GSA Connects 2021 Wrap-Up



Discovery of an Entrapped Early Permian (ca. 299 Ma) Peri-Gondwanic Sliver in the Cretaceous Shyok Suture of Northern Ladakh, India: Diverse Implications



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Cover: A panoramic view of the confluence of the Nubra and Shyok River valleys, Northern Ladakh, India, displaying geological formations of the Shyok Suture Zone. Photo by Rajeev Upadhyay taken from old Sumur village fort, which is situated on the Karakoram Batholith. See related article, p. 4–10.

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Discovery of an Entrapped Early Permian (ca. 299 Ma) Peri-Gondwanic Sliver in the Cretaceous Shyok Suture of Northern Ladakh, India: Diverse Implications

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ABSTRACT

In a significant breakthrough, we report the first discovery of twenty-six genera and thirty-five species of Early Permian (Asselian-Sakmarian and Artinskian; 299 Ma to 276 Ma) Gondwanic palynomorphs from a tectonically emplaced metasedimentary sliver of Shyok Ophiolitic Mélange of the India-Asia Collision zone of Northern Ladakh, India. These palynofloral assemblages are of peri-Gondwanian (Cimmerian) origin and have a strong affinity with the Gondwana assemblage of peninsular India. Similar palynofloral assemblages are also known from Extra-Peninsular India. Salt Range, Karakoram, Antarctica, Australia, South Africa, and South America. The occurrence of Gondwanic sliver within the Shyok Suture is interpreted as a thin flake of active continental margin of peri-Gondwanic microcontinent/Kshiroda plate, which was sliced off during the subduction/ collision process, between Ladakh block and Karakoram-Qiangtang-Lhasa terrane and amalgamated with obducted remnants of the accretionary prism of the nascent Shyok Suture. The Shyok Suture closed during the mid- to Late Cretaceous period. Subsequent syn- and post-collision synkinematic episodes tectonically juxtaposed the peri-Gondwanic sliver in the tectonized zone of Shyok Ophiolitic Mélange. The India-Asia collision, which took place ca. 60-50 Ma with the demise of Neo-Tethys Ocean, along the Indus Tsangpo Suture Zone, modified the geometry of accreted ophiolitic stack of the Shyok Suture.

INTRODUCTION

The supercontinent Pangaea began to break apart during the late Carboniferous– early Permian period (ca. 300 Ma–272 Ma). This break-up is followed by the seafloor spreading, which produced new oceanic crust and several smaller oceans and larger plates. The erstwhile Tethys Ocean, juxtaposed between the Eurasian continent in the north and Gondwana in the south, ruptured, and culminated into the subsequent opening and closing of nascent Neo-Tethys and Paleo-Tethys oceans, respectively. Several smaller continental fragments existed between the two continental masses (Smith et al., 1981; Nie et al., 1990; Scotese and Langford, 1995; Upadhyay et al., 1999b).

Paleogeographic reconstructions of Pangaea during the late Paleozoic (Smith et al., 1981; Nie et al., 1990; Scotese and Langford, 1995) show that a southern belt of these continental fragments stretching from Iran and Afghanistan, through Tibet to western Thailand, Malaysia, and Sumatra has been accreted to Asia since the mid-Paleozoic (Şengör, 1987; Metcalfe, 2006). The Karakoram-Hindukush microplate in the west and the Qiangtang-Lhasa block in central and southeastern Asia are among these blocks, which were welded/sutured to Asia, probably around 130-120 Ma (Şengör, 1987; Dewey et al., 1988, and references therein) (Fig. 1). The origin, migration path, timing of accretion, and assembly of all of these blocks in their present tectonic position are little known. The paleogeography during the break-up of Gondwana is poorly constrained, and scant geological information is available from Pamir, Northern Ladakh, Karakoram, and western Tibet. However, based on temperate fauna, flora, and even glacial and glaciomarine deposits (tillites or diamictites) from the Permian sequences, the Central Iran, Helmand, Western Qiangtang, Lhasa, and Sibumasu blocks are interpreted as having rifted off the northern margin of Gondwana in post-Early Permian times (Smith et al., 1981; Nie et al., 1990: Scotese and McKerrow, 1990: Scotese and Langford, 1995; Upadhyay et al., 1999b; Muttoni et al., 2009). These blocks belong to a poorly defined continent named peri-Gondwana or Cimmeria (Sengör, 1987). Based on the occurrence of Early Permian marine Gondwanan sediments, the Karakoram terrane is now (Fig. 1) identified as a peri-Gondwanan microcontinent at a latitude ~35 S, somewhere between the Indian plate and the Qiangtang-Lhasa blocks (Upadhyay et al., 1999b). Paleogeographic reconstruction of the Early Permian shows that these peri-Gondwanian microcontinents were situated between $\sim 20^{\circ}$ and 40° southern latitudes (Nie et al., 1990; Scotese and Langford, 1995; Muttoni et al., 2009).

Thus, the origin and evolution of the Ladakh-Kohistan block and Karakoram terrane of northwest India and Lhasa and Qiangtang blocks of western Tibet have now been widely accepted to have resulted from multiple subduction/collisional events between Gondwana-derived terranes or continents and Eurasia since the late Paleozoic (Gansser, 1977; Allégre et al., 1984; Şengör, 1987; Dewey et al., 1988; Scotese and McKerrow, 1990; Nie et al., 1990; Beck et al., 1995; Burg et al., 1996; Upadhyay et al., 1999b; Metcalfe, 2006; Muttoni et al., 2009; Bouilhol et al., 2013; Upadhyay, 2002, 2014; Borneman et al., 2015).

In northwest India, the Ladakh block lies between the Indian Plate in the south and the Eurasian Plate in the north. To the west, this block is separated from the Kohistan Complex by the Nanga Parbat–Haramosh syntaxis, and to the east, it is separated from the Lhasa and Quiangtang blocks by the Karakoram fault (Upadhyay, 2002, 2014) (Figs. 1 and 2). The Ladakh block is bounded by two suture zones—the Indus Suture in the south and the Shyok Suture in

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Figure 1. (A) Geological map of the Himalaya showing location of Trans-Himalayan Plutonic Belt, suture zones, and major boundary thrusts of Himalaya. (B) Detail of western Himalaya showing extension of Indus-Shyok sutures in Kohistan-Ladakh block and Karakoram Terrane of India; Decation of early Permian Gondwanic palynomorphs bearing outcrops near Tirit Bridge and Skuru along the Shyok Suture Zone of Northern Ladakh (modified after Kirstein et al., 2006). (C) Photograph showing the tectonic juxtaposition of Gondwanic palynomorphs bearing outcrop across a geological section near Tirit Bridge. (D) Field photograph of Gondwanic palynomorphs bearing highly cleaved outcrop of pebbly mudstone near the village of Skuru. (E) Close-up of outcrop (D) showing dark gray to black fragmentary remains of unidentifiable plant fossils near Skuru.

the north. These sutures mark the closing of different branches of the Tethys Ocean with the Indus Suture, recording the final collision of India with Asia at 60–50 Ma (Gansser, 1977; Beck et al., 1995; Burg et al., 1996; Bouilhol et al., 2013; Upadhyay,

2002, 2014; Borneman et al., 2015, and references therein). The more northerly Shyok Suture (Figs. 1 and 2) separates Ladakh from Asian continental rocks of the Karakoram mountains to the north and contains ophiolitic mélanges and thrust units derived from the southern Asian margin that were juxtaposed when Kohistan/ Ladakh collided with Asia at 102–85 Ma or 40 Ma (Gansser, 1977; Beck et al., 1995; Burg et al., 1996; Bouilhol et al., 2013; Upadhyay, 2002, 2014; Borneman et al.,



Figure 2. Geological map showing different lithotectonic units of the Shyok Suture Zone (S.S.Z.) exposed in the Nubra-Shyok river valleys, Northern Ladakh. Decation of early Permian palynomorphs bearing locality within the Shyok Ophiolitic Mélange – exposed near the village of Skuru and Tirit Bridge (modified after Upadhyay et al., 1999a). K.K. fault–Karakoram fault; MBT–main boundary thrust; MCT–main central thrust; MMT–main mantle thrust; N.S.Z.–northern suture zone.

2015, and references therein). The accreted arc units are well exposed along the Indus–Shyok sutures. All along its length, the Indus and Shyok sutures are characterized by obducted remnants of Neo-Tethyan oceanic crust (Figs. 1 and 2).

In northern Ladakh, the rocks of the Shyok Suture Zone, trending northwestsoutheast across the Nubra-Shyok River valleys, occur within intensely deformed tectonic slices between the Ladakh batholith—to the southwest—and the Karakoram batholith to the northeast (Figs. 1 and 2). The occurrence of Aptian-Albian rudists and orbitolinids from the Shyok Suture Zone defines a minimum age for the subductionrelated volcanics associated with the Shyok Suture (Upadhyay, 2014) and establishes a strong correlation with the equivalent suture zone in northern Pakistan (i.e., Northern Suture) to the west of the Nanga Parbat– Haramosh syntaxis and in Lhasa-Quiangtang (i.e., Bangong Nujiang Suture) to the east vis-à-vis their palaeo-geographic significance (Gansser, 1977). The geological structure of the Shyok Suture Zone has recently been described and discussed elsewhere (Burg et al., 1996; Bouilhol et al., 2013; Upadhyay, 2002, 2014; Borneman et al., 2015, and references therein).

