.

Résumé Workshop: 4 Oct., noon–1 p.m. PDT
Presenters will review the fundamentals of crafting a winning résumé.

Women in Geology: 4 Oct., 2–3 p.m. PDT
Speakers will address issues faced by women in geology. Short presentations will be followed by networking in breakout rooms.

Company and Agency Information Session: 5 Oct., noon–1 p.m. PDT
Visit with agency and company representatives to ask your career questions in breakout rooms. Learn about each unique work culture and types of internships and careers available.

Networking Event: 5 Oct., 2–3 p.m. PDT
Learn the importance of networking to your career and meet some professionals willing to offer advice and answer questions in breakout rooms.

Career Pathways Webinar: 6 Oct., noon–1:30 p.m. PDT
Panelists from industry, government, academia, and non-traditional sectors will answer questions and offer advice in preparation for a career in these fields.

Early Career Networking Event: 6 Oct., 2–3 p.m. PDT
This panel is made up of representatives from several non-profits who have activities of interest to early career professionals.

GEOCAREERS CENTER IN PORTLAND

Open Sun.–Tues., 9 a.m.–5 p.m.

GSA will provide a safe environment for participants by following health and safety guidelines as outlined by the Oregon Convention Center in addition to using plexiglass partitions and other interventions to reduce COVID-19 transmission risk.

Post or view jobs

Drop-In Mentoring
Mentoring will be on a first-come, first-served basis. Sign up on site to secure your 30-minute consultation.

Résumé/CV Review Clinic
Review will be on a first-come, first-served basis. Sign up on site to secure your 30-minute consultation.

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Change lives. Teach science.

Join a **fully paid** graduate teacher education program in Earth and space science that prepares you to teach in high-need middle and high schools, including a monthly stipend towards living expenses in the New York City area.

Learn to teach from experienced education faculty and residency mentors. Study and conduct research alongside renowned Museum scientists.

Apply Today!

Complete details are available at **amnh.org/mat**

With deepest appreciation, the Museum acknowledges Kathryn W. Davis for her generous founding support of the Master of Arts in Teaching (MAT) Program. Leadership support for the MAT program is provided by The Shelby Cullom Davis Charitable Fund.

Generous support has been provided by the Bezos Family Foundation.

The MAT program is supported in part by the U.S. Department of Education under Grant Numbers U336S140026 and U336S190042 and the National Science Foundation under Grant Number DUE-1852787.

Additional support has been provided by The Rice Family Foundation and Nancy B. and Hart Fessenden.

amnh.org/mat

mat@amnh.org | 212-313-7464

Resource & Innovation Center Exhibitors

COMMERCIAL BOOTH

ASC Scientific
Beta Analytic Inc.
Don's Bones of the Earth
Exploration Instruments LLC
Geophysical Survey Systems Inc. (GSSI)
GeoScienceWorld
GeoSep Services
Guideline Geo
IKON Mining & Exploration
Isomass Scientific Inc.
Isotopx Inc.
Pearson
Picarro Inc.
Quantectum AG
Real World Globes
SciAps Inc.
Terra Persona LLC
Thermo Fisher Scientific
UNAVCO Inc.
W.W. Norton & Company
Waveland Press
Wildcat Technologies LLC
Zeiss

NON-PROFIT/EDUCATION

American Geosciences Institute
American Museum of Natural History Master of Arts in Teaching Program
Baylor University
Center for Applied Isotope Studies, University of Georgia
Consortium of Universities for the Advancement of Hydrologic Science Inc. (CUAHSI)
Continental Scientific Drilling Facility
Environmental Isotope Laboratory
GIA (Gemological Institute of America Inc.)
Ice Age Floods
Indiana University Dept. of Earth and Atmospheric Sciences
IUGS Deep-time Digital Earth (DDE)
National Cave and Karst Research Institute
National Park Service
National Science Foundation
The Paleobiology Database
South Dakota School of Mines and Technology
Treatise on Invertebrate Paleontology
U.S. Geological Survey
U.S. Science Support Program, IODP
University of Nevada, Las Vegas
Washington Geological Survey
Western Science Center
Yellowstone Bighorn Research Association (YBRA)

GSA SCIENTIFIC DIVISIONS

Environmental and Engineering Geology Division
Geophysics and Geodynamics Division
Karst Division
Hydrogeology Division
Planetary Geology Division

CAMPUS CONNECTION

Auburn University Dept. of Geosciences
Central Washington University
Colorado School of Mines Dept. of Geology & Geology Engineering
East Carolina University
Kansas State University
LSU Dept. of Geology & Geophysics
Mississippi State University Dept. of Geosciences
Missouri State University GGP Dept.
Missouri University of Science and Technology
Oklahoma State University
Oregon State University
Rice University
Rutgers University Earth & Planetary Sciences Dept.
San Diego State University
Texas A&M University
Texas Tech University
Tulane University, Dept of Earth & Environmental Sciences
University of Connecticut Dept. of Geosciences
University of Idaho
University of Kansas
University of Louisiana at Lafayette School of Geosciences
University of Michigan
University of Minnesota Dept. of Earth Sciences
University of Missouri
University of Notre Dame
University of Oklahoma
University of Pennsylvania
University of Southern California
University of Southern Mississippi
University of Texas at Dallas
University of Texas at San Antonio
University of Wisconsin–Madison
University of Wyoming
Utah State University Geosciences
Vanderbilt University
Virginia Tech Dept. of Geosciences
Western Michigan University

ASSOCIATED SOCIETY

AASP - The Palynological Society
American Institute of Professional Geologists (AIPG)
Association for Women Geoscientists (AWG)
Association of American State Geologists (AASG)
Association of Earth Science Editors (AESE)
Association of State Boards of Geology (ASBOG®)
European Geosciences Union (EGU)
International Association for Geoscience Diversity (IAGD)
National Association of Geoscience Teachers (NAGT)
Paleontological Research Institution
The Paleontological Society
Sigma Gamma Epsilon

CALL FOR NOMINATIONS

Nemmers Prize in Earth Sciences $200,000

Northwestern University invites nominations for the Nemmers Prize in Earth Sciences, to be awarded during the 2021–22 academic year. The prize pays the recipient $200,000.

Candidacy for the Nemmers Prize in Earth Sciences is open to those with careers of outstanding achievement in their disciplines as demonstrated by major contributions to new knowledge or the development of significant new modes of analysis. Individuals of all nationalities and institutional affiliations are eligible except current or recent members of the Northwestern University faculty and recipients of the Nobel Prize.

The 2022 Nemmers Prize recipient will deliver a public lecture and participate in other scholarly activities at Northwestern University for up to 10 weeks during the 2022–23 academic year.

Nominations will be accepted until December 31, 2021. The online submission form at **nemmers.northwestern.edu** requires the nominee's CV and one nominating letter of no more than 1,000 words describing the nominee's professional experience, accomplishments, and qualifications for the award. Self-nominations will not be accepted; nominations from experts in the field are preferred to institutional nominations. Please email questions to **nemmers@northwestern.edu**.

The Nemmers Prizes are made possible by a generous gift to Northwestern University by the late Erwin Esser Nemmers and the late Frederic Esser Nemmers.

Northwestern

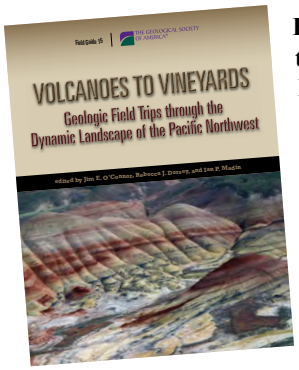
Nemmers Prizes • Office of the Provost • Northwestern University • Evanston, Illinois 60208
nemmers.northwestern.edu

Northwestern University is an equal opportunity, affirmative action educator and employer.

Explore Oregon with Free GSA Field Guides

Whether it's the striking cliffs of the Oregon coast, the breath-taking waterfalls of the Columbia River Gorge, or the sweeping vistas from Mount Hood, plenty out-of-the-ordinary sites are waiting to be explored within a short distance from Portland. Pull on your hiking boots and hit the trail with these Oregon field guides. To coincide with GSA Connects 2021, we're offering free digital access to the following selection now through the end of October. Visit the GSA Bookstore at https://rock.geosociety.org/Store/ and search "FreePortland" to download your copies today!

Columbia River Gorge: The geologic evolution of the Columbia River in northwestern Oregon and southwestern Washington
DNAG Centennial Field Guide 1—Cordilleran Section, 1987, p. 321–326



Eruption-related lahars and sedimentation response downstream of Mount Hood: Field guide to volcaniclastic deposits along the Sandy River, Oregon
GSA Field Guide 15, 2009, p. 221–236

Cataclysms and controversy—Aspects of the geomorphology of the Columbia River Gorge
GSA Field Guide 15, 2009, p. 237–252

The Boring Volcanic Field of the Portland-Vancouver area, Oregon and Washington: Tectonically anomalous forearc volcanism in an urban setting
GSA Field Guide 15, 2009, p. 253–270

Geoarchaeological themes in a dynamic coastal environment, Lincoln and Lane Counties, Oregon
GSA Field Guide 15, 2009, p. 319–336

Snowpack data collection in the Mount Hood area using SNOTEL and geomorphic events related to snowmelt
GSA Field Guide 15, 2009, p. 471–480

Coastal geomorphology, hazards, and management issues along the Pacific Northwest coast of Oregon and Washington
GSA Field Guide 15, 2009, p. 495–519

Geothermal geology and utilization in Oregon: A field guide
GSA Field Guide 15, 2009, p. 583–598

The Columbia River Basalt Group—From the gorge to the sea
GSA Field Guide 15, 2009, p. 737–774

Begin your exploration at **https://rock.geosociety.org/store/**

KU DEPARTMENT OF GEOLOGY

College of Liberal Arts & Sciences

Visit our integrated education & research facilities at the Earth, Energy & Environment Center

Visit us virtually at geo.ku.edu

Sedimentary Geology/Paleontology
Tectonics/Geophysics/Hydrogeology
Glaciology/Geobiology/Geochemistry/
Environmental Geology
BS, MS, PhD and Online PSM

GSA President '20-'21
& KU Geology Professor
Doug Walker

geo.ku.edu

CALL FOR NOMINATIONS

2022 GSA Awards & Medals

GSA selects individuals based on track record, a commitment to integrity, and promise to continue living up to the ethical standards embodied in GSA's Code of Ethics & Professional Conduct, in addition to their many accomplishments.

The deadline for receipt of all medal, award, and recognition nominations is **1 Feb. 2022.**

https://www.geosociety.org/awards

Penrose Medal

The Penrose Medal was established in 1927 by R.A.F. Penrose Jr. to be awarded in recognition of eminent research in pure geology, for outstanding original contributions, or for achievements that mark a major advance in the science of geology. This award is made only at the discretion of the GSA Council, and nominees may or may not be members of the Society. Penrose's sole objective was to encourage original work in purely scientific geology, which is interpreted as applying to all scientific disciplines represented by GSA. Scientific achievements should be considered rather than contributions in teaching, administration, or service. Mid-career scientists who have already made exceptional contributions should be given full consideration for the award.

Day Medal

The Arthur L. Day Medal was established in 1948 through a donation by Arthur L. Day, founding director of the Geophysical Laboratory of the Carnegie Institution of Washington. It recognizes outstanding distinction in the application of physics and chemistry to the solution of geologic problems, with no restriction on the particular field of geologic research. It was Day's wish to provide an award to recognize outstanding achievement in research and to inspire further effort, rather than to reward a distinguished career, and so it has been the longstanding practice of the Society to award this medal to geoscientists actively pursuing a research career.