SAMPLE LOCATION

The palynomorphs bearing tectonic slivers are ~50 m thick and crop out at two different localities; i.e., near the village of Skuru (on Diskit-Turtuk road section; 34°66'75"N and 77°29'66"E) and ~300 m ENE of Tirit Bridge (on Diskit-Panamik road section; 34°31′59″N and 77°41′24″E) (Figs. 1 and 2). These outcrops are tectonically juxtaposed by mafic volcanics and slates and are located ~400 m below the main structure of the Shyok suture in Skuru and ~500 m below the Karakoram shear zone in Tirit Bridge locality. The highly cleaved and deformed outcrops are pale brown to buff-colored and are made up of pebbly mudstone with interspersed dark gray-black fragmentary, coaly, and sometimes powdery remains of possible plant fossil fragments (Figs. 1C-1E). The pebbly mudstone is dominated by quartzite clasts and is completely devoid of ophiolitic and volcanic arc-related debris-clasts, matrix, and cementing material, defying its ophiolitic and arc origin.

MATERIAL AND METHODS

The dark gray-black portion of half a dozen samples of the pebbly mudstone and associated shale were macerated to recover spore and pollen grains. Samples were cleaned with distilled water, and after drying, crushed into smaller pieces (2-3 mm) and treated with hydrofluoric acid (40% concentration) to dissolve the siliceous component. The samples were then treated with nitric acid to digest the organic matter and treated with 5%-10% alkali to remove the humus. The samples were thoroughly washed with distilled water, and the residue was mixed with polyvinyl alcohol and smeared over a cover glass and kept for drying at room temperature. After complete drying, the cover glasses were mounted in Canada balsam. For quantitative estimation, two hundred palynomorphs were counted per sample. These slides are housed at the repository of the Museum of the Birbal Sahni Institute of Palaeosciences, Lucknow, India.

CISULARIAN (EARLY PERMIAN) PALYNOMORPHS

In a significant breakthrough, we report Early Permian (Asselian-Sakmarian and Artinskian; 299 Ma to 276 Ma) palynomorphs from a metasedimentary sliver, which is tectonically sandwiched within the litho-tectonic units of the Ophiolitic Mélange zone of the Shyok Suture (Figs. 1–3). The



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Figure 3. (A) Early Permian (Asselian-Sakmarian) palynomorphs recovered from Shyok Ophiolitic Mélange near Tirit Bridge Northern Ladakh: 1. Parasaccites korbaensis; 2. Parasaccites diffuses; 3. Plicatipollenites indicus; 4. Barakarites densicorpus; 5. Ginkgocycadophytus vetu; 6. Picatipollenites trigonalis; 7. Potonieisporites mutabilis; 8. Lacinitriletes badamensis; 9. Leiotriletes adntoides; 10. Striasulcites ovatus; 11. Scheurinipollenites tentulus; 12. Rhizomaspora indica; 13. Rhizomaspora fimbriata; 14. Verticipollenites cf. V. debilis; 15. Ibisporites diplosaccus; 16. Faunipollenites varius; 17. Platysaccus brevizonatus; 18. Verticipollenites secretus; 19. Striaties subtilis; 20. Crescentipollenites korbaensis; 21. Laharites parvus; 22. Lunatisporites sp.; 23. Distriatites bilateris. (B) Early Permian (Artinskian) palynomorphs recovered from Shyok Ophiolitic Mélange near Skuru locality of Nothern Ladakh: 1. Scheuringipollenites minutes; 2. Scheuringipollenites barakarensis; 3. Scheuringipollenites maximus; 4. Faunipollenites varius; 5. Faunipollenites perexiguus; 6. Faunipollenites magnus; 7. Faunipollenites goraiensis; 8. Faunipollenites congoensis; 9. Striatopodocarpites sp.; 10. Rhizomaspora indica; 11. Striomonosaccites ovatus; 12. Parasaccites obscures; 13. Ibisporites diplosaccus. (C) Quantitative analysis shows the dominance and frequency of characteristic palynomorphs recorded in the present study.

following 26 genera and 35 species have been identified from the Tirit Bridge locality (Fig. 3A): Barakarites densicorpus Tiwari, 1965; Crescentipollenites korbaensis (Tiwari) Bharadwaj, Tiwari and Kar, 1974; Distriatites bilateris Bharadwaj, 1962; Faunipollenites varius Bharadwaj emend. Tiwari et al., 1989; Ibisporites diplosaccus Tiwari, 1968; Lacinitriletes badamensis Venkatachala and Kar, 1965; Lahirites parvus Bharadwaj and Salujha, 1964; Lunatisporites sp., Parasaccites korbaensis Bharadwaj and Tiwari, 1964; Platysaccus brevizonatus Tiwari, 1968; Plicatipollenites trigonalis Lele, 1964; Potonieisporites mutabilis Lele and Chandra, 1971; Primuspollenites, Rhizomaspora indica, Scheuringipollenites tentulus Tiwari, 1973; Striatites subtilis Bharadwaj and Salujha, 1964; Striasulcites ovatus Venkatachala and Kar, 1968; Striatopodocarpites gondwanensis Lakhanpal, Sah and Dube, 1960; and Verticipollenites secretus Bharadwai, 1962. The genera found within the count (Fig. 3C) are Callumispora (3%-8%); Parasaccites (10%-15%); *Plicatipollenites* (8%-12%); Potonieisporites (5%–10%); Rhizomaspora (2%-3%); Primuspollenites (1%-2%); Faunipollenites (2%-5%); Striatopodocarpites (3%-5%); Striatites (2%-3%); Scheuringipollenites (3%–4%); Vesicaspora (2%–4%); Striasulcites (1%–3%); Crescentipollenites (2%-3%); *Hamiapollenites* (1%-2%); Distriatites (2%–3%); and the sporadic taxa (0%-1%) includes Lacinitriletes, Verticipollenites, Barakarites, Leiotriletes, Verrucosisporites, Ibisporites, Lunatisporites, Sahnites, Caheniasaccites, Corisaccites. Ginkgocycadophytus, and Tetraporina (Figs. 3A and 3C).

The dominance of Parasaccites and subdominance of Plicatipollenites in Tirit Bridge samples point to an Asselian age (early Permian; 299-297 Ma); however, the presence of monosaccates (Parasaccites, Plicatipollenites) in association with Callpumispora spp. Faunipollenites spp., Straitopodocarpites spp., Crescentipollenites spp., and the First Appearance Datum (FADs) species of Barakarites gondwanensis Maithy, 1965, and Scheuringipollenites barakarensis Tiwari, 1973, points to a Sakmarian age (early Permian; 297-284 Ma). The aforementioned palynofloral assemblage is similar to those observed from the Parasaccites korbaensis zone (Tiwari and Tripathi, 1992) of Upper Talchir (Asselian) and the Karharbari Formation (Sakmarian) of Gondwana assemblage of peninsular India (Potonié and Lele, 1961), Chhongtash Formation of Karakoram (Upadhyay et al., 1999b), Salt Range in Pakistan (Balme, 1970), Tethys Himalaya (Gothan and Sahni, 1937), Arunanchal Pradesh (Srivastava and Bhattacharyya, 1996), Antarctica (Barrett and Kyle, 1975), Australia (Kemp et al., 1977), South Africa (Manum and Tien, 1973), and South America (Souza, 2006).

The assemblage at the Skuru locality (Fig. 3B) is dominated by a non-striate bisaccate pollen grain and is represented by: Faunipollenites varius Bharadwaj and Salujha emend. Tiwari et al., 1989; F. perexiguus Bharadwaj and Salujha emend. Tiwari et al., 1989; F. magnus (Bose and Kar) Tiwari and Vijaya, 1989; F. goraiensis Potonie and Lele, 1961; F. congoensis (Bose and Kar) Tiwari et al., 1989; Ibisporites diplosaccus Tiwari, 1968; Parasaccites obscures Tiwari, 1965; Platysaccus hingirensis Tiwari, 1968: Rhizomaspora indica Tiwari, 1965; Scheuringipollenites barakarensis Tiwari, 1973; S. minutes (Sinha) Bharadwaj and Dwivedi, 1981; S. maximus (Hart) Tiwari, 1973; and Striomonosaccites ovatus Bharadwaj, 1962, besides the occurrence of Platysaccus Naumova emend. Potonie and Klaus, 1954; Rhizomaspora Wilson, 1962; Striasulcites Venkatachala and Kar, 1968 and Striatopodocarpites Soritscheva and Sedova emend. Bharadwaj, 1962. The palynofloral assemblage is dominated by nonstriate bisaccate pollen Scheuringipollenites (40%) and striate bisaccate pollen Faunipollenites (35%), Ibisporites (3%), monosaccates pollen Parasaccites (8%-10%), whereas the forms Platysaccus, Rhizomaspora, Striasulcites and Striatopodocarpites are sporadic (1%-2%)(Fig. 3B).