Young Scientist Award (Donath Medal)

The Young Scientist Award was established in 1988 to be awarded to a young scientist (35 years or younger throughout the year in which the award is to be presented—*for 2022, only those candidates born* ***on or after 1 January 1987*** *are eligible*) for outstanding achievement in contributing to geologic knowledge through original research that marks a major advance in the earth sciences. The award consists of a gold medal and an honorarium.

How to Nominate

To ensure thorough consideration by the respective committees, please follow these nomination instructions carefully; additional information supplied will not enhance the nomination. For each candidate, please submit the following:

1. **Nomination form:** Go to https://rock.geosociety.org/forms/Awardform.asp to submit the form online.
2. **Supporting documents,** to be submitted as e-mail attachments or via post:

- Curriculum vitae;
- Summary (300 words or less) of the scientific contributions to geology that qualify the candidate for the award;
- Selected bibliography of no more than 20 titles (for the Donath Medal, only 10 titles are required); and
- Letters of support from five GSA Fellows or members *in addition to* the person making the nomination. **For the Day Medal only:** letters from five scientists with at least three of those being from GSA Fellows or members and up to two from fellows or members of the Mineralogical Society of America, Geochemical Society, or American Geophysical Union.

Florence Bascom Geologic Mapping Award

The Florence Bascom Geologic Mapping Award, established in 2013, acknowledges contributions in published high-quality geologic mapping that led the recipient to significant new scientific discoveries, to bring about greater understanding of fundamental geologic processes and concepts, and to contribute to the application of new knowledge to societal needs and opportunities in such areas as mineral resources and water resources and the environment.

The recipient will have authored high-quality geologic maps, cross sections, and summary reports that have received scientific acclaim and are available to both peers and the public, through federal or state agencies or major scientific societies. In evaluating the merits of nominees for this award, scientific achievements should be considered rather than contributions in teaching, administration, or service. Nominees may or may not be members of the Society, and they may be from any nation.

The selection are (A) excellence of the nominee's published geologic maps; (B) clear record of greater understanding of fundamental geologic processes and/or concepts, and high-quality publication of same, emerging directly from the meritorious quality of the geologic mapping; and (C) peer acclaim of the practical usefulness of the geologic mapping and the new discoveries that emerged from the mapping.

How to Nominate

1. **Nomination form:** Go to https://rock.geosociety.org/forms/Awardform.asp to submit the form online;
2. **Supporting documents,** to be submitted as e-mail attachments or via post:

- Curriculum vitae;
- Letter of nomination (300 words or less) addressing the evaluation criteria;
- Selected bibliography of geologic maps (20 titles or less);
- Selected bibliography of peer-reviewed publications (20 titles or less);
- PDFs or website links to several key geologic maps authored by the nominee; and
- Letters of support from three scientists with at least two from GSA Fellows or members and one from a member of another professional geoscience organization. Diverse supporters (including individuals who are not currently/recently associated with the nominee's institution) are strongly encouraged.

Randolph W. "Bill" and Cecile T. Bromery Award

The Bromery Award for Minorities should be given to any minority, preferably African Americans, who qualify under at least one of these two categories:

1. Nominee has made significant contributions to research in the geological sciences, as exemplified by one or more of the following:
- Publications that have had a measurable impact on the geosciences;
- Outstanding original contributions or achievements that mark a major advance in the geosciences; and
- An outstanding lifetime career that demonstrates leadership in geoscience research.

2. Nominee has been instrumental in opening the geoscience field to other minorities, as exemplified by one or more of the following:
- Demonstrable contributions in teaching or mentoring that have enhanced the professional growth of minority geoscientists;
- Outstanding lifetime career service in a role that has highlighted the contributions of minorities in advancing the geosciences; and
- Authorship of educational materials of high scientific quality that have enjoyed widespread use and acclaim among educators or the general public.

How to Nominate

1. **Nomination form:** Go to https://rock.geosociety.org/forms/Awardform.asp to submit the form online.
2. **Supporting documents,** to be submitted as e-mail attachments or via post:
- Curriculum vitae;
- Letter of nomination (300 words or less);
- Letters of support from three scientists with at least two from GSA Fellows or members and one from a member of another professional geoscience organization; and
- Optional selected bibliography of no more than 10 titles.

Doris M. Curtis Outstanding Woman in Science Award

The Doris M. Curtis Outstanding Woman in Science Award recognizes a woman who has had a major impact on the field of the geosciences based on her Ph.D. research. The generous support of the Doris M. Curtis Memorial Fund makes this award possible. GSA's 103rd president, Doris Curtis pioneered many new directions for geology, not the least of which was her tenure as GSA president after an unbroken chain of 102 men. Causes dear to her were women, public awareness, minorities, and education. Women are eligible for this award the first five years following their Ph.D. degree.

How to Nominate

1. **Nomination form:** Go to https://rock.geosociety.org/forms/Awardform.asp to submit the form online.
2. **Supporting documents,** to be submitted as e-mail attachments or via post:
- Curriculum vitae including dissertation title and abstract;
- Letter of nomination that clearly states how the Ph.D. research has impacted the geosciences in a major way;
- Letters of support from three scientists with at least two from GSA Fellows or Members and one from a member of another professional geoscience organization; and
- Selected bibliography of no more than 10 titles.

GSA Distinguished Service Award

Established in 1988, this award recognizes individuals for their exceptional service to the Society. GSA members, Fellows, associates, and employees may be nominated for consideration, and any GSA member or employee may submit a nomination for the award.

How to Nominate

1. **Nomination form:** Go to https://rock.geosociety.org/forms/Awardform.asp to submit the form online.
2. **Supporting documents,** to be submitted as e-mail attachments or via post:
- Curriculum vitae;
- Letter of nomination (300 words or less);
- Brief biographical sketch that clearly demonstrates the applicability of the selection criteria; and
- Optional selected bibliography of no more than 10 titles.

GSA Public Service Award

Established in 1998 in honor of Eugene and Carolyn Shoemaker, this award recognizes contributions that have materially enhanced the public's understanding of the earth sciences or have significantly served decision makers in the application of scientific and technical information to public affairs and earth science–related public policy. This may be accomplished by individual achievement in:

- Authorship of educational materials of high scientific quality that have enjoyed widespread use and acclaim among educators or the general public;
- Acclaimed presentations (books and other publications, mass and electronic media, or public presentations, including lectures) that has expanded public awareness of the earth sciences;
- Authorship of technical publications that have significantly advanced scientific concepts or techniques applicable to the resolution of earth-resource or environmental issues of public concern; and/or
- Other individual accomplishments that have advanced the earth sciences in the public interest.

How to Nominate

1. **Nomination form:** Go to https://rock.geosociety.org/forms/Awardform.asp to submit the form online.
2. **Supporting documents,** to be submitted as e-mail attachments or via post:
- Curriculum vitae;
- Letter of nomination (300 words or less);
- Brief biographical sketch that clearly demonstrates the applicability of the selection criteria; and
- Selected bibliography of no more than 10 titles.

Honorary Fellow

Established by the GSA Council in 1909, honorary fellowship may be bestowed on individuals who have made outstanding and internationally recognized contributions to geoscience or provided notable service to the Society. In practice, nearly all candidates are non–North Americans who live and work outside of North America. The most noteworthy exceptions were astronauts. The awardee does not have to be a member of the Society to receive the award. No more than two Honorary Fellows will be awarded annually. Honorary Fellows will be recognized during the GSA annual meeting and will receive complimentary lifetime membership in the Society.

How to Nominate

1. **Nomination form:** Go to https://rock.geosociety.org/forms/Awardform.asp to submit the form online.
2. **Supporting documents,** to be submitted as e-mail attachments or via post:

- Curriculum vitae;
- Letter of nomination (300 words or less) that clearly demonstrates the applicability of the selection criteria;
- Letters of support from three scientists with at least two from GSA Fellows and one from a GSA Fellow or a person of equivalent international stature; and
- Selected bibliography of no more than 20 titles.

Note

Candidates whose names are submitted by the respective award committees to GSA Council but who do not receive an award will remain under consideration by those committees for three years. For those still under consideration, it is recommended that an updated nomination letter be sent to GSA.

All nomination forms and submission instructions are online at www.geosociety.org/awards. Nomination forms and instructions may also be obtained from GSA Grants and Awards, P.O. Box 9140, 3300 Penrose Place, Boulder, CO 80301-9140, USA, +1-303-357-1028, awards@geosociety.org.

OTHER AWARDS

John C. Frye Environmental Geology Award

Deadline: 31 Mar. 2022

In cooperation with the Association of American State Geologists (AASG), GSA makes an annual award for the best paper on environmental geology published either by GSA or by one of the state geological surveys.

Anyone can nominate a paper as long as it is selected from a GSA or state geological survey publication and published during the preceding three full calendar years. The nomination letter must include a paragraph stating the importance of the paper. Up to three letters from users of the publication can be included to support the nomination.

Each nominated paper will be judged on its uniqueness or significance as a model of its type of work and its overall worthiness for the award. The paper must (1) establish an environmental problem or need; (2) provide substantive information on the basic geology or geologic process pertinent to the problem; (3) relate the geology to the problem or need; (4) suggest solutions or provide appropriate land-use recommendations based on the geology; (5) present the information in a manner that is understandable and directly usable by geologists; and (6) address the environmental need or resolve the problem. It is preferred that the paper be directly applicable to informed laypersons (e.g., planners, engineers).

Please send your nominations to GSA Grants and Awards, P.O. Box 9140, Boulder, CO 80301-9140, USA. For more information, go to http://www.stategeologists.org/awards_honors.php.

AGI Medal in Memory of Ian Campbell

The AGI Medal in Memory of Ian Campbell recognizes singular performance in and contribution to the profession of geology. Candidates are measured against the distinguished career of Ian Campbell, whose service to the profession touched virtually every facet of the geosciences. Campbell was a most uncommon man of remarkable accomplishment and widespread influence, and in his career as a geologist, educator, administrator, and public servant, he was noted for his candor and integrity. To submit a nomination, go to https://www.americangeosciences.org/awards.

AGI Marcus Milling Legendary Geoscientist Medal

The 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. To submit a nomination, go to https://www.americangeosciences.org/awards/legendarygeoscientist.

Why GSA Membership Is Important to Me

1. When did you first become a member? Did anything or anyone influence you to become a member?

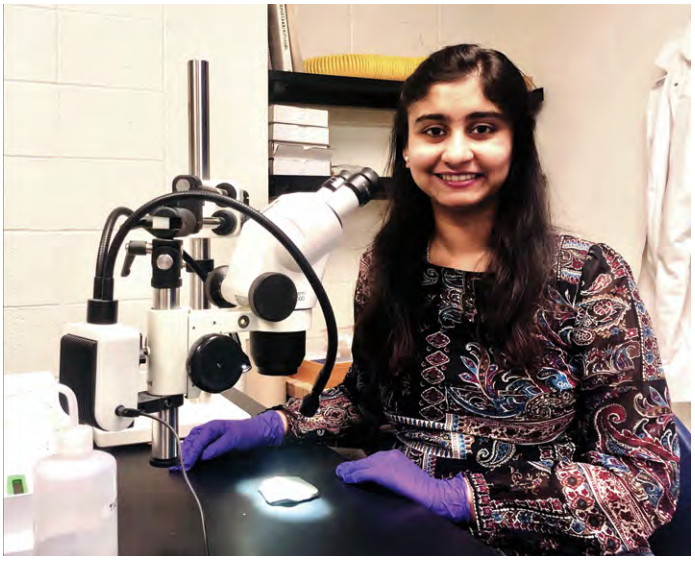
I first became a GSA member in 2017 through the On To the Future (OTF) program. In 2017, I wanted to present research results from my master's thesis at the annual meeting. I was searching for a travel grant and discovered the OTF program, which is a wonderful opportunity for students attending their first GSA annual meeting. Besides the financial assistance, every OTF student is paired with a mentor, who guides their mentee throughout the meeting. I realized that GSA is much more than an academic society; it is a great avenue to share research results, network, and build stronger academic connections.