The dominance of nonstriate bisaccate pollen *Scheuringipollenites* (40%) and striate bisaccate pollen *Faunipollenites* (35%) in the Skuru samples favors an Artinskian (late Cisuralian, ca. 284–276 Ma) age. These palynofloral assemblages are similar to those established from the Barakar Formation of Gondwana assemblage of India (Tiwari and Tripathi, 1992); Antarctica (Kyle, 1977); Collie Basin Australia (Kemp et al., 1977); Ketawaka and Songwe-Kiwira Coalfield in Tanzania, Africa (Manum and Tien, 1973); and South America (Souza and Marques-Toigo, 2003).

TECTONIC IMPLICATION

The palynoflora assemblages from the pebbly mudstone unit of the Shyok Suture Zone (Figs. 1–3) dates these metasediments

of Asselian to Artinskian age (ca. 299-276 Ma, early Permian) and record this age for the first time, from the entire length and width of Indus-Shyok sutures across the tectonic collage of India-Asia continental collision. It is remarkable to note that the palynoflora assemblages have a strong affinity to those that were recorded from the Lower Gondwana stratigraphic units of peninsular India and in other Gondwanic domains (Upadhyay et al., 1999b; Gothan and Sahni, 1937; Potonié and Lele, 1961; Balme, 1970; Manum and Tien, 1973; Barrett and Kyle, 1975; Kemp et al., 1977; Kyle, 1977; Backhouse, 1991; Tiwari and Tripathi, 1992; Srivastava and Bhattacharyya, 1996; Souza and Marques-Toigo, 2003; Souza, 2006, and references therein).

Keeping in mind the global significance of the Permian period of Gondwana supercontinent with regard to the palaeogeographic evolution of the Asian margin during the late Palaeozoic to Palaeogene, it is prudent to denote that the existence of Permian rocks, together with Palaeozoic biogeographic data, firmly establishes a Gondwanan origin for most of the peri-Gondwanian (Cimmerian) microcontinents. In particular, the identification of extensive Early Permian pebbly mudstones in the region and the subsequent interpretation of these pebbly mudstones as glacial-marine deposits (Stauffer and Lee, 1986; Metcalfe, 2006, and references therein). Therefore, based on the assumption mentioned above, we suggest that the early Permian palynomorphs bearing tectonic sliver of deformed pebbly mudstone, which is entrapped in the Ophiolitic Mélange of the Shvok Suture, have a close affinity to those of peri-Gondwanian (Cimmerian) origin.

It is well known that the peri-Gondwanan (Cimmerian) tectonic elements and early Permian exposures are well distributed in the Shyok Suture vicinity; i.e., the Karakoram terrane to the north and the Qiangtang-Lhasa blocks to the ENE and ESE, respectively. It is quite evident that a thin flake of active continental margin of these peri-Gondwanic microcontinents/Kshiroda plate (Jagoutz et al., 2015) were sliced off during the course of the subduction/collision process, between Ladakh and Karakoram-Qiangtang-Lhasa blocks, and amalgamated with obducted remnants of accretionary prism of the nascent Shyok Suture. The Shyok Suture closed during the mid- to Late Cretaceous period. Subsequent syn- and post-collision synkinematic episodes were responsible for

their tectonic juxtaposition and exhumation in the tectonized zone of Shyok Ophiolitic Mélange.

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GSA President Barb Dutrow: Updates from GSA



Barb Dutrow, GSA President

COVID-19

The past nearly two years of the COVID-19 pandemic have accelerated changes and highlighted the strong leadership team in place at GSA Headquarters. With our mission always at the forefront, GSA embraced new opportunities, such as pivoting to online meetings and expanding inclusivity and accessibility to our science.

This year, GSA set the standard for moving forward with an in-person meeting while

maintaining the health and safety of our members. Requiring proof of vaccination as well as a negative COVID test prior to arrival at the convention center in Portland, Oregon, USA, provided those on site with a sense of well-being. The ample space in meeting rooms, poster sessions, and the Resource & Innovation Center made social distancing easy. Nearly 3,000 people enjoyed the first face-to-face meeting for many of us in the past two years. There were seamless transitions from in-person to virtual presentations. GSA's On To The Future program brought in 76 scholars to experience their first GSA Connects meeting, along with many other students and early career scientists. For those unable to travel, a hybrid component was available, and portions of the meeting were live streamed. Meetings have changed, will continue to change for the future, and GSA is at the forefront of the new meetings era.

DECADAL STRATEGIC PLAN

GSA is currently implementing its ambitious strategic plan. The plan includes a focus on embedding JEDI (justice, equity, diversity, inclusivity) into all areas of GSA's governance, leadership, awards, membership, and outreach. Our latest efforts derive from recommendations from the ad hoc Awards and Nominations Committee. It's that time of the year when GSA accepts nominations for awards, leadership, and committee positions. Members will note substantial modifications to the awards criteria and nominations process as part of our continuing JEDI efforts. GSA actively seeks more diversity in our awards, on committees, and in leadership positions. Our members can facilitate this by participating in the nominations process at all levels. Embedding JEDI in our awards and nominations is key to ensuring that they are inclusive and to reflect the diversity of our membership. The ad hoc Awards and Nominations Committee recommendations are expansive. One goal is to implement these recommendations and to ensure a more inclusive process. A search is also underway for a full-time director of diversity to continue expansion and implementation of these many opportunities, which also tie to our Center for Professional Development, part of the decadal strategic plan.

ON TO THE FUTURE

GSA's On To the Future (OTF) program has proven to be highly successful at increasing diversity in the next generation of earth scientists. The program provides first-time attendees from marginalized groups to attend the GSA Connects meetings, helping them with transportation and registration costs while partnering them with mentors. OTF also offers pre- and post-meeting programs to facilitate networking and maximize the mentees' experiences. This program has expanded and needs more mentors, so please sign up (go to www.geosociety.org/GSA/OTF/Home.aspx and click on "mentorship").

YEAR TO COME

Change at GSA continues. With the announced retirement of our exceptional executive director, Vicki S. McConnell, a search is under way to identify another highly qualified candidate. To set the stage for this nationwide search, the Executive Committee retreat, led by Seth Kahan, focused on visionary leadership. This retreat was attended by Council and staff. Moving the search forward and facilitating knowledge transfer and succession planning is a high priority.

MISSION STATEMENT REFRESH

As a mission-driven organization, it is imperative to have our mission statement capture the breadth of our activities. GSA has evolved over the years, and we need our mission statement to evolve with us. It is time to refresh our mission statement to align with our all that GSA does for science and society.

SALE OF THE BOULDER HEADQUARTERS CAMPUS

A few years ago, the ad hoc Campus Vision Committee recommended the sale of the headquarters campus in Boulder, Colorado, USA, and Council ratified this decision in 2020. With the transition to a hybrid working environment, the need to minimize our carbon footprint, and the opportunity to maximize the utilization of office space, Council determined that, after nearly 50 years, it is time to move. A purchase sales agreement has been signed with Boulder Housing Partners (BHP), a not-for-profit local entity, and is undergoing "due diligence" with the City of Boulder. Subsequently, GSA is planning to relocate our offices to another front-range location. Because the building is iconic, BHP plans to save and repurpose the historical original wing of the building as part of a residential development project.

SPECIAL PAPER 546

Southern and Central Mexico: **Basement Framework, Tectonic Evolution, and** Provenance of Mesozoic–Cenozoic Basins

Edited by Uwe Martens and Roberto Stanley Molina Garza

This volume furthers our understanding of key basins in central and southern Mexico, and establishes links to exhumed sediment source areas in a plausible paleogeographic framework. Authors present new data and models on the relations between Mexican terranes and the assem-0 bly and breakup of western equatorial Pangea, plate-tectonic and ER terrane reconstructions, uplift and exhumation of source areas, the influence of magmatism on sedimentary systems, and the provenance and delivery of sediment to Mesozoic and Cenozoic basins. Additionally, authors establish relationships between basement regions (sediment source) in the areas that supplied sediment to Mesozoic rift basins, Late Cretaceous foreland systems, and Cenozoic basins developed in response to Cordilleran events.

> SPE546, 468 p., ISBN 9780813725468 list price \$120.00 | member price \$84.00



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Letter from the General Chairs

It's still hard to believe that GSA Connects actually happened, much less that it's over. After more than two years without an in-person meeting, almost 3,000 of us gathered in Portland and were joined by more than 1,000 additional online participants.

As scientists, we recognize uncertainty as part of everything we do, but "uncertain" doesn't adequately describe the events and related decision making leading up to Portland. When we started working with GSA staff in 2020, we expected we'd go down to the wire, and we did: The format of GSA Connects wasn't confirmed until mid-September, and there were multiple adaptations up to and during the meeting itself.