2. Did you or do you participate in any programs or committees or apply for research grants?

At my first GSA annual meeting, I was thrilled to know about the various student opportunities. I felt extremely welcomed and decided to get more involved with the society. Now as an OTF alumni, I attend OTF workshops and virtual hours. I have served as the student representative of the Geology and Society Division, moderated fireside chats, chaired a technical session, co-convened a Pardee Symposium and a mining session, and volunteered during annual meetings. These positions help me stay connected with the different Divisions and communities within GSA.

3. How has GSA membership been particularly impactful on your career?

GSA membership has a huge contribution toward my overall professional development and in broadening my academic network. In addition, I received a graduate student research grant in 2020, which will allow me to conduct international fieldwork in Morocco.



4. What is the greatest benefit to being a member of GSA?

My professional network has grown immensely over the years by being part of the broader GSA community, participating in year-round events, and through interdisciplinary networking.

5. What would you say to a peer who is considering joining GSA/starting their geoscience journey?

GSA is full of opportunities for everyone; it does not matter if you are a student, early career researcher, academic, or industry professional. Never underestimate the scope of networking, and GSA is a great place for that.

Sinjini Sinha
University of Texas at Austin
GSA member since 2017

PRELIMINARY ANNOUNCEMENT AND CALL FOR PAPERS

Joint North-Central–Southeastern Section

56th Annual Meeting of the North-Central Section, GSA
71st Annual Meeting of the Southeastern Section, GSA
Cincinnati, Ohio, USA | 7–8 April 2022

www.geosociety.org/nc-mtg

Cincinnati skyline at night. Photo by Jake Blucker on Unsplash.

Our livable future needs geoscience

LOCATION

This joint Section Meeting will be held in Cincinnati, Ohio, USA, at the Duke Energy Convention Center, located downtown. Urban renewal throughout Cincinnati and just across the Ohio River in northern Kentucky has created dozens of breweries and brew pubs, new and renovated city parks, restaurants, cafés, and coffee bars, museums, theatres, and shopping. Cincinnati's seven hills lie atop the world-renowned fossiliferous Ordovician Cincinnatian Series, and southwestern Ohio and northern Kentucky mark the terminus of the Laurentide Ice Sheet. The region's bedrock geology and its glacial history underlie Cincinnati's nexus of landslide hazards and urban development, as well as the dynamics of large and small watersheds throughout the region. Six short courses, 45 technical sessions, and 11 field trips will highlight the region's geology, reflect modern quantitative approaches, and cover the range of twenty-first-century geoscience, from the critical zone to the deep crust. There will also be a panel discussion (open to the public) featuring corporate environmental and sustainability managers. Abstract submissions on all aspects of geoscience are welcome. Amid catastrophic climate change, there is a widening recognition that a global sustainable future requires revolutionizing resource management and development, which depends on an integrated understanding of earth materials, processes, and history. Now is the time for geoscience to make a more meaningful impact in education, research, and society. Please join us in the Queen City!

CALL FOR PAPERS

Abstracts deadline: 14 Dec.
Submit online at **https://www.geosociety.org/nc-mtg**
Abstract submission fee: GSA members: professionals: US$30; students: US$18. Non-members: professionals: US$60; students: US$36.

If you cannot submit an abstract online, please contact Heather Clark, +1-303-357-1018, hclark@geosociety.org.

TECHNICAL PROGRAM

Theme Sessions

T1. **Actualistic Paleontology: Learning from the Modern to Better Interpret the Past.** *Endorsed by Society for Sedimentary Geology (SEPM); Paleontological Society.* Yurena Yanes, University of Cincinnati, yurena.yanes@uc.edu; Ezekiel King Phillips, University of Cincinnati, kingphej@mail.uc.edu; Catherine Nield, University of Cincinnati, nieldce@mail.uc.edu.

T2. **Correlating the Ordovician: Honoring the Career and Contributions of Stig M. Bergström.** Stephen A. Leslie, James Madison University, lesliesa@jmu.edu; Daniel Goldman, University of Dayton, dgoldman1@udayton.edu; Matthew R. Saltzman, The Ohio State University, saltzman.11@osu.edu.

T3. **Under the (Ancient) Sea: Marine Life from the Coastal to Great Plains.** Sarah Sheffield, University of South Florida, ssheffield2@usf.edu; Christy Visaggi, Georgia State University, cvisaggi@gsu.edu; Stephen Hill, University of South Florida, stephen51@usf.edu; Whitney Lapic, University of South Florida, lapicw@usf.edu.

T4. **Astrobiology: What's the Latest on the Search for Life, Past or Present, Outside of Earth?** Andy Czaja, University of Cincinnati, andrew.czaja@uc.edu; Sally Potter-McIntyre, Southern Illinois University, pottermcintyre@siu.edu.

T5. **Development and Application of Geochemical Proxies to Paleoclimate Studies.** Megan Corcoran, University of Cincinnati, corcormc@mail.uc.edu; Aaron Diefendorf, University of Cincinnati, diefenan@ucmail.uc.edu.

T6. **Limnogeology and Paleoclimate.** Edward Lo, University of Kentucky, edward.lo@uky.edu; Leandro Luz, University of Kentucky, leandro.luz@uky.edu; John Dilworth, University of Kentucky, john.dilworth@uky.edu.

T7. **Recent Advances and Applications in Paleoceanography.** Andrea M. Erhardt, University of Kentucky, andrea.erhardt@uky.edu; Alex Reis, University of Kentucky, alex.reis@uky.edu.

T8. **Integrated Studies of Paleozoic Black Shale.** *Endorsed by GSA Sedimentary Geology Division; GSA Energy Geology Division.* Jay Zambito, Beloit College, zambitoj@beloit.edu;

Pat McLaughlin, Indiana Geological & Water Survey, pimclaug@iu.edu.

T9. **Advances in Understanding Processes at or near the Groundwater–Surface Water Interface.** Reza Soltanian, University of Cincinnati, soltanma@uc.edu; Jonathan Malzone, Eastern Kentucky University, Jonathan .Malzone@eku.edu.

T10. **Crossing Streams: Advances in Stream Science in the Southeast and North-Central United States.** *Endorsed by GSA Quaternary Geology and Geomorphology Division.* Brad Johnson, Davidson College, brjohnson@davidson.edu; Anne Jefferson, Kent State University, ajeffer9@kent.edu.

T11. **Exploring Spatial and Temporal Patterns of Past and Present Hydroclimate Variability in the North American Midcontinent.** Todd Grote, Indiana University Southeast, tdgrote@ius.edu; Broxton W. Bird, Indiana University–Purdue University, Indianapolis, bwbird@iupui.edu; Ronald C. Counts, Mississippi Mineral Resources Institute, University of Mississippi, rcounts@olemiss.edu.

T12. **Karst Hydrology and Speleology: Perspectives from the Eastern United States.** *Endorsed by GSA Karst Division; GSA Quaternary Geology and Geomorphology Division; GSA Geochronology Division; GSA Hydrogeology Division; GSA Sedimentary Geology Division; GSA Soils and Soil Processes Division; National Cave and Karst Research Institute.* Sarah M. Arpin, Kentucky Geological Survey, University of Kentucky, sarah.arpin@uky.edu; Sarah A. Burgess, Indiana Geological & Water Survey, Indiana University, burgesss@iu.edu; Rachel F. Bosch, Northern Kentucky University, rachelfbosch@gmail.com.

T13. **Water and Agriculture under a Changing Climate.** Racha El Kadiri, Middle Tennessee State University, racha.elkadiri@mtsu.edu.

T14. **Utilizing the Current Critical Zone Research Coordination Networks to Study Carbonates in the Critical Zone.** *Endorsed by GSA Karst Division; GSA Quaternary Geology and Geomorphology Division; GSA Geochronology Division; GSA Hydrogeology Division; GSA Sedimentary Geology Division; GSA Soils and Soil Processes Division; National Cave and Karst Research Institute.* Rachel Bosch, Northern Kentucky University, rachelfbosch@gmail.com; Sarah M. Arpin, Kentucky Geological Survey, University of Kentucky, sarah.arpin@uky.edu.

T15. **Down by the River: Recent Interdisciplinary Geoarchaeological and Paleoenvironmental Research in Mid-Continental River Valleys.** Benjamin Cross, The Ohio State University, cross.500@buckeyemail.osu.edu; Todd Grote, Indiana University Southeast, tdgrote@ius.edu.

T16. **Geosciences for a Sustainable Future.** Amy Townsend-Small, University of Cincinnati, amy.townsend-small@uc.edu.

T17. **Metal Pollution in the Eastern Midcontinent and Beyond.** Mark P.S. Krekeler, Miami University, krekelmp@miamioh.edu; Matthew Dietrich, Indiana University–Purdue University Indianapolis, dietrimj17@gmail.com.

T18. **Urban Geochemistry and Hydrology.** *Endorsed by International Association of GeoChemistry.* W. Berry Lyons, The Ohio State University, lyons.142@osu.edu; David T. Long, Michigan State University, long@msu.edu.

T19. **Application of Unmanned Aerial System Technologies for Engineering Geology and Geohazard Investigations.** *Endorsed by GSA Environmental and Engineering Geology Division; GSA Landslide Committee.* Sarah Johnson, Northern Kentucky University, johnsonsa@nku.edu; Matt Crawford, Kentucky Geological Survey, mcrawford@uky.edu.

T20. **Advances in Geophysics for Shallow Subsurface Investigations.** *Endorsed by GSA Geophysics and Geodynamics Division; GSA Hydrogeology Division; GSA Environmental and Engineering Geology Division; GSA Soil and Soil Processes Division.* Kennedy O. Doro, The University of Toledo, kennedy.doro@utoledo.edu.

T21. **Geologic Mapping Using the H/V Spectral Ratio Method in the North-Central United States.** Daniel Blake, Ohio Department of Natural Resources, daniel .blake@dnr.ohio.gov; John Esch, Michigan Geological Survey, eschj@michigan.gov; Carole D. Johnson, U.S. Geological Survey, cjohnson@usgs.gov; Brian Currie, Miami University, curriebs@miamioh.edu; Ernest Hauser, Wright State University, ernest.hauser@wright.edu.

T22. **Geophysical Investigations in the Central and Southeastern United States.** *Endorsed by GSA Geophysics and Geodynamics Division.* Kevin Mickus, Missouri State University, kevinmickus@missouristate.edu.

T23. **Resilience and Resource Strategies for the Coastal and Nearshore Zone in a Changing World.** Joshua H. Long, U.S. Geological Survey, jhlong@usgs.gov; Katie Luciano, South Carolina Geological Survey, lucianok@dnr.sc.gov; Till J.J. Hanebuth, Coastal Carolina University, thanebuth@coastal.edu; Clark Alexander, Skidaway Institute of Oceanography, University of Georgia, clark.alexander@skio.uga.edu.