But it worked! We had field trips, in-person and online short courses, in-person, online, and hybrid technical sessions, all the receptions and business meetings that were fun to join in person. We were able to bring hot topics and recent policy changes into play in our Pardees, noon-time lectures, and alcohol-free poster sessions in the Resource & Innovation Center. We had face-to-face (masked, of course) mentoring sessions, alumni events, and inducted a new group of GSA Fellows. We marveled at our ability to recognize each other even with masks—and realized that mistakenly calling out to people we thought we recognized was risk-free because no one knew who was doing it. We even basked in the glow of seeing PowerPoint presentations in person rather than online. Maybe most gratifying was seeing the enthusiasm (and a little relief) on the part of everyone there, the enjoyment in each other's company, the people experiencing their first GSA meeting in a while and those experiencing their first GSA meeting, the ongoing exchange of science and everything else, and the grace with which folks handled the hiccups we faced. There may not have been a better review than, "This actually felt like GSA."

Of course, none of this would have been possible without the dedicated volunteers on our Local Organizing Committee, GSA staff, and student volunteers. As impressive as they were, their efforts would have been for naught without the 4,000 people who jumped in and made GSA Connects 2021 a success—Thank you!

We wish the best of luck to our counterparts for GSA Connects 2022, Cal Barnes and Jeff Lee, the Denver Local Organizing Committee, and everyone else involved in planning for Denver next October—See you there!



Ian Madin, Co-General Chair



Jeff Rubin, Co-General Chair

Thanks to the GSA Connects 2021 Organizing Committee



Ian Madin: General Co-Chair



Jeff Rubin: General Co-Chair



Amy Brock-Hon: Technical Program Chair



Robinson Cecil: Technical Program Vice-Chair



Anita Grunder: Field Trip Co-Chair



Adam Booth: Field Trip Co-Chair



Scott Burns: Sponsorship Chair



Kevin Gardner: Student/Early Career Professionals Chair



Gina Roberti: Community Education Chair



Robyn Dahl: K-12 Chair

Thank You to All the Mentors Who Volunteered Their Time at GSA Connects 2021

Mentors are integral to GSA's meetings and are a source of motivation and support for students and early career professionals as they seek advice and information related to their academic and career pathways. The following are programs in which mentors presented, along with some selected comments from mentees.

- GeoCareers Résumé Workshop
- Women in Geology
- GeoCareers Company & Agency Information Session
- Networking Event
- GeoCareers Career Pathways Webinar
- Early Career Networking Event
- Drop-in Mentoring
- Résumé/CV Review Clinic

"I felt immeasurably inspired by the exceedingly strong women who spoke at the Women in Geology program. It was very inspiring!"

"I attended several GeoCareers Events and they really helped me."



"This was my first meeting and I really enjoyed meeting with mentors. I hope they will continue to meet with students at the GSA meetings from now on."

Thanks to Our GSA Connects 2021 Exhibitors

108 vendors participated, showcasing new products and services, as well as graduate school programs. Our event was enhanced

immensely by their presence. https://community.geosociety.org/gsa2021/showcase/exhibitors



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Award & Nomination Deadlines



www.geosociety.org/nominate

For details, see the October 2021 *GSA Today* or go to **www.geosociety.org/nominate.** You can also email awards@ geosociety.org.

2022 GSA Medals and Awards

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

Nomination deadline: 1 Feb.

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

Nomination deadline: 1 March 2022

John C. Frye Environmental Geology Award

Nomination deadline: 31 March 2022

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

The 2021 awardee is New Mexico Bureau of Geology and Mineral Resources Bulletin 162, "Lifetime projections for the High Plains Aquifer in east-central New Mexico," by Geoffrey Rawling and Alex Rinehart.

2022 Cole Research Grant Awards

Learn more at **www.geosociety.org/gsa/about/awards/gsa/** grants/postdoc.aspx. Application deadline: 1 Feb. 2022.

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

Tim W. Wawrzyniec Fellowship at the Rocky Mountain Biological Laboratory

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

AGI Awards

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

Nomination deadline: 1 Feb.

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

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

Call for GSA Fellowship Nominations

Deadline: 1 Feb.

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

My GSA Membership Journey

I became a member in 2019 when I was an international college freshman at the University of California Berkeley. I was looking for funding for my summer fieldwork at the Juneau Icefield Research Program. I came across GSA's field camp scholarship, which later I got awarded twice. I was also a recipient of the On To the Future program, which was a great professional development opportunity.

When I was a junior, I became a student representative in both the GSA Education Committee and International Committee. It was eye-opening for me to attend business meetings in both committees, communicating with and learning from people in different career paths. Through participating in behind-the-scenes work for award nominations, I gained more insights on how to write my scholarship applications. I was excited to be a voice for the geoscience students, making decisions and changes to the professional field by serving on a committee.

Now I am the chair-elect of the GSA Student Advisory Council; my work is more focused on the student experience in geoscience. Like many students, I go to school in a small earth-science department, so organizing social events through GSA was a great way to know more peers in my field. I faced lots of hardship in funding my thesis research and I thought I should not be alone. Thus, I initiated an undergraduate student research funding survey to see how GSA can better support our undergraduate students.



Yueyi Che conducting field research for her senior thesis in Yosemite National Park.

Serving in GSA student leadership was an important step in transforming things I learned from my student organization leadership experience to a professional setting. I would highly encourage geoscience students, especially undergraduate students, to serve as student representatives. GSA loves to hear our perspectives. By contributing to the professional community, we can grow as individuals and shape the future of geoscience.

Yueyi Che

Chair of the GSA Student Advisory Council GSA member since 2019



GSA Scientific Division Awards

ENERGY GEOLOGY DIVISION

Gilbert H. Cady Award

Nominations due 1 Mar.

Submit nominations to the Cady Award chair (the past Division chair).

This award recognizes outstanding contributions in the field of coal geology that advance the science both within and outside of North America. https://community.geosociety.org/energydivision/ awards/cady

Curtis-Hedberg Award

Nominations due 1 May.

Submit nominations to the Curtis-Hedberg Award chair (the past Division chair).

The inaugural Curtis-Hedberg Award will be made for outstanding contributions in the field of petroleum geology. https://community.geosociety.org/energydivision/awards/ curtishedberg

ENVIRONMENTAL AND ENGINEERING GEOLOGY DIVISION

E.B. Burwell, Jr., Award

Nominations due 1 Feb.

Submit nominations to Jim McCalpin at mccalpin@geohaz.com. This award honors the memory of one of the founding members of the Division and the first chief geologist of the U.S. Army Corps of Engineers. It is made to the author or authors of a published paper of distinction that advances knowledge concerning principles or practice of engineering geology, or of related fields of applied soil or rock mechanics where the role of geology is emphasized. The paper that receives the award must: (1) deal with engineering geology or a closely related field, and (2) have been published no more than five years prior to its selection. There are no restrictions on the publisher or publishing agency of the paper. https://community.geosociety.org/eegdivision/awards/burwell

Richard H. Jahns Distinguished Lecturer

Nominations due 31 Jan.

Submit email nominations or questions to the EEGD chair.

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

GEOARCHAEOLOGY DIVISION

Richard Hay Student Paper/Poster Award Nominations due 1 Sept.

Submit nominations to gsa.agd@gmail.com.

Richard Hay was a long-standing member of the Division and had a long and distinguished career in sedimentary geology, mineralogy, and archaeological geology. He is particularly well known for his work on the Olduvai Gorge and Laetoli Hominid-bearing sites and was awarded the Division's Rip Rapp Award in 2000. The Division is proud to have our student travel award bear his name. The award is a travel grant for a student (undergraduate or graduate) presenting a paper or poster at GSA's annual meeting. The grant is competitive and will be awarded based on the evaluation of the scientific merit of the research topic and the clarity of an expanded abstract for the paper or poster prepared by a student for presentation in the Division's technical session at the meeting. https:// community.geosociety.org/geoarchdivision/awards/student/hay

Claude C. Albritton, Jr., Award

Nominations due 15 Mar.

Submit nominations to gsa.agd@gmail.com.

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

Rip Rapp Award

Nominations due 15 Feb.

Submit nominations to gsa.agd@gmail.com.

George "Rip" Rapp Jr. was one of the primary individuals responsible for establishment of the Division and generously established an award fund with the GSA Foundation. Nominations should include a biographical sketch, a statement of outstanding achievements, and a selected bibliography of the nominee. https:// community.geosociety.org/geoarchdivision/awards/riprapp

GEOINFORMATICS DIVISION

Outstanding Contributions in Geoinformatics Award Nominations due 15 Feb.

This award will be made to an individual who has contributed in an outstanding manner to geology through the application of the principles of geoinformatics. The individual should be a member of GSA. https://community.geosociety.org/geoinformaticsdivision/ awards

GEOPHYSICS DIVISION

George P. Woollard Award

Nominations due 1 Feb.