T24. **Landscape Evolution in Mid-Continental Settings.** Jason Dortch, Kentucky Geological Survey, University of Kentucky, Jason.M.Dortch@uky.edu; Dylan Ward, University of Cincinnati, dylan.ward@uc.edu; Matthew Jungers, Denison University, jungersm@denison.edu.

T25. **Justice, Equity, Diversity, and Inclusion in the Geoscience Classroom.** Meghan Cook, University of South Florida, mlcook3@usf.edu; Heather Lehto, Angelo State University, heather.lehto@angelo.edu; Victor Ricchezza, Perimeter College at Georgia State University, vricchezza@gsu.edu.

T26. **Nevertheless She Persisted (or Not): Challenges to Retention of Women in the Geosciences through Pandemic and Non-Pandemic Times.** *Endorsed by Association for Women Geoscientists.* Patricia H. Kelley, University of North Carolina Wilmington, kelleyp@uncw.edu; Georgina Lukoczki, Kentucky Geological Survey, gina.lukoczki@uky.edu; G. Lynn Wingard, Association for Women Geoscientists, lwingard.awg@gmail.com; Amy Radakovich Block, Minnesota Geological Survey, rada0042@d.umn.edu; Lisa Tranel, Illinois State University, ltranel@ilstu.edu.

T27. **The Future of Geoscience Teaching after the "Great Disruption": Lessons from Lockdown.** Kent Ratajeski, University of Kentucky, kent.ratajeski@uky.edu; Suzanne K. Birner, Berea College, BirnerS@berea.edu.

T28. **Geoscience in Plain Language.** Andrea Corpolongo, University of Cincinnati, corpolaa@mail.uc.edu; Zeke King Phillips, University of Cincinnati, kingphej@mail.uc.edu; Emily Simpson, University of Cincinnati, simpsoey@mail.uc.edu; Megan Corcoran, University of Cincinnati, corcormc@mail.uc.edu.

T29. **Undergraduate and Graduate Geoscience Student Showcase.** *Endorsed by Council on Undergraduate Research.* Claire McLeod, Miami University, mcleodcl@miamioh.edu; Ken Brown, DePauw University, kennethbrown@depauw.edu; Jamie MacDonald, Florida Gulf Coast University, jmacdona@fgcu.edu; Lee Phillips, University of North Carolina at Greensboro, plphilli@uncg.edu; Jeff Ryan, University of South Florida, ryan@mail.usf.edu.

T30. **Undergraduate Oral Presentations.** Marian Buzon, University of West Georgia, mbuzon@westga.edu; Brittani McNamee, University of North Carolina Asheville, bmcnamee@unca.edu.

T31. **Undergraduate Research (Posters).** *Endorsed by Council on Undergraduate Research.* Lee Phillips, University of North Carolina at Greensboro, plphilli@uncg.edu; Jeff Ryan, University of South Florida, ryan@mail.usf.edu; Robert D. Shuster, University of Nebraska–Omaha, rshuster@unomaha.edu.

T32. **Geologic Maps, Geophysical Maps, 3-D Geological Models, Digital Mapping Techniques, Map Derivatives, and Digital Map Preparation (Posters).** Randy Kath, University of West Georgia, rkath@westga.edu; Karen Tefend, University of West Georgia, ktefend@westga.edu.

T33. **Deep Structural Learning-Based Remote Sensing for Geology.** Thomas Y. Chen, Academy for Mathematics, Science, and Engineering, thomaschen7@acm.org.

T34. **Melt, Emplace, Mix, Erupt! (MEME) Investigating the Dynamics of Magmatic Systems via Microanalysis.** Claire McLeod, Miami University, mcleodcl@miamioh.edu; Aleksandra Gawronska, Miami University, gawronaj@miamioh.edu; Marion Lytle, Miami University, lytleml@miamioh.edu; Alex Schweitzer, Miami University, schweia7@miamioh.edu.

T35. **Midcontinent Precambrian Basement from the Superior Province to the Southern Appalachians.** Dave Moecher, University of Kentucky, moker@uky.edu; J. Mitchell Clay, University of Kentucky, jmclay.3@uky.edu; J. Rick Bowersox, Kentucky Geological Survey, j.r.bowersox@uky.edu.

T36. **Mineral-Scale Insights on Modern and Ancient Plate Margin Processes.** Katherine F. Fornash, Ohio University, kffornash@ohio.edu; Jae Bridges, Ohio University, jaembridges@gmail.com; Selene Lisbey, Ohio University, sel.lisbey@gmail.com.

T37. **Appalachian Orogenies: When and How Do They Start and End?** Arthur J. Merschat, U.S. Geological Survey, amerschat@usgs.gov; Ryan J. McAleer, U.S. Geological Survey, rmcaleer@usgs.gov; J. Ryan Thigpen, University of Kentucky, ryan.thigpen@uky.edu; Jamie Levine, Appalachian State University, levinejs@appstate.edu.

T38. **Integrating Multiple Approaches to Unveil Tectonic Processes and Histories in Deep-Seated Terrains.** Allen J. McGrew, The University of Dayton, amcgrew1@udayton.edu; Jeffrey M. Rahl, Washington and Lee University, RahlJ@wlu.edu.

T39. **Intraplate Earthquakes in Central and Eastern USA.** Lewis A. Owen, North Carolina State University, lewis.owen@ncsu.edu; Ronald C. Counts, Mississippi Mineral Resources Institute, University of Mississippi, rcounts@olemiss.edu.

T40. **Strategic Minerals of the North American Midcontinent: Importance, Occurrence, and U.S. Initiatives.** John Rakovan, Miami University, Rakovajf@miamioh.edu; Jared Freiburg, Illinois State Geological Survey, freiburg@illinois.edu; Craig Dietsch, University of Cincinnati, dietscc@ucmail.uc.edu.

T41. **Ore Deposits of the North American Midcontinent.** Martin Appold, University of Missouri–Columbia, appoldm@missouri.edu; Sarah Smith-Schmitz, University of Missouri–Columbia, ses7f1@mail.missouri.edu.

T42. **Carbon Storage Research.** Stephen Greb, Kentucky Geological Survey, University of Kentucky, greb@uky.edu.

T43. **Geologic Energy Storage: Current and Prospective Opportunities in the Midwestern United States.** *Endorsed by GSA Energy Geology Division.* Joao Meyers, U.S. Geological Survey and George Mason University, jsmeyers@usgs.gov; Marc Buursink, U.S. Geological Survey, mbuursink@usgs.gov; Donna Willette, Illinois State Geological Survey, dcwillet@illinois.edu.

T44. **Success in the Face of Adversity: Telling the Stories of Women in Geology.** E.A. Driggers, Tennessee Technological University, edriggers@tntech.edu; Katherine J. Lewandowski, Eastern Illinois University, kjlewandowski@eiu.edu.

T45. **All Things Whittlesey: Civil War, Glacial, Engineering, Structural Geology, and Other Topics Related to Fields Investigated by Geologist Charles Whittlesey (1808–1886).** Joe Hannibal, Cleveland Museum of Natural History, jhannibal@uakron.edu; Kevin E. Evans, Missouri State University, kevinevans@missouristate.edu.

FIELD TRIPS

Trip registration opens in Jan. 2022. For additional information, please contact the field trip co-chairs: Steve Greb, greb@uky.edu; Clair McLeod, mcleodcl@miamioh.edu.

A Bike Tour: Piecing Together the Surficial Geology and History of the Four Mile Creek River Valley, Ohio. Christina Tenison, Miami University, tenisocn@miamioh.edu; Jason Rech, Miami University, rechja@miamioh.edu.

A New Look at the Classic Cincinnatian: Sequences, Cycles, and Events in the Upper Ordovician of the Cincinnati Vicinity. Carlton E. Brett, University of Cincinnati, brettce@ucmail.uc.edu; Ben Dattilo, Purdue University, Fort Wayne, dattilob@pfw.edu; Kyle Hartshorn, Cincinnati Dry Dredgers, khartshorn1.0@gmail.com.

Buried-Valley Aquifers and the Theis Environmental Monitoring and Modeling Site. Reza Soltanian, University of Cincinnati, soltanma@uc.edu; Alan Fryar, University of Kentucky, alan.fryar@uky.edu.

Geology of the Central Kentucky Karst and Mammoth Cave. Rachel Bosch, Northern Kentucky University, rachelfbosch@gmail.com; Sarah Arpin, Kentucky Geological Survey, University of Kentucky, sarah.arpin@uky.edu; Patricia Kambesis, Western Kentucky University, pat.kambesis@wku.edu; Rickard Toomey III, Mammoth Cave National Park, rick_toomey@nps.gov.

Hydrogeology and Water Monitoring Technology in Yellow Springs, Ohio. *Endorsed by GSA Hydrogeology Division; National Cave and Karst Research Institute.* Sarah A. Burgess, Indiana Geological & Water Survey, Indiana University, burgesss@iu.edu; Douglas Aden, Ohio Geological Survey, Ohio Department of Natural Resources, douglas.aden@dnr.ohio.gov; Brittany Parrick, Ohio Geological Survey, Ohio Department of Natural Resources, brittany.parrick@dnr.ohio.gov; Lee Florea, Indiana Geological & Water Survey, Indiana University, lflorea@iu.edu; Tracy Branam, Indiana Geological & Water Survey, Indiana University, tbranam@iu.edu.

Natural Arches in the Red River Gorge Geological Area. Steve Martin, Kentucky Geological Survey, smartin401@uky.edu.

Organic-Rich Rocks and Associated Sediments near the Devonian–Mississippian Boundary in Northeastern Kentucky. Frank R. Ettensohn, University of Kentucky, fettens@uky.edu; Charles Mason, retired, Morehead State University, mason.charles1947@gmail.com; R. Tim Lewis, retired, WPXEnergy, rtim.lewis@gmail.com; Geoff Clayton, retired, Trinity University, gclayton@tcd.ie.

Pleistocene Geology, Paleontology, and the History of Science at Big Bone Lick, Kentucky. Glenn W. Storrs, Cincinnati Museum Center, gstorrs@cincymuseum.org; Cameron Schwalbach, Cincinnati Museum Center, cschwalbach@cincymuseum.org.

Defending Cincinnati: Geological and Topographical Aspects of Civil War Forts and Batteries, Camp Dennison, and Morgan's Raid. ONLINE EVENT. Joe Hannibal, Cleveland Museum of Natural History, jhannibal@uakron.edu; Jeannine Kreinbrink, K & V Cultural Resources Management LLC, kreinbrinkjmo@gmail.com; Kevin E. Evans, Missouri State University, kevinevans@missouristate.edu.

Revisiting the Wisconsin Depositional History of the Southernmost Extent of the Scioto Sublobe, Ohio. T. Andrew Nash, Ohio Department of Natural Resources, Division of Geological Survey, thomas.nash@dnr.ohio.gov; Tyler Norris, Ohio Department of Natural Resources, Division of Geological Survey, tyler.norris@dnr.ohio.gov; Thomas Valachovics, Ohio Department of Natural Resources, Division of Geological Survey, thomas.valachovics@dnr.ohio.gov.