Submit nominations to the Division chair.

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

GEOSCIENCE EDUCATION DIVISION

Biggs Award for Excellence in Earth Science Teaching Nominations due 1 Mar.

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

HISTORY AND PHILOSOPHY OF GEOLOGY DIVISION

Mary C. Rabbitt History and Philosophy of Geology Award

Nominations due 15 Feb.

Submit nominations to the Division's secretary/treasurer.

This award recognized exceptional scholarly contributions of fundamental importance to the understanding of the history of the geological sciences. Achievements deserving of the award include, but are not limited to, publication of papers or books that contribute new and profound insights into the history of geology based on original research or a synthesis of existing knowledge. Neither the nominator nor the nominee need be a member of the Division or of GSA. The nomination packet should include (1) a letter detailing the contributions that warrant the award; and (2) the nominee's current curriculum vitae including name, title, affiliation, education, degrees, honors and awards, major career events, and contributions that warrant the award. Monies for the award are administered by the GSA Foundation. https://community.geosociety.org/ histphildiv/awards/rabbitt

Gerald M. and Sue T. Friedman Distinguished Service Award

Nominations due 15 Feb.

Submit nominations to the Division's secretary/treasurer.

This award is presented for exceptional service to the advancement of our knowledge of the history and philosophy of the geological sciences. Neither the nominator nor the nominee must be a member of the Division or of GSA. The service to the history and philosophy of geology may include, but is not limited to, the discovery of and making available rare source materials; comprehensive bibliographic surveys; organizing meetings and symposia in the history and philosophy of geology; and exceptional service to the Division. The nomination packet should include (1) a letter detailing the contributions that warrant the award; and (2) the nominee's current curriculum vitae, including name, title, affiliation, education, degrees, honors and awards, major career events, and the contributions that warrant the award. The award is made possible by a bequest from the estate of Mary C. Rabbitt. Monies for the award are administered by the GSA Foundation. https:// community.geosociety.org/histphildiv/awards/dsa

History and Philosophy of Geology Student Award Nominations due 15 June

Submit nominations to the Division's secretary/treasurer.

This award provides US\$1000 for a paper to be given at the national GSA meeting. Awards may also be given for second place. Oral presentations are preferred. Faculty advisors may be listed as second author, but not as the lead author of the paper. The proposed paper may be (1) a paper in the history or philosophy of geology; (2) a literature review of ideas for a technical work or thesis/dissertation; or (3) some imaginative aspect of the history or philosophy of geology we have not thought of before. Students should submit an abstract of their proposed talk and a 1,500-2,000-word prospectus for consideration. Currently enrolled undergraduates and graduate students are eligible as are those who received their degrees at the end of the fall or spring terms immediately preceding the national GSA meeting. The award is made possible by a bequest from the estate of Mary C. Rabbitt. Monies for the award are administered by the GSA Foundation. https://community.geosociety.org/ histphildiv/awards/student

HYDROGEOLOGY DIVISION

O.E. Meinzer Award

Nominations due 1 Feb.

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

This award recognizes the author or authors of a publication or body of publications that have significantly advanced the science of hydrogeology or a closely related field. The nomination must cite the publication(s) on which the nomination is based and describe the role of the publication(s) in advancing hydrogeology or a closely related discipline. Inclusion of up to three additional third-party letters in support of the nomination is encouraged. https://community.geosociety.org/hydrodivision/awards/ meinzer

George Burke Maxey Distinguished Service Award Nominations due 1 Feb.

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

This award will be made in recognition of distinguished personal service to the hydrogeology profession and to the Hydrogeology Division. The award is based on a history of sustained creditable service to the hydrogeology profession and to the Division. Please submit a letter of nomination that describes the distinguished service that warrants the nomination. Supporting letters are helpful but not required. https://community.geosociety.org/hydrodivision/awards/ serviceaward

Kohout Early Career Award

Nominations due 1 Feb.

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

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

Birdsall-Dreiss Distinguished Lecturer

Nominations due 1 Feb.

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

The lecturer is selected based on outstanding contributions to hydrogeology or a closely related field through original research and public communication and the potential for continued contributions to the profession. Include at least one letter of nomination, a copy of the nominee's curriculum vitae, and at least two supporting letters describing the significant contributions or accomplishments constituting the basis for the nomination. https://community.geosociety .org/hydrodivision/birdsall/past/about2020-2021

LIMNOGEOLOGY DIVISION

Israel C. Russell Award

Nominations due 15 Mar.

Nominations should be forwarded electronically to the Division treasurer David Finkelstein.

This award recognizes major achievements in limnogeology through contributions in research, teaching, and service. Nominations should consist of a letter describing the nominee's accomplishments in the field of limnogeology (broadly defined and including limnogeology, limnology. and paleolimnology), service to students and teaching, and contributions to GSA, as well as a curriculum vitae. https:// community.geosociety.org/limnogeologydivision/awards/russell

Kerry Kelts Research Award

Nominations due 30 June

Nominations should be forwarded electronically to the Division chair.

This award is for undergraduate or graduate student research related to limnogeology, limnology, or paleolimnology. https://

community.geosociety.org/limnogeologydivision/awards/ kerrykelts

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

MGPV Distinguished Geologic Career Award Nominations due 31 Mar.

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

MGPV Early Career Award

Nominations due 31 Mar.

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

PLANETARY GEOLOGY DIVISION (PGD)

G.K. Gilbert Award

Nominations due 1 Dec.

This award recognizes outstanding contributions to the solution of a fundamental problem(s) of planetary geology in its broadest sense, including planetary geology, geochemistry, mineralogy, petrology, tectonics, geophysics, and the field of meteoritics. Such contributions may consist either of a single outstanding publication or a series of publications that have had great influence on the field. https://community.geosociety.org/pgd/awards/gilbert

The Eugene M. Shoemaker Impact Cratering Award Nominations due 19 Aug.

This award is for undergraduate or graduate students, of any nationality, working in any country, in the disciplines of geology, geophysics, geochemistry, astronomy, or biology. The award, which will include US\$2500, is to be applied to the study of impact craters, either on Earth or on the other solid bodies in the solar system. Areas of study may include, but are not limited to, impact cratering processes; the bodies (asteroidal or cometary) that make the impacts; or the geological, chemical, or biological results of impact cratering. https://community.geosociety.org/ pgd/awards/shoemaker

Pellas-Ryder Award

Nominations due 31 Jan.

This award, which is jointly sponsored by the Meteoritical Society and the PGD, is awarded to an undergraduate or graduate student who is first author of the best planetary science paper published in a peer-reviewed scientific journal during the year prior to the award. Potential topics are listed on the cover of *Meteoritics & Planetary Science*, and include asteroids, comets, craters, interplanetary dust, interstellar medium, lunar samples, meteors, meteorites, natural satellites, planets, tektites, and origin and history of the Solar System. https://community.geosociety.org/pgd/awards/pellas-ryder

Ronald Greeley Award for Distinguished Service Nominations due 30 June

This award is given to members of the PGD, and those outside of the Division and GSA, who have rendered exceptional service to the PGD for a multi-year period. The award is not open to serving members of the management board but may be awarded to past members of the management board who have provided exceptional service to the PGD. Nominations, which should include a description of what the nominee has given to the PGD community, may be made by any PGD member to the management board. https:// community.geosociety.org/pgd/awards/greeley

QUATERNARY GEOLOGY AND GEOMORPHOLOGY DIVISION

Farouk El-Baz Award for Desert Research

Nominations due 1 Apr.

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

Distinguished Career Award

Nominations due 1 Apr.

Submit nominations to the Division secretary.

This award is presented annually to a Quaternary geologist or geomorphologist who has demonstrated excellence in their contributions to science. Because the award recognizes research excellence, selfnomination is not permitted. Neither nominators nor nominees need be GSA members. Nominations should include (1) a brief biographical sketch; (2) a statement of no more than 200 words describing the candidate's scientific contributions to Quaternary geology and geomorphology; (3) a selected bibliography of no more than 20 titles; and (4) a minimum of four letters from colleagues supporting the nomination. Please submit electronically unless hardcopy previously approved. https://community.geosociety.org/qggdivision/awards/distinguished-career

Kirk Bryan Award for Research Excellence

Nominations due 1 Feb.

Submit to the Division secretary.

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

SEDIMENTARY GEOLOGY DIVISION

Laurence L. Sloss Award for Sedimentary Geology Nominations due 15 Feb.

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

Sedimentary Geology Division and Structural Geology and Tectonic Division Joint Award: Stephen E. Laubach Structural Diagenesis Research Award Nominations due 1 Apr.