Upper Ordovician and Lower Silurian Facies, Cycles, and Sequences in Southern Ohio: A Field and Core Workshop. *Endorsed by Ohio Department of Natural Resources, Division of Geological Survey.* Carlton E. Brett, University of Cincinnati, brettce@ucmail.uc.edu; Christopher Waid, Ohio Department of Natural Resources, Division of Geological Survey, christopher.waid@dnr.ohio.gov; Cole Farnam, University of Cincinnati, farnamce@mail.uc.edu; Patrick McLaughlin, Indiana Geological & Water Survey, pimclaug@iu.edu.

SHORT COURSES

Creating Scientific Research Collaborations with Rhetoric and Communication Scholars. ONLINE EVENT. Lauren Cagle, University of Kentucky, Lauren.cagle@uky.edu.

Designing Instructional Access and Inclusion across Geoscience Learning Environments. *Endorsed by International Association for Geoscience Diversity (IAGD); GSA Geoscience Education Division.* Christopher Atchison, University of Cincinnati, christopher.atchison@uc.edu; Anita Marshall, University of Florida, anita.marshall@ufl.edu; Sean Thatcher, Rutgers University, sean.thatcher1990@gmail.com; Ian Castro, University of Cincinnati, castroio@ucmail.uc.edu; Ivan Carabajal, University of Cincinnati, carabaig@mail.uc.edu.

Fluvial Terraces: From Modeling to the Field. *Endorsed by Kentucky Geological Survey.* Yichuan Zhu, Kentucky Geological Survey, yichuan.zhu@uky.edu; Matt Massey, Kentucky Geological Survey, matthew.massey@uky.edu; Jason Dortch, Kentucky Geological Survey, Jason.M.Dortch@uky.edu.

Methods of Metal Pollution Investigation. Mark P.S. Krekeler, Miami University, krekelmp@miamioh.edu; Matthew Dietrich,

Indiana University–Purdue University Indianapolis, dietrimj17@gmail.com; Kenneth Brown, DePauw University, kennethbrown@depauw.edu.

Professional Registration and Preparation Tips for National Professional Geologist (PG) Exams. William Andrews, Kentucky Geological Survey, wandrews@uky.edu.

Résumé and Cover Letter Clinic: A Workshop for GSA On To the Future Students. Stephen K. Boss, University of Arkansas, sboss@uark.edu; Katherine Ellins, University of Texas at Austin, kellins@jsg.utexas.edu.

REGISTRATION

Registration opens in Jan. 2022
Early registration deadline: 28 Feb.
Cancellation deadline: 7 Mar.

For further information or if you need special accommodations, please contact one of the general co-chairs, Craig Dietsch, dietscc@ucmail.uc.edu; Rebecca Freeman, rebecca.freeman@uky.edu.

ACCOMMODATIONS

Hotel registration deadline: 15 Mar.

Blocks of rooms have been reserved at the Hilton Cincinnati Netherland Plaza (35 West 5th Street, one block from the Duke Energy Convention Center) and the Hyatt Regency Cincinnati (151 West 5th Street, across the street from the convention center).

For the Hilton, the meeting rates are US$154 per night for single and double rooms, US$164 for triple occupancy, and US$174 for quadruple occupancy, all plus tax. Reservations can be made by telephone, either by calling the hotel directly at +1-513-421-9100 or by calling 1-800-HILTONS (use group code GSA).

For the Hyatt, the meeting rates are US$165 per night for single and double rooms, US$175 for triple occupancy, and US$185 for quadruple occupancy, all plus tax. Reservations can be made by calling the hotel directly at +1-513-579-1234 (group code G-DGSA) or online at https://www.hyatt.com/en-US/group-booking/CINCI/G-DGSA.

In either case, please be sure to let them know that you are attending the GSA Joint North-Central–Southeastern Section Meeting.

GSA STUDENT MENTOR PROGRAMS AND CAREER WORKSHOPS

Career Mentoring Luncheons

Ask your career-related questions and learn about non-academic pathways in the geosciences while networking with professionals at the Roy J. Shlemon and John Mann Mentor luncheons. GSA student members are welcome. Learn more about these programs at **https://www.geosociety.org/mentors.**

Career Workshop Series

This three-part series will feature career development planning, an exploration of geoscience job sectors, and information on best practices for crafting a résumé and cover letter. Non-technical skills and workforce statistics will be reviewed. The series will be led by workshop presenters and geoscientists. No registration is required, and everyone is welcome.

Learn more at **https://www.geosociety.org/mentors.**
Questions? Contact Jennifer Nocerino at jnocerino@geosociety.org.

STUDENT VOLUNTEERS

Take advantage of work opportunities to earn free registration. Students interested in helping with the various aspects of the meeting should contact student volunteer coordinator Maija Sipola, sipolame@miamioh.edu.

CORPORATE SPONSORSHIPS

We are expecting public and private government, non-profit, and industry representatives to be present at the meeting to mentor students and early career professionals. If you know of any possibilities for involving sponsors in GSA's mentor programs, please contact Debbie Marcinkowski, dmarcinkowski@geosociety.org; Jennifer Nocerino, jnocerino@geosociety.org; and/or the meeting co-chairs and sponsorship chair listed below.

LOCAL COMMITTEE

General Co-Chairs: Craig Dietsch, dietscc@ucmail.uc.edu; Rebecca Freeman, Rebecca.freeman@uky.edu
Technical Program Co-Chairs: Dan Sturmer, sturmedm@ucmail.uc.edu; Alan Fryar, alan.fryar@uky.edu
Associated Society Events Coordinator: Gwen Daley, daleyg@winthrop.edu
Exhibits Chair: Cole Edwards, edwardsct4@appstate.edu
Field Trip Co-Chairs: Steve Greb, greb@uky.edu; Clair McLeod, mcleodcl@miamioh.edu
Posters Chair: Kent Ratajeski, kent.ratajeski@uky.edu
Public Engagement Committee: Meg Corcoran, corcormc@mail.uc.edu; Andrea Corpolongo, corpolaa@mail.uc.edu; Zeke King Phillips, kingphej@mail.uc.edu; Emily Simpson, simpsoey@mail.uc.edu
Short Course Chair: Jason Dortch, jason.m.dortch@uky.edu
Sponsorship Chair: David P. Moecher, moker@uky.edu
Student Volunteers: Maija Sipola, sipolame@miamioh.edu

THE GEOLOGICAL SOCIETY OF AMERICA®

2022 GSA SECTION MEETINGS

SOUTH-CENTRAL SECTION

14–15 March
McAllen, Texas, USA
Meeting chairs: Juan González, juan.l.gonzalez@utrgv.edu; Chu-Lin Cheng, chulin.cheng@utrgv.edu
https://www.geosociety.org/sc-mtg

A resistant layer of the Roma sandstone is exposed crossing the Rio Grande. Photo by Juan González.

JOINT CORDILLERAN–ROCKY MOUNTAIN SECTION

15–17 March
Las Vegas, Nevada, USA
Meeting chairs: Michael Wells, michael.wells@unlv.edu; Alexis Ault, alexis.ault@usu.edu
https://www.geosociety.org/cd-mtg

Red Rock Canyon, Nevada.
Photo by Daniel Halseth on Unsplash.

NORTHEASTERN SECTION

20–22 March
Lancaster, Pennsylvania, USA
Meeting chairs: Andy deWet, adewet@fandm.edu; Chris Williams, cwillia2@fandm.edu
https://www.geosociety.org/ne-mtg

Susquehanna River, southern Lancaster County.
Photo by Emily Wilson.

JOINT NORTH-CENTRAL–SOUTHEASTERN SECTION

7–8 April
Cincinnati, Ohio, USA
Meeting chairs: Craig Dietsch, dietscc@ucmail.uc.edu; Rebecca Freeman, rebecca.freeman@uky.edu
https://www.geosociety.org/nc-mtg

Cincinnati skyline at night.
Photo by Jake Blucker on Unsplash.

ROCK STARS

Lou Henry Hoover (1874–1944): An Independent Woman of Action

Joanne Bourgeois, *University of Washington; Michele Aldrich*; Léo F. Laporte, University of California Santa Cruz*

Lou Henry on a family trip to camp. Acton, California, USA, 22 Aug. 1891. Lou really walked all the way; she sat on one of the park burros for fun and was photographed. Courtesy Herbert Hoover Presidential Library, photo 31-1891-05.

When Lou Henry was born to Florence Ida Weed and Charles Delano Henry in Waterloo, Iowa, USA, on 29 March 1874, her father named her "Lou" for the boy he was hoping she'd be. Another girl, Jean, was born in 1882. Their father worked at several positions before moving the family to southern California in 1885, partly for his wife's health, and also where he finally succeeded as a banker; they subsequently settled in Monterey, California, USA, in 1892. Charles, an avid outdoorsman, took Lou fishing and hunting, hiking and camping, ice skating and horseback riding, rock collecting and mineral prospecting. She savored these times.

Lou was tall for her generation (5'8"), and her love of physical activity and the outdoors was an enthusiasm she retained all her life and went on to share with others, particularly via the Girl Scouts and the National Amateur Athletic Federation (predecessor to the NCAA). "The happiest part of my own very happy childhood and girlhood was without doubt the hours and days, sometimes entire months, which I spent pseudo-pioneering or scouting in our wonderful western mountains with my father in our vacation times. So I cannot but want every girl to have the same widening, simplifying, joy-getting influences in her own life" (LHH Speech, Hoover Library, quoted in NAblog).

Lou Henry's postsecondary education began in 1890 at a "normal school"—designed for training high-school graduates to become teachers. She started at Los Angeles Normal (now UCLA) and completed her degree in 1893 at San Jose Normal (now San José State). She originally chose the Los Angeles school, in part, for its emphasis on physical activity, even for women students, and because the institution had what she said was the best gymnasium west of the Mississippi. She also joined a school club where members gathered and displayed samples of the natural world.

GEOLOGY AT STANFORD

Lou was not sure what profession she could pursue, as possibilities were limited for a woman at that time; her early experiences with substitute teaching and bank clerking were not satisfying. While holding temporary jobs, she attended public lectures by John Casper Branner, the recently appointed chairman of the geology department at the new Stanford University (opened 1891). Branner's lecture, "The Bones of the Earth," inspired her, and with his encouragement, she entered Stanford in 1894 as its first woman undergraduate geology major. She was joined at Stanford a year later by her sister Jean.

It was in Branner's laboratory that Lou Henry met her future husband (and later President of the United States), Herbert C. (Bert) Hoover, who described himself as Branner's "handy boy." Bert recalled, "I felt it my duty to aid the young lady in her studies both in the laboratory and in the field. And this call to duty was stimulated by her whimsical mind, her blue eyes, and a broad grinnish smile…" (H. Hoover, 1951). There is little detail about exactly what Lou studied in her geology major, but courses in the curriculum included dynamic and structural geology, economic geology and assaying, topographic geology, mineralogy and petrology, historical geology, and paleontology.

Professor Branner and other faculty encouraged students to work on summer geology field surveys throughout the west, and soon field camp became a popular part of the curriculum, but for men only (until 1964). "So while the boys headed off [for the summer] with their maps and hammers, Lou Henry, '98, the first Stanford woman to graduate in geology, had to stay behind on campus, cataloging rock

Lou Henry in a chemistry lab at Stanford University, 1895. Courtesy Herbert Hoover Presidential Library, photo 31-1895-10.

*Michele Aldrich passed away in November 2016 after a brief illness. This article includes material from her unpublished studies of Lou Henry's time at Stanford and her work on *De re Metallica*, with access to Michele's papers and permission to use those materials by Mark Aldrich.

specimens" (https://stanfordmag.org/contents/stanford-history-a-snapshot). However, on a class field trip she quickly convinced her classmates that she was more at home in the wilds than many of them when she vaulted over a fence as they discussed how to help her.

While J.C. Branner encouraged Lou Henry to pursue a career in geology, she was disappointed that he did not offer her an assistantship, and whereas he envisioned her working in the classroom and lab, she wanted to do research and observation in the field. Branner encouraged her to pursue graduate work leading to teaching, but prospects were not encouraging. Meanwhile she was corresponding with Bert, who had graduated and was working in Australia as a mining engineer.

WORK WITH MINING ENGINEER HERBERT HOOVER

In late 1898 from Australia, with a job offer in hand to advise China in mining and development, Bert Hoover wired Lou a proposal along the lines of "Going to China via San Francisco. Will you go with me?" They were married on 10 February 1899 and left for China the next day, but their work in China was cut short by the Boxer Rebellion in 1900. In the following years, Lou and Bert Hoover would travel around the world following Bert's profession, a lifestyle that Lou relished. They would see Australia, New Zealand, Burma, Ceylon, India, Egypt, Russia, and most of western Europe. Theirs was to be a full partnership.

In 1907, they settled in London. Visiting the British Museum, Lou saw a copy of Gregorius Agricola's 1556 treatise on mining, *De Re Metallica*, which she had originally seen in Branner's lab. Finding no suitable translation, and because Lou was proficient in Latin, the geologic couple decided to provide one—she'd do the translation of what had been termed an "untranslatable" text, he the explanation and interpretation of the mining procedures and equipment described therein. Agricola had in fact invented many of the terms, as they did not exist in Latin, which led the couple to develop a library of earlier mining treatises in order to understand Agricola's own knowledge. In Lou's part of their acceptance speech for the 1914 Gold Medal from the Mining and Metallurgical Society of America, she spoke of learning to persevere in "unraveling this great tangle of knotted string."

Lou also helped her husband in the preparation and copyediting of the text *Principles of Mining: Valuation, Organization and Administration: Copper, Gold, Lead, Silver, Tin and Zinc* (H. Hoover, 1909). She influenced him to include in the book a chapter on character building and ethical principles for young engineers.

In 1911, while traveling England, Lou Henry Hoover had the opportunity to meet pioneering seismologist John Milne, who was living on the Isle of Wight. Recognizing the importance of his work, she interviewed him and wrote an article describing his time in Japan and his fundamental efforts in seismometry and earthquake monitoring. That same year, J.C. Branner nominated Lou Henry Hoover for membership in the Seismological Society of America (incorporated 1910); she was quickly elected and remained a member until her death. Her 1912 paper on John Milne was among the first published by the society.

INFLUENCE ON GIRL SCOUTING AND WOMEN'S SPORTS

Beginning in 1917, Lou became involved in the Girl Scouts of America. She first accepted an invitation to address the fledgling organization on the importance of food conservation during the war. Soon after, founder Juliette Gordon Low invited her to become acting Girl Scout commissioner for the District of Columbia. A few years later, Lou agreed to become a leader of Troop VIII, but only after reading various materials put out by the Girl Scouts. "I myself made a very careful study of the programs of … organizations dealing with recreational and educational activities of high school-aged young people … and I found … there was just no comparison possible between the Girl Scouts and any other organization of its class" (quoted in Christian, 1994).

Lou Hoover (standing) led lessons on wartime vegetable gardening, here with some Girl Scouts, circa 1918. Courtesy Herbert Hoover Presidential Library, photo 31-1918-19.

A former member of her troop VIII recalled, "Mrs. Hoover was the ideal leader for this group. We were fired with her enthusiasm … she was generally interested in all of us …. She taught me about birds to pass my bird finder badge at the National Museum, encouraged me to know more about trees …, and when I was working on my nature badges, took me all through her house, and made me tell the source, method of processing, and reason for using practically every metal or stone in her home—and she knew her geology." Lou Hoover helped write the "rock finder" badge, her favorite, yet "she was always surprised how many girls preferred homemaking badges to outdoor ones" (quotes from Christian, 1994).

No doubt inspired by Lou, her younger sister Jean Henry Large wrote three books (the "Nancy series") about Girl Scouting: *Nancy Goes Girl Scouting* (1927), *Nancy's Lone Girl Scouts* (1930), and *Nancy Goes Camping* (1931). "Lone Girl Scouts" was a program Lou Hoover helped pioneer to serve girls living in outlying, underpopulated places, so individuals could join and participate in scouting without having to belong to a troop. Lou also worked to generate private support so that Scout dues alone would not be the sole support of the organization.

In the 1920s, with the rapid expansion of newspaper and radio reportage of amateur and professional sports, the National Amateur Athletic Federation was founded. In 1923, Lou Hoover, a strong advocate of physical fitness for girls and women, was named vice president, with the task of creating a women's division, and thereafter served as president of that division for the next 18 years. In this role, she addressed philosophic differences over competition versus participation, issues of facilities and space for women, and the persistent lack of qualified women's coaches.

A ROCK STAR?

Although not a GSA "Rock Star" in the traditional sense, Lou Henry Hoover for her time made significant use of her pioneering geologic education, most notably in her work with mining engineer Herbert Hoover. This background also influenced the nature of her support for girls' and women's development. Lou Hoover also has a remarkable history of war relief, social welfare, civil rights, and other forms of leadership and service, including as First Lady of the United States of America.

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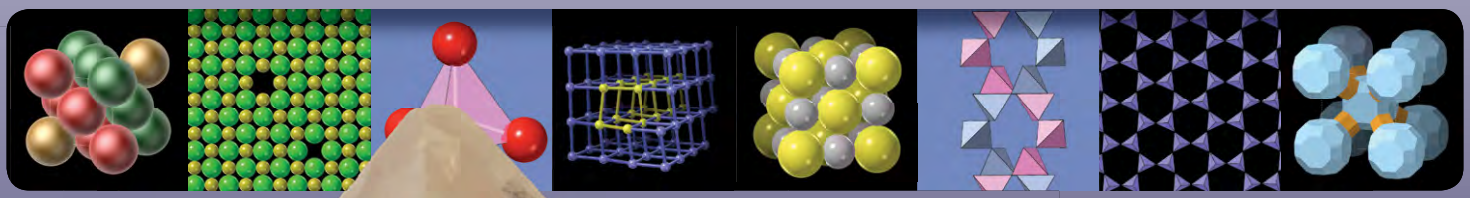

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GSA Undergraduate Student Research Funding Survey Results

GSA Student Advisory Council: **Yueyi Che,** Chair-Elect; **Rebecca Taormina,** Chair; **Alexandra Nagurney,** Past-Chair

Research is an important aspect of an undergraduate geoscience degree (i.e., Hunter et al., 2006; Laursen et al., 2010; Lopatto, 2009). Like any research, undergraduate research requires a financial commitment to conduct the work. While most professional geoscience societies (i.e., the Geological Society of America, the Mineralogical Society of America, the Society of Economic Geologists, and Sigma Xi) have both undergraduate and graduate research grants, the research grant budget is catered to graduate students. For example, in 2020, the GSA Graduate Research Grant Program funded 360 graduate students at an average award of US$1,820. Undergraduate research grants are implemented through GSA's Sections with South-Central, North-Central, Southeastern, Northeastern, and Rocky Mountain Sections providing undergraduate research awards ranging from US$500–US$1500.

To help understand the financial needs for undergraduate research, the GSA Student Advisory Council initiated an Undergraduate Student Research Funding Survey in January 2021. We collected 70 survey responses, which is 1% of the GSA student members. For the demographic of the surveyed students, please check out our slide at https://bit.ly/3AhVaDY.

RESULTS SUMMARY

1. 45.7% of the students needed less than US$1000 to complete their research, 85.7% could complete their research for under US$5000, while 7.1% needed >US$10,000 for their research.
2. Students expressed needs for different aspects of research, including stipends for time worked (35.7%), sample processing at labs (30%), fieldwork (20%), and conference registration and travel (12.9%).
3. Almost half (48.6%) of undergraduate student research is fully funded. However, 21.4% of student research has no funding at all.
4. University/department programs (60%) and outside scholarships and grants (38.6%) are the two most popular funding sources for undergraduate students. Individual donor/professor's grants (28.6%), self (22.9%), and family members (7.1%) are also funding sources for undergraduate research.
5. Challenges for students to find research grants include finding grants specifically for undergraduate students (44.3%), not being aware of research grant platforms or resources (42.9%), not being able to find grants for their research interest (32.9%), the award amount is too small to cover the budget (22.9%), and grants are too competitive (22.9%). Being an international student (11.4%), as well as one's gender and/or ethnicity (4.3%), can restrict one's access to opportunities.
6. Despite all the challenges undergraduate students face, 62.9% of the students expressed that funding was not an issue, 22.9% of the students found less expensive alternatives but still fulfilled the same research interest, 10% of them had to completely change their research direction but still got research experience, and 4.3% of the students had to give up their research due to financial reasons.

Our survey collected a lot of comments from the students. The comments have four common themes:

1. Student identity. Transfer students "have no idea who to even speak to about this (applying for grants)" and international students wish that the grants were "given regardless of citizenship." Students also find that "there are so few Section research grants available for undergraduates."
2. Mentorship and support system at university. Students say that "without that amazing program [at my university] I never would've gotten the chance to do real, independent research." On the contrary, without sufficient support from the university, students are "struggling to pull in funding to continue the work."
3. Mentorship dynamics. When some students' mentors completely "handled most of the money," the students "know little to nothing (about budgeting) [and] feel as though outside of the school setting they won't be able to find a research job outside of college."

We hope these students' voices can be heard by the universities, their departments, and professional organizations, including various leaderships within GSA. For example, we encourage undergraduates to apply to the Sections' undergraduate research grants, and we encourage GSA Sections to consider expanding their research grant programs (in terms of dollar value of grants and number of recipients). We can invest in the future of undergraduate students by investing in undergraduate research.

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(Potential)

Support by the Numbers

Of GSA members

6,128

30.5%

donate to GSAF to support programs that benefit 20,075 members and beyond

If every member gave simply

the price of a coffee from a cafe, it would fund the cost of our Science Policy Fellow

or it could provide...

50 On To the Future grants to serve those from groups under-represented in the geosciences

If the members who have yet to contribute gave just $5 each, 35 GSA student members could receive scholarships toward a field camp of their choice—a hallmark of many geoscientists' training

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to help provide assistance to

836

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https://gsa-foundation.org

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(https://www.geosociety.org/jobs) for up-to-the-minute job postings. Job Board ads may also appear in a corresponding monthly print issue of *GSA Today*. Send inquires to advertising@geosociety.org, or call +1-800-427-1988 ext. 1053 or +1-303-357-1053.

POSITIONS OPEN

Lecturer in Applied Geochemistry, Department of Geosciences, Auburn University

The Department of Geosciences at Auburn University invites applications for a 9-month nontenure track faculty Lecturer in Applied Geochemistry beginning January 1, 2022. The position is a one-year appointment subject to annual review based on performance, need for services and available funding.