This award promotes research that combines structural geology and diagenesis and curriculum development in structural diagenesis. It addresses the rapidly growing recognition that fracturing, cement precipitation and dissolution, evolving rock mechanical properties, and other structural diagenetic processes can govern recovery of resources and sequestration of material in deeply buried, diagenetically altered and fractured sedimentary rocks. The award highlights the growing need to break down disciplinary boundaries between structural geology and sedimentary petrology, exemplified by the work of Dr. Stephen Laubach and colleagues. Graduate students, postgraduate, and faculty-level researchers are eligible. https://community.geosociety.org/ sedimentarygeologydiv/awards/laubach

STRUCTURAL GEOLOGY AND TECTONIC DIVISION

Career Contribution Award

Nominations due 1 Mar.

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

Outstanding Publication Award Nominations due 1 Mar.

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

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https://www.geosociety.org/webinars



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.

Joint Cordilleran– Rocky Mountain Section

118th Annual Meeting of the Cordilleran Section, GSA

72nd Annual Meeting of the Rocky Mountain Section, GSA

Las Vegas, Nevada, USA | 15–17 March 2022

www.geosociety.org/cd-mtg



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

Rendezvous at the Geologic Crossroads

LOCATION

Join us in Las Vegas, Nevada, USA, for a Rendezvous at the Geologic Crossroads of the Cordillera, Great Basin, and Colorado Plateau. The meeting will be held on the University of Nevada Las Vegas campus, with easy access to museums, restaurants, shopping, and the neon metropolis of the Las Vegas strip. Las Vegas is pleasantly warm and dry in March, and it's a perfect time to explore the city, as well as the world-class geology in nearby Red Rock Canyon Nation Conservation Area, Valley of Fire State Park, Lake Mead National Recreation Area, the Mojave Preserve, and Death Valley National Park. A diverse array of technical sessions, field trips, and short courses highlight the exceptional regional geology including the Neoproterozoic-Paleozoic rift to passive margin stratigraphy; Mesozoic arc and retroarc histories and processes; and the magmatic, sedimentologic, and tectonic record of large magnitude Cenozoic extension. Additionally, current concerns of arid zone hydrogeology, drought science, paleoclimatology, and emerging technologies and mining demands for low CO₂ energy solutions will be featured. We look forward to seeing you in Las Vegas for all that a spring, in-person meeting in the Mojave Desert has to offer!

REGISTRATION

Early registration deadline: 7 Feb.

Cancellation deadline: 14 Feb.

For further information or if you need special accommodations, please contact one of the general co-chairs, Alexis Ault, alexis.ault@ usu.edu, or Michael Wells, michael.wells@unlv.edu

REGISTRATION FEES (all fees are in U.S. dollars)

Member Type	Early		Standard				
	Full Mtg.	One Day	Full Mtg.	One Day			
Professional Member	\$305	\$225	\$335	\$270			
Professional Member 70+	\$205	\$140	\$230	\$170			
Professional Nonmember	\$335	\$245	\$390	\$285			
Early Career Professional	\$275	\$195	\$300	\$240			
Student Member	\$125	\$90	\$140	\$110			
Student Nonmember	\$150	\$100	\$175	\$120			
K-12 Professional	\$135	\$65	\$135	\$90			
Guest or Spouse	\$75	\$70	\$80	\$75			
Field Trip/Short Course Only	\$25	n/a	\$25	n/a			

ACCOMMODATIONS

Hotel registration deadline: 21 Feb.

A block of rooms has been reserved at the Embassy Suites, 4315 S. University Center Drive, Las Vegas, Nevada 89119, USA, which is within walking distance of the University of Nevada Las Vegas campus. The meeting rate is US\$120 per night plus tax. Reservations can be made by calling +1-800-362-2779. Please be sure to identify yourself with the group code CORD/RMGSA22 and that you are attending the Joint GSA Cordilleran and Rocky Mountain Section Meeting. Hotel booking can also be made online at https://www.hilton.com/en/book/reservation/deeplink/? &ctyhocn=LASESES&groupCode=CESCOR&arrival=20220310 &departure=20220322&cid=OM,WW,HILTONLINK,en,Direct Link&fromId=HILTONLINKDIRECT.

TECHNICAL PROGRAM

Symposia

- S1. Honorary Session for B. Clark Burchfiel and Gregory A. Davis for their Seminal Contribution to the Modern Understanding of the North America Cordilleran Orogen. An Yin, University of California Los Angeles, yin@epss .ucla.edu; Brian Wernicke, Caltech, brian@gps.caltech.edu.
- S2. Mesozoic-Cenozoic Tectonic History of Northwestern Mexico and Southwestern USA: A Tribute to César Jacques-Ayala for His Career and Contributions to Sonoran Geology. Alexander Iriondo, Universidad Nacional Autónoma de Mexico, iriondo@geociencias.unam.mx; Arturo Barrón-Díaz, Universidad de Sonora, arturo.barron@ unison.mx; Felipe Escalona-Alcázar, Universidad Autónoma de Zacatecas, fescalona@uaz.edu.mx.
- S3. The Tectono-Magmatic Evolution of the Basin and Range Province: A Session in Honor of Ernie Anderson. Endorsed by the GSA Structural Geology and Tectonics Division. Paul J. Umhoefer, Northern Arizona University; paul.umhoefer@nau.edu; L. Sue Beard, U.S. Geological Survey, Flagstaff; sbeard@usgs.gov; James E. Faulds, Nevada Bureau of Mines and Geology, University of Nevada Reno; jfaulds@unr.edu; David M. Miller, U.S. Geological Survey, Moffet Field, dmiller@usgs.gov.

- S4. Science at the Intersection of Soils, Weathering, Geomorphology, Climate, Ecology and Wildfire— A Tribute to the Careers of Les McFadden and Grant Meyer. Endorsed by GSA Quaternary Geology and Geomorphology Division. Jennifer Pierce, Boise State, jenpierce@boisestate.edu; Lyman Persico, Whitman College, persiclp@whitman.edu; Anne Tillery, U.S. Geological Survey, actillery1@gmail.com; Jennifer Aldred, New Mexico Highlands, jaldred@nmhu.edu; Catherine Opalka, ceopalka@ku.edu.
- S5. Celebrating the 50th Anniversary of the Department of Geoscience at the University of Nevada Las Vegas. Eugene Smith, University of Nevada Las Vegas, gene .smith@unlv.edu; Matthew Lachniet, University of Nevada Las Vegas, matthew.lachniet@unlv.edu.

Theme Sessions

- T1. Late Paleozoic Stratigraphy and Tectonics of the Southwestern Cordillera and Rocky Mountain Region. Endorsed by GSA Sedimentary Geology Division; GSA Structural Geology and Tectonics Division; GSA Quaternary Geology Division. John Singleton, Colorado State University, john.singleton@colostate.edu; Ryan Leary, New Mexico Institute of Mining and Technology, ryan.leary@nmt.edu; Dustin Sweet, Texas Tech University, Dustin.Sweet@ttu.edu; Sven Egenhoff, Colorado State University; Sven.Egenhoff@ colostate.edu.
- T2. Neo-Insights into the Neoproterozoic of Western North America. William Guenthner, University of Illinois Urbana-Champaign, wrg@illinois.edu; Kendra Murray, Idaho State University, kendramurray@isu.edu; Devon Orme, Montana State University, devon.orme@montana.edu; David Pearson, Idaho State University, davepearson@isu.edu.
- T3. Unraveling the History of the Rio Grande Rift: From Contraction to Extension and Evolution of the Rift. Theresa Schwartz, U.S. Geological Survey, tmschwartz@ usgs.gov; Amy Gilmer, U.S. Geological Survey, agilmer@ usgs.gov; Jens-Erik Lund Snee, U.S. Geological Survey, jlundsnee@usgs.gov; Jeremy Caves Rugenstein, Colorado State University, jeremy.rugenstein@colostate.edu; Jason W. Ricketts, University of Texas at El Paso, jricketts@utep.edu.
- T4. Cryptic and Slow-Moving Quaternary-Active Faults in the Western U.S. Richard Koehler, University of Nevada Reno/ Nevada Bureau of Mines and Geology, rkoehler@unr.edu; Joanna Redwine, Bureau of Reclamation, jredwine@usbr.gov; Sylvia Nicovich, Bureau of Reclamation, snicovich@usbr.gov.
- T5. Slip Behavior and Seismic Potential of Active Faults in the North American Cordilleran. Sinan Akciz, California State University Fullerton, sakciz@fullerton.edu; Alexis K. Ault, Utah State University, alexis.ault@usu.edu.
- T6. **From the Sevier to Laramide: Connecting Hinterland to Foreland by Tectonics, Structure, and Sedimentation.** Carla Eichler, Oklahoma Geological Survey, carla.eichler@

ou.edu; Jacob Thacker, New Mexico Bureau of Geology & Mineral Resources, Jacob.Thacker@nmt.edu.