Applicants must have a Ph.D. in Geosciences or related field at the time appointment begins with demonstrable teaching experience. The teaching load will be three courses each semester. These courses may include, but are not limited to: Introduction to Geochemistry, Environmental Geology, as well as other undergraduate courses (e.g., Dynamic Earth) or graduate-level courses as determined by candidate's expertise, experience and department needs. Required qualifications include excellent written and interpersonal communication skills. The ability to incorporate quantitative, analytical, and/or field-based geochemical tools into both undergraduate and graduate courses will be an asset. The candidate selected for the position must meet eligibility requirements to work in the United States at the time the appointment begins and be able to continue working legally for the proposed term of employment.

Applicants should submit: (1) a curriculum vitae, (2) a letter of application (1–2 pages) describing teaching philosophy and experience, (3) a statement of inclusion (click here for more information), and (4) the names and contact information of three professional references. In the statement of inclusion, describe how your experience and/or potential contributions in teaching and service will advance the College of Sciences and Mathematics' mission of creating a more diverse, equitable and inclusive workplace. To apply please go to https://www.auemployment.com/postings/24637, complete the online form and upload the required application documents.

Applicants are encouraged to visit the AU website to learn more about Auburn University and the Department of Geosciences (http://www.auburn.edu/cosam/departments/geosciences/).

Review of applications will begin October 15, 2021, and will continue until a candidate accepts appointment.

Auburn University is an EEO/VET/Disability Employer and committed to building an inclusive and diverse community.

Tenure-Track Assistant Professor, Hydrological and/or Climate Sciences University of Illinois at Chicago

The Department of Earth and Environmental Sciences in the College of Liberal Arts and Sciences at the University of Illinois at Chicago (UIC) invites applications for a tenure-track Assistant Professor who pursues fundamental research in the hydrological and/or climate sciences. The applicant's research must be relevant to Earth systems at a global scale, and may also address linkages to regional processes including, but not limited to, those involving the Great Lakes, urban environments, surface waters, and landscape evolution. The successful candidate is expected to establish an innovative and productive program of scientific research, using more than one approach (e.g., observational, modeling, experimental), that complements department strengths in climate science and biogeochemistry. The candidate will be expected to teach undergraduate courses in core topics in the earth sciences and graduate courses in their area of specialty, advise graduate students (M.S. and Ph.D.), and mentor undergraduate students in research projects. Applicants must have a Ph.D. in Earth Sciences or a related field, and a record of research accomplishments; postdoctoral experience is preferred.

The Department (https://eaes.uic.edu/) has extensive laboratory and computing facilities, hosts a diverse and growing undergraduate and graduate student body, and has expanding collaborations with other campus units including chemistry, health sciences, and biological sciences. UIC is one of the most ethnically and culturally diverse universities in the country and the Department is committed to closing the diversity gap in the earth sciences by fully supporting underrepresented students, faculty, and staff. UIC is a public R1 institution and the largest institution of higher education in the Chicago area with over 33,000 undergraduate, graduate, and professional students. To apply, please complete the online application providing contact information and three professional references at https://jobs.uic.edu (click on the Job Board and then on the position link) and upload a cover letter, curriculum vitae, and separate statements of research plans, teaching plans, and perspectives on and commitment to diversity, equity, and inclusion in the geosciences. For fullest consideration, please apply by October 25, 2021. Final authorization of the position is subject to availability of funding.

The University of Illinois at Chicago is an affirmative action, equal opportunity employer that has a strong institutional commitment to the principle of diversity and is particularly interested in receiving applications from a broad spectrum of people. We do not discriminate on the basis of sex, gender identity, sexual orientation, race, color, religion, national origin, disability, protected Veteran status, age, or any other characteristic protected by law.

Offers of employment by the University of Illinois may be subject to approval by the University's Board of Trustees and are made contingent upon the candidate's successful completion of any criminal background checks and other pre-employment assessments that may be required for the position being offered. Additional information regarding such pre-employment checks and assessments may be provided as applicable during the hiring process. The University of Illinois System requires candidates selected for hire to disclose any documented finding of sexual misconduct or sexual harassment and to authorize inquiries to current and former employers regarding findings of sexual misconduct or sexual harassment. For more information, visit https://www.hr.uillinois.edu/cms/One.aspx?portalId=4292&pageId=1411899

Assistant Professor of Earth & Environmental Sciences, Structural Geology/Active Tectonics/Natural and Environmental Hazards, Denison University

Denison University invites applications for a tenure track position in the Department of Earth & Environmental Sciences, to begin in August 2022. We seek a broadly trained scientist engaged in the study of Structural Geology, Active Tectonics, and Natural & Environmental Hazards. Successful candidates are expected to be outstanding teacher-scholars and contribute to the continued growth of the Department and College. Candidates are required to have by start date a Ph.D. in Earth & Environmental Sciences or an allied discipline.

We require a colleague who is committed to teaching excellence in the liberal arts tradition, is field- based, has broad interests beyond their individual specialty, and will provide a balance of classroom, field, and laboratory experiences for our students. Candidates must have the desire and ability to teach courses at all levels of the curriculum, including Structural Geology. Successful candidates are expected to maintain a vibrant, ongoing research program that actively incorporates undergraduate students. In addition, we seek a colleague dedicated to developing and supporting diversity and inclusion in the earth and environmental sciences.

Denison University is an academically rigorous liberal arts college with an increasingly diverse campus community. It offers a competitive salary and a comprehensive benefits package. Denison is located in the village of Granville, 30 minutes from Columbus, Ohio, the state capital, which hosts a wide range of cultural and artistic opportunities. Granville also offers an excellent public school system and easy access to outdoor activities.

All application materials will be handled electronically at employment.denison.edu. Applications must include a cover letter, curriculum vitae, academic transcripts of undergraduate and graduate courses (unofficial acceptable), teaching statement, and research statement. In addition, please include the contact information for three persons who know your work well, who will then be requested to upload reference letters. Completed application materials submitted by October 4, 2021,

will receive full consideration, and evaluation will continue until the position is filled. Although not a requirement for consideration, we plan to meet with selected candidates at the Geological Society of America Annual Meeting in Portland, Oregon. Please contact Dr. David Goodwin, EESC Chair, with any questions (goodwind@denison.edu).

To achieve our mission as a liberal arts college, we continually strive to attract and hire candidates with diverse backgrounds, experiences, and identities. Denison fosters a campus community that recognizes the value of all persons regardless of age, disability, ethnicity, gender expression and identity, national origin, race, religion, sexual orientation, or socio-economic background. For additional information and resources about diversity at Denison, please see our Diversity Guide (https://denison.edu/forms/diversity-guide). Denison University is an Equal Employment Opportunity Employer.

Assistant Professor of Geology at West Texas A&M University, Canyon, Texas

West Texas A&M University, a Member of The Texas A&M University System located in Canyon, Texas, invites applications for a tenure-track Assistant Professor position in Geology to begin in August 2022. This full-time (9-month) position at West Texas A&M University will include responsibilities in teaching (60%), research (35%), and service supportive of the Department of Life, Earth, and Environmental Sciences (5%).

Candidates with expertise in sedimentary geology, basin analysis, hydrogeology, paleontology, and/or petroleum/economic geology are encouraged to apply, but other areas may be considered. Teaching duties constitute a 9 Adjusted Contact Hour (ACH) per semester workload, including (but not limited to) courses in Physical Geology, Historical Geology, Sedimentology and Stratigraphy, Paleontology, and Hydrogeology. We welcome candidates who are also excited to develop new courses within their relevant area(s) of expertise at the undergraduate and graduate levels.

The Department of Life Earth and Environmental Sciences is committed to fostering diverse and inclusive learning environments. Candidates who share our commitment to promoting diversity, equity, and inclusion through excellence in teaching, research, and service are encouraged to apply.

The successful candidate will be expected to conduct externally funded research with an emphasis on undergraduate research experiences, communicate their scholarship by publishing in impactful peer-reviewed journals and presenting at professional conferences, provide academic advisement to undergraduate and graduate students, and engage in effective community outreach.

Salary and benefits are competitive and commensurate with qualifications and experience.

Interested candidates may apply at jobs.wtamu.edu. Apply by October 15, 2021 to guarantee full consideration.

For the complete job posting, please visit: https://tamus.wd1.myworkdayjobs.com/en-US/WTAMU_External/job/Canyon-WTAMU/Assistant-Professor-of-Geology_R-037378.

Assistant Professor (Tenure Track) of Geological Science, California State University Long Beach

The Department of Geological Sciences, California State University Long Beach (CSULB) invites applications for a tenure-track Assistant Professor in Geophysics or in any other Geoscience discipline that substantially employs geophysical methods in research to start Fall 2022. A qualified candidate should be dedicated to teaching at the undergraduate and master's level and committed to developing an externally funded research program that will involve students. As part of a campus that serves a very diverse community, the Department of Geological Sciences seeks candidates who, through previous experience supporting diverse students or their own lived experience, will be committed to the successful teaching and mentoring of all students.

Southern California abounds with world-class geologic exposures for teaching and research in the mountains, deserts, coast and ocean - most within a few-hour drive. CSULB is also located in the vibrant Los Angeles-Long Beach-Orange County metropolitan area, rich with universities and colleges, government agencies and local industry that provide many opportunities for collaboration.

Please follow this link for a detailed position description, list of required and preferred qualifications, and explanation of the application procedure. Review of applications will begin October 18, 2021. https://careers.pageuppeople.com/873/lb/en-us/job/501173/assistant-professor-of-geological-sciences-geoscience

FELLOWSHIP OPPORTUNITY

Application Open for 2021–2022 Distinguished Postdoctoral Fellows, Jackson School of Geosciences at The University of Texas at Austin

The Jackson School of Geosciences at The University of Texas at Austin is seeking applicants for its 2021–2022 school-wide Distinguished Postdoctoral Fellows Program. We seek to hire creative and enterprising postdoctoral scholars who will conduct independent research on topics that advance our understanding of Earth as a system while engaging with researchers and faculty across the Jackson School. We welcome applicants with research interests across geosciences disciplines, but we are particularly interested in applicants who want to work at the interfaces between disciplines.

Topics of collaborative study could include, but are not limited to:

- Polar-to-equatorial coastal processes and sea-level change;
- Energy systems, including transitional sources, alternative energy, and infrastructure (e.g., geothermal systems, gas hydrates, hydrogen energy, carbon capture and storage, energy and environmental economics);
- Subduction zone geodynamics;
- Climate change and water-energy security;
- Computational fluid- and solid-Earth geophysics, including machine learning;
- Natural hazard modeling and monitoring;
- Planetary evolution and habitability.

The Geological Society of America Seeks to Hire a Diversity, Equity, and Inclusion Associate Director

About Us

The Geological Society of America (GSA) (https://www.geosociety.org) unites a diverse community of geoscientists in a common purpose to study the mysteries of our planet (and beyond) and share scientific findings. Members and friends around the world, from academia, government, and industry, participate in GSA meetings, publications, and programs at all career levels, to foster professional excellence. GSA values and supports inclusion through cooperative research, public dialogue on earth issues, science education, and the application of geoscience in the service of humankind.

GSA is an Equal Opportunity Employer, and GSA is committed to creating and maintaining a workplace in which all employees have an opportunity to participate and contribute to the success of the business organization and are valued for their skills, experience, and unique perspectives. This commitment is embodied in our organizational policies and the way we do business at GSA, and is an important principle of sound business management. Please see GSA's Commitment to Diversity at https://www.geosociety.org/GSA/about/Diversity/GSA/About/Diversity.aspx.