- T7. Geology of Death Valley: Old versus New Ideas, Hypotheses, and Theories. Jeffery R. Knott, California State University, Fullerton, jknott@fullerton.edu; Jim P. Calzia, U.S. Geological Survey, jcalzia@usgs.gov.
- T8. New Insights into the Paleogeographic and Tectonic Evolution of the Cordilleran Foreland Basin. Jennifer Aschoff, University of Alaska Anchorage, jaschoff@alaska .edu; Zhiyang Li, University of Alaska Anchorage and Colorado College, zli@coloradocollege.edu.
- T9. Battery and Energy Metals: Mineral Potential of the Southwestern U.S. Simon Jowitt, University of Nevada Las Vegas, simon.jowitt@unlv.edu; Brian McNulty, University of Nevada Las Vegas, brian.mcnulty@unlv.edu.
- T10. Mining in the Rocky Mountain and Cordilleran Regions and Beyond: Risks and Opportunities. Steven H. Emerman, Malach Consulting, SHEmerman@gmail.com.
- T11. Continental Arc Volcanism: A Crystal's Perspective. Mai Sas, Western Washington University, sasm@wwu.edu; Nathan Andersen, U.S. Geological Survey, nandersen@ usgs.gov.
- T12. Advances in Understanding Arc Magmatism in the SW Cordillera. Robinson Cecil, California State University, Northridge, robinson.cecil@csun.edu; Joshua Schwartz, California State University, Northridge, joshua.schwartz@ csun.edu; Jade Star Lackey, Pomona College, jadestar .lackey@pomona.edu.
- T13. Directly Dating Deformation, Metamorphism, and Metasomatism through Petrochronology. Endorsed by GSA Structural Geology and Tectonics Division; GSA Geochronology Division; GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division. Margaret Odlum, University of Nevada Las Vegas, margaret.odlum@unlv .edu; Cailey Condit, University of Washington, ccondit@ uw.edu; Stacia Gordon, University of Nevada Reno, staciag@unr.edu.
- T14. Paleomagnetism, Rock Magnetism, Environmental Magnetism, Instrumentation, Archaeomagnetism, Planetary Magnetism, and Petrofabrics! Dr. Klaus Petersen, lp-research, Inc., klaus@lp-research.com; Emilio Herrero-Bervera, SOEST-HIGP, University of Hawai'i at Mānoa, herrero@soest.hawaii.edu.
- T15. Records of Quaternary Paleoclimate in the Great Basin. Endorsed by GSA Quaternary Geology and Geomorphology Division. Matthew Lachniet, University of Nevada Las Vegas, matthew.lachniet@unlv.edu; Brendon Quirk, Purdue University, brendonjamesq@ gmail.com; Benjamin Laabs, North Dakota State University, benjamin.laabs@ndsu.edu.

- T16. Quaternary Paleoclimate Records of the Rocky Mountain Region. Endorsed by GSA Quaternary Geology and Geomorphology Division. Shannon Mahan, U.S. Geological Survey, smahan@usgs.gov; Tammy Rittenour, Utah State University, tammy.rittenour@usu.edu; Peter Fawcett, University of New Mexico, fawcett@unm.edu.
- T17. **Contemporary Topics in Arid Zone Hydrogeology.** Michael Nicholl, University of Nevada Las Vegas, michael.nicholl@unlv.edu.
- T18. Integrated Drought Science and Technology. Rebecca J. Frus, U.S. Geological Survey, rfrus@usgs.gov; Katharine G. Dahm, U.S. Geological Survey, kdahm@usgs.gov; Todd J. Hawbaker, U.S. Geological Survey, tjhawbaker@usgs.gov; Adrian P. Monroe, U.S. Geological Survey, amonroe@usgs .gov; Patrick J. Anderson, U.S. Geological Survey, andersonpj@usgs.gov.
- T19. Groundwater Contribution to Flow in Headwater Streams. Endorsed by GSA Hydrogeology Division. William Sanford, Colorado State University, william.sanford@colostate.edu
- T20. Advances and Applications of River Science in the West. Erich Mueller, Southern Utah University, erichmueller@ suu.edu; Alan Kasprak, Fort Lewis College, akasprak@ fortlewis.edu.
- T21. **Hydrogeology of the Nevada National Security Site.** Rebecca J. Frus, U.S. Geological Survey, rfrus@usgs.gov; Tracie R Jackson, U.S. Geological Survey, tjackson@usgs .gov; Mark B. Hausner, DRI, Mark.Hausner@dri.edu.
- T22. Landscape Evolution across Time Scales from the High Plains to the Colorado Plateau. Sean Gallen, Warner College of Natural Resources, Colorado State University, sean.gallen@colostate.edu; Eyal Marder, Warner College of Natural Resources, Colorado State University, eyal.marder@ colostate.edu.
- T23. Trilobites to Tectonics: Advances in Understanding the Lower Paleozoic Stratigraphic Record of the Western U.S. Endorsed by GSA Sedimentary Geology Division. Carol M. Dehler, Utah State University; Ganqing Jiang, University of Nevada Las Vegas, ganqing.jiang@unlv.edu.
- T24. Sedimentary Record of Cordilleran Orogenic Systems. Endorsed by GSA Sedimentary Geology Division; GSA Geochronology Division; GSA Structural Geology and Tectonics Division; GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division; GSA Quaternary Geology and Geomorphology Division. Tomas Capaldi, University of Nevada Las Vegas, tomas.capaldi@unlv.edu; Alexander R. Tye, Dixie State University, alex.tye@dixie .edu; Elizabeth A. Balgord, Weber State University, elizabethbalgord@weber.edu.

- T25. Cretaceous Source Rocks from Texas to Alaska: Depositional, Diagenetic, and Geochemical Signatures across the Western Interior Seaway. Katherine Whidden, U.S. Geological Survey, kwhidden@usgs.gov; Justin Birdwell, U.S. Geological Survey, jbirdwell@usgs.gov; Kate French, U.S. Geological Survey, kfrench@usgs.gov; Richard Lease, U.S. Geological Survey, rlease@usgs.gov; Jason Flaum, U.S. Geological Survey, jflaum@usgs.gov.
- T26. Carbon Capture, Utilization, and Storage (CCUS) in the Rocky Mountain Region. Lisa Stright, Colorado State University, lisa.stright@colostate.edu; Breck Johnson, Occidental Petroleum Corporation, breck_johnson@oxy.com.
- T27. Undergraduate Research Posters. Endorsed by Council on Undergraduate Research (CUR) Geosciences Division. Jeff Marshall, Cal Poly Pomona, marshall@cpp.edu.
- T28. Engaging Communities in Geo-STEM with Technology. Ping Wang, pingwang@nova77.org.
- T29. **Planetary Analogs in the Western U.S.** Ari Koeppel, Northern Arizona University, akoeppel@nau.edu; Jennifer Buz, California Institute of Technology, jennifer.buz@ nau.edu; Helen Eifert, Northern Arizona University, he248@nau.edu.

FIELD TRIPS

GSA's Commitment to Care prioritizes your safety; thus we are implementing the following for all trips:

- Only one person will be allowed per hotel room unless the people are related or are partners.
- If a field trip uses dormitory-style lodging, rooms won't be shared.
- If a field trip uses tent camping for lodging, each person must have their own tent.
- Transportation in minivans, SUVs, vans, and buses will operate at half capacity to allow for social distancing.

For additional information, please contact the Field Trip cochairs: Carol Dehler, carol.dehler@usu.edu, and Ganqing Jiang, ganqing.jiang@unlv.edu. Prices shown below are based on implementation of COVID-19 social distancing restrictions on transportation and lodging and may be lower should pandemic status change.

- FT1. Cretaceous Plutonic Rocks of the Mojave Desert: Markers of Subduction Dynamics. Sat.–Mon., 12–14 March. Cost: US\$380. Leaders: Nicholas J. Van Buer, California State Polytechnic University, Pomona, njvanbuer@cpp.edu; Rita C. Economos, Southern Methodist University, reconomos@ smu.edu; David M. Miller, U.S. Geological Survey, dmiller@ usgs.gov; Allen F. Glazner, University of North Carolina, Chapel Hill, afg@unc.edu; Keith A. Howard, U.S. Geological Survey, khoward@usgs.gov; Calvin F. Miller, Vanderbilt University, calvin.f.miller@vanderbilt.edu.
- FT2. Geologic Highlights of Death Valley National Park. Sat.–Mon., 12–14 March. Cost: US\$510. Leaders: Allen F. Glazner, University of North Carolina at Chapel Hill,

afg@unc.edu; Arthur G. Sylvester, University of California Santa Barbara, sylvester@ucsb.edu; Nathan Niemi, University of Michigan, naniemi@umich.edu.

- FT3. Miocene Extension and Magmatism in the Northern Colorado River Extensional Corridor. Sat.–Mon., 12–14 March. Cost: US\$615. Leaders: Phillip B. Gans, University of California Santa Barbara, gans@geol.ucsb.edu; Evan Monroe, University of California Santa Barbara, emonroe@ucsb.edu.
- FT4. **The Cryogenian Kingston Peak Formation.** Sat.–Mon., 12–14 March. Cost: US\$597. Leaders: Lyle Nelson, Johns Hopkins University, lylelnelson@jhu.edu; Emmy Smith, Johns Hopkins University, efsmith@jhu.edu.
- FT5. Vertebrate Paleontology and Cenozoic Depositional Environments of Death Valley National Park, California. Sat.–Sun., 12–13 March. Cost: US\$415. Leaders: Torrey Nyborg, Loma Linda University; E. Bruce Lander, Paleo Environmental Associates, Inc., and Natural History Museum of Los Angeles County Vertebrate Paleontology Dept., tnyborg06g@llu.edu.
- FT6. Microbialites Right under Our Noses: Miocene and Modern Lakes Near Las Vegas, Nevada. Sun.–Mon., 13–14 March. Cost: US\$205. Leaders: Thomas Hickson, University of St. Thomas, tahickson@stthomas.edu; Kevin Theissen, University of St. Thomas, kmtheissen@ stthomas.edu; and Melissa Lamb, University of St. Thomas, malamb@stthomas.edu.
- FT7. Revisiting the Origin and Evolution of the Lower Colorado River: New Ages, New Mapping, Refined Ideas. Sun.–Mon., 13–14 March. US\$300. Endorsed by GSA Quaternary Geology and Geomorphology Division. Leaders: P. Kyle House, U.S. Geological Survey, khouse@ usgs.gov; Philip A. Pearthree, Arizona Geological Survey, pearthre@email.arizona.edu; Shannon A. Dulin, University of Oklahoma, sdulin@ou.edu.
- FT8. Landslide Deposits and Mechanisms in the Eastern Spring Mountains, Nevada. Mon., 14 March. Cost: US\$120. Leaders: Nicholas Ferry, University of Kansas, nferry@ku.edu; Daniel M. Sturmer, University of Cincinnati, Daniel.Sturmer@uc.edu.
- FT9. Geology of Frenchman Mountain and Rainbow Gardens. Mon., 14 March. Cost: US\$75. Leader: Steve Rowland, University of Nevada Las Vegas, steve.rowland@unlv.edu.
- FT11. Geology and Paleontology of Tule Springs Fossil Beds National Monument. Fri., 18 March. Cost: US\$40. Leaders: Kathleen Springer, U.S. Geological Survey, kspringer@usgs.gov; Jeff Pigati, U.S. Geological Survey, jpigati@usgs.gov; Eric Scott, Cogstone Resource Management, escott@cogstone.com.

- FT12. Structure, Metamorphism, and Geodynamic Significance of the Catalina Schist Terrane. Fri.–Sun., 18–20 March. Cost: US\$880. Leaders: John Platt, University of Southern California, jplatt@usc.edu; Marty Grove, Stanford University, mjgrove@stanford.edu.
- FT13. The Buckskin-Rawhide and Northern Plomosa Mountains Metamorphic Core Complexes, West-Central Arizona. Fri.–Sun., 18–20 March. Cost: US\$480. Leaders: John Singleton, Colorado State University, john.singleton@ colostate.edu; Nikki Seymour, Stanford University, nseymour@stanford.edu.
- FT14. Unraveling the Multi-Phase History of Southern Death Valley Geology. Fri.–Sat., 18–19 March. Cost: US\$585. Leaders: Zachariah Fleming, Occidental College, zfleming@oxy.edu; Terry Pavlis, University of Texas at El Paso, tlpavlis@utep.edu; Ghislain Trullenque, UniLaSalle, ghislain.trullenque@unilasalle.fr.

SHORT COURSES

For additional information, please contact the Short Course chair: Margaret Odlum, margaret.odlum@ unlv.edu.

- SC1. Using the StraboSpot2 Digital Data System. Mon., 14 March, 8:30 a.m.–5 p.m. Cost: US\$25. Conveners: Doug Walker, University of Kansas, jdwalker@ku.edu; Nick Roberts, University of Wisconsin, nmroberts@wisc.edu; Alex Lusk, University of Wisconsin, alusk@wisc.edu; Basil Tikoff, University of Wisconsin, basil@geology.wisc.edu.
- SC2. Critical Metal and Mineral Deposits: An Overview. Mon., 14 March, 9 a.m.–5 p.m. (online/streaming only). Cost: US\$10 students/US\$50 all others. Convener: Simon Jowitt, University of Nevada Las Vegas, simon.jowitt@ unlv.edu.
- SC3. Optically Stimulated Luminescence Dating Short Course: Essential Guide for Sampling and Dark Secrets Behind the Technique. Mon., 14 March, 9 a.m.–5 p.m. Cost: US\$10. Endorsed by GSA Geochronology Division; GSA Quaternary Geology and Geomorphology Division. Convener: Tammy Rittenour, Utah State University, tammy.rittenour@usu.edu.
- SC4. Practical PYTHON for Earth Scientists. Mon., 14 March, 9 a.m.–5 p.m. Cost: US\$50 student; US\$400 professional. Endorsed by Rocky Mountain Association of Geologists; Colorado School of Mines Continuing & Professional Education Services. Convener: Matthew W. Bauer, PG; Colorado School of Mines and Sabata Energy Consultants; bauer@mines.edu.
- SC5. Introduction to Inductively Coupled Plasma Mass Spectrometry. Mon., 14 March, 9 a.m.–5 p.m. Cost: US\$25. Conveners: Chris DeFelice, University of Nevada Las Vegas, defelc1@unlv.nevada.edu; Shichun Huang, University of Nevada Las Vegas, Shichun.huang@unlv.edu.

OPPORTUNITIES FOR STUDENTS AND EARLY CAREER PROFESSIONALS

Mentor Programs

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.

GeoCareers Workshops

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.

To learn more about mentors and career workshops, go to **www.geosociety.org/mentors** or 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 Pamela Burnley, pamela.burnley@unlv.edu

PROFESSIONALS

Interested in sharing information about your applied geoscience or hydrology career with students, or interested in earning CEUs by attending the meeting? Being a mentor is a rewarding experience. To learn more about serving as a mentor at the joint Cordilleran–Rocky Mountain Section Meeting, contact Jennifer Nocerino at jnocerino@geosociety.org.

The meeting also offers an excellent opportunity to earn CEUs toward your continuing education requirements for your employer, K–12 school, or professional registration. Please check the meeting website after the meeting to download your CEU certificate.

CORPORATE SPONSORSHIP

We invite support for the Joint Meeting of the Cordilleran and Rocky Mountain Sections by becoming a sponsor. Sponsorship brings targeted advertising, provides direct connections to diverse professionals and students, and helps underwrite the cost of this special meeting. Interested sponsors of other meeting events should contact Simon Jowitt, simon.jowitt@unlv.edu. In addition, we aim to connect sponsors and industry representatives with students and early career professionals for formal and informal mentoring opportunities. If there are possibilities to engage sponsors for the mentor programs, please contact Debbie Marcinkowski, Executive Director of the GSA Foundation, dmarcinkowski@geosociety.org.

LOCAL COMMITTEE

General Co-Chairs: Michael Wells, michael.wells@unlv.edu; Alexis Ault, alexis.ault@usu.edu

Technical Program Co-Chairs: Tomas Capaldi, tomas.capaldi@unlv.edu; Dennis Newell, dennis.newell@usu.edu

Field Trip Co-Chairs: Carol Dehler, carol.dehler@usu.edu; Ganqing Jiang, ganqing.jiang@unlv.edu

Short Course Chair: Margo Odlum, margaret.odlum@unlv.edu Sponsorships Chair: Simon Jowitt, simon.jowitt@unlv.edu Exhibits Chair: Michael Nicholl, michael.nicholl@.unlv.edu Student Volunteer Chair: Pamela Burnley, pamela.burnley@ unlv.edu



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Sign in to the GSA Member Community & Join the Discussion

Having the GSA Member Community at your fingertips allows you to collaborate on projects, discuss hot-topic issues, and ask for feedback from your peers.

Sign in to:

- Join the conversation by posting in the Open Forum—the all-GSA member discussion group, where any member can post questions, photos, videos, or discuss and share thoughts.
- Connect with GSA members worldwide through the Member Directory.
- Be a part of specific communities based on your discipline or location such as GSA scientific Divisions and geographic Sections.



https://community.geosociety.org



X429 FIELD GEOLOGY IN THE ROCKY MOUNTAINS June 7-July 20 2022

Join us next summer for an intensive 6-week, 6-credit capstone field course taught in western Montana and NW Wyoming from the IU Judson Mead Geologic Field Station in the Tobacco Root Mountains.

3.8 Ga of geologic history, exquisitely exposed. We typically have up to 60 students from over 25 universities, faculty from 6 universities, and a 7:1 student-to-instructor ratio.

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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 meeting will be held at the Duke Energy Convention Center in downtown Cincinnati, Ohio, USA. Renewed interest in the downtown area 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. Five 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 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!

A TWENTY-FIRST-CENTURY MEETING

Our meeting will be in person with a *streaming option*. All oral session rooms will be live-streamed, and all participants who are not on site will be able to see and listen to all presentations in real-time, including Q&A and discussions. Off-site participants will be unable to live chat or talk to the rooms