Position Summary

The Diversity, Equity, and Inclusion Associate Director will coordinate across the GSA mission, strategic plan, Justice, Equity, Diversity, and Inclusion (JEDI) initiatives, programs, and centers of excellence to leading GSA to become an inclusive and equitable organization that engages diverse students, professional and academic geoscientists, and the communities they serve, and creates an environment in which all can thrive. They will lead the development, management, analysis, and operation of GSA's work to embed JEDI in all aspects of GSA's operations, outreach, education, and actions. They will hold equity and justice for all geoscientists at the forefront of their work at GSA. The Diversity and Inclusion Associate Director is responsible for developing the implementation strategies regarding the recommendations of the GSA Diversity Working Group and the GSA Decadal Strategic Plan. The Diversity and Inclusion Associate Director will work with the GSA URGE (Unlearning Racism in the Geosciences) pod and coordinate with the GSA HR Manager in assisting with GSA staff integration of JEDI into the GSA workforce and workplace. The Associate Director reports directly to the GSA Executive Director.

The position is full time with benefits. GSA headquarters is located in Boulder, Colorado. For the right candidate, business may be conducted remotely with some time required on site or at meetings.

Key Knowledge, Skills, and Abilities

- Understanding of DEI issues in the sciences and experience with developing DEI programs.
- Minimum of a bachelor's degree or equivalent in an earth-science discipline or science education. Geoscience is preferred.
- Proven excellent oral & written communication skills to a wide range of audiences.
- Demonstrated project management skills.
- Grant-writing experience.
- Demonstrated ability to inspire and influence others.
- Working knowledge of Microsoft Office Suite and the ability to learn iMIS (association management system).
- Ability to use Google Workspace Suite.
- Ability to maintain program web pages.

Other Requirements

- Travel required, including GSA annual and section meetings as well as to represent GSA DEI initiatives and programs at relevant venues.
- Extensive computer work—six or more hours per day; multiple projects and multiple deadlines that create a demanding work environment are standard, may need the ability to carry luggage and equipment.
- Must be fully vaccinated from COVID. Note: Medical or religious exemption may be considered.

Contact HR@geosociety.org for further information.

Salary range is US$60,000 to US$97,000 based on experience. Benefits include 403(b) and PTO. Submit cover letter, résumé, and three professional references. The cover letter must detail why the applicant is a perfect fit for this position; include examples of not-for-profit experience if applicable. Please submit your application to HR@geosociety.org.

The appointment is for two years with a salary of $60,000 per year, plus health care and other benefits. Research support of $10,000 per year is also provided. The start date is flexible and can be as early as February 1, 2022. Applicants must complete a Ph.D. before starting, but be no more than three years past their doctoral degree date.

An application package should include:

- a document outlining past achievements and general research interests (one page);
- a brief research proposal, including a short section describing how the research may leverage and magnify research being conducted at the Jackson School, ideally with more than one research group at the Jackson School (one page);
- a current CV that includes education and employment history, publications, and awards;
- a list of names and contact information for three potential references.

The application deadline for this round of funding is November 7, 2021. Applicants should send applications electronically (in PDF form) as an email attachment to PostDocJSG@jsg.utexas.edu.

Applicants are welcome to reach out to research groups across the Jackson School to discuss potential areas of research interest. Please note that the Jackson School has many postdoctoral fellows in addition to the Distinguished Postdoctoral Fellows. To apply for other postdoctoral opportunities, applicants are encouraged to make direct contact with Jackson School scientists they are interested in working with.

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The project aims at the development of general understanding of the properties of phosphate minerals, their structures, and their stability in aqueous and hydrothermal systems. The main focus of the project is evaluating the ability of phosphate minerals to incorporate iodine and uranium in their structures. The successful candidate is expected to conduct experiments on apatite crystallization from uranium and iodine bearing fluids; conduct geochemical and microscopy analyses on experimental products; perform thermodynamic calculations; prepare publications.

The candidate needs to have a MS (or international analog of MS) degree in broad discipline of geology, chemistry, or physics. Preference will be given to a person who has experience in the fields of crystal growth and/or aqueous chemistry as well as in electron microscopy, mass spectrometry, and/or spectroscopy techniques.

Interested applicants should contact Prof. Rinat Gabitov at rinat.gabitov@gmail.com

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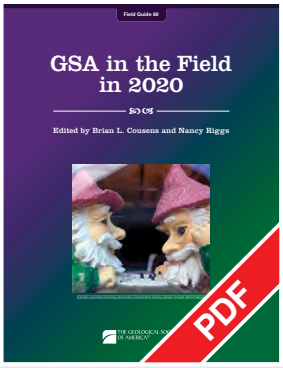

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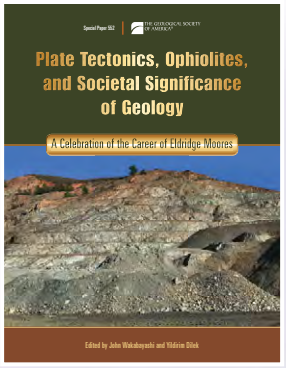

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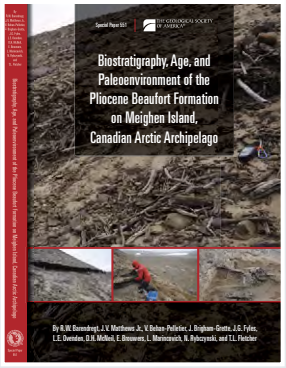

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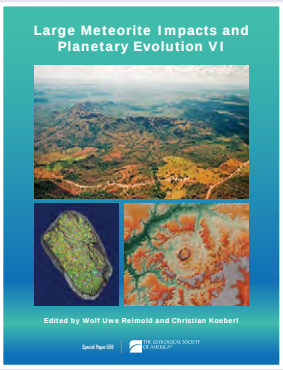

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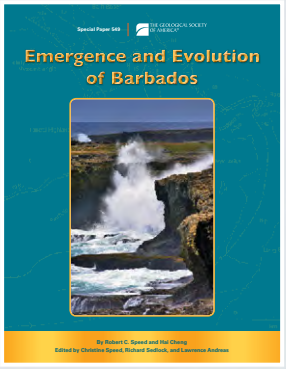

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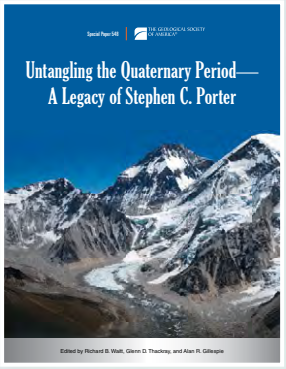

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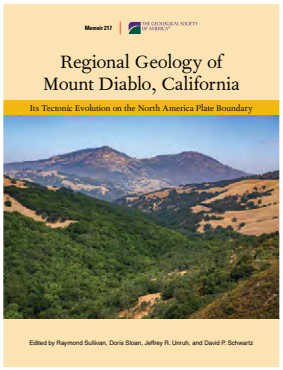

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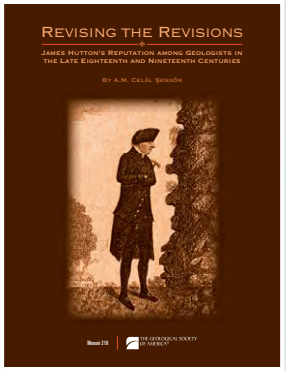

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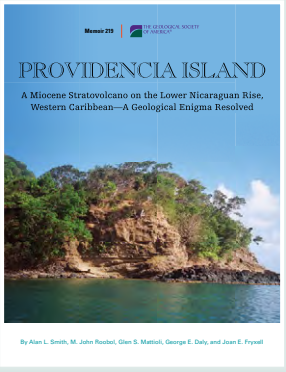

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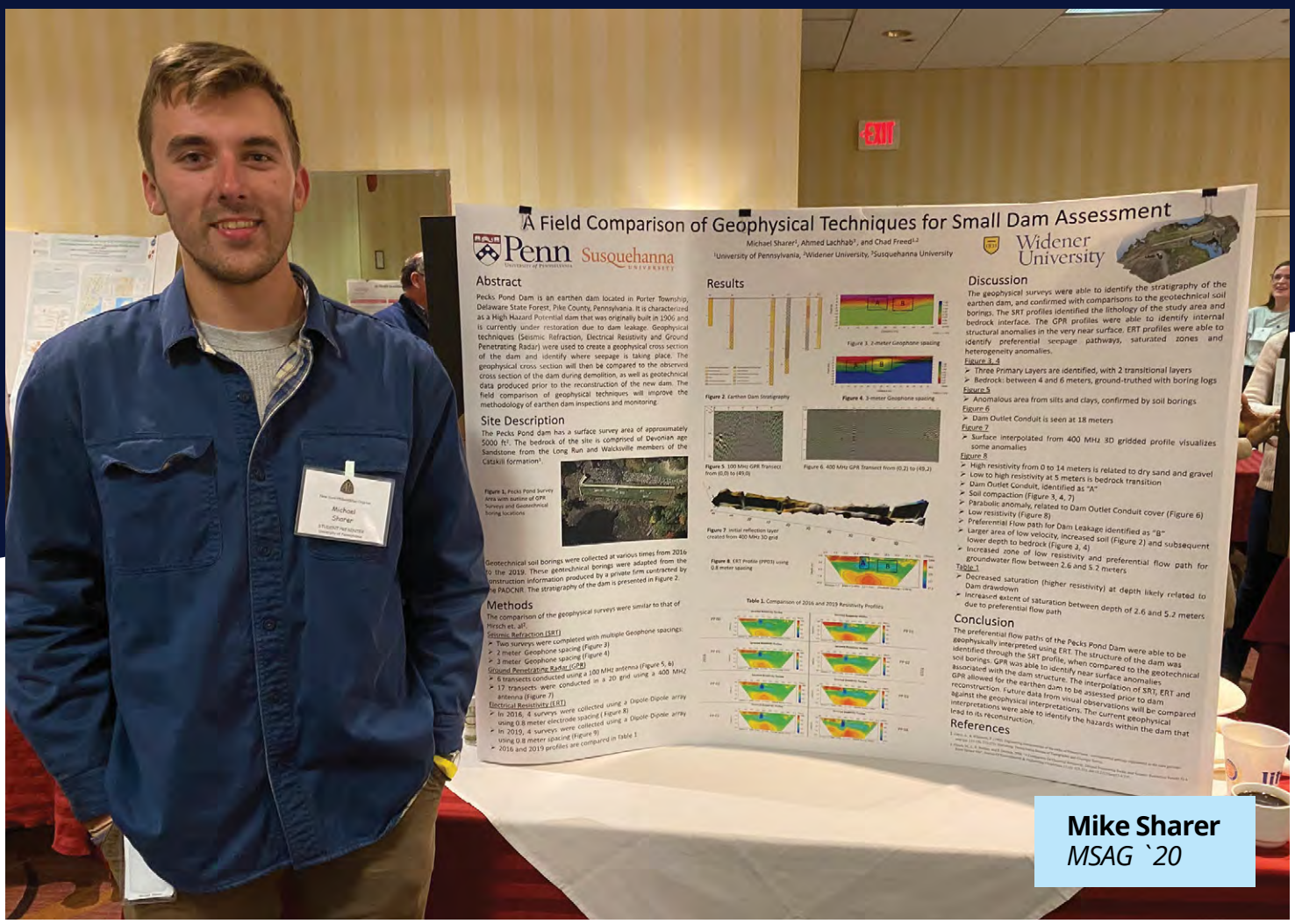

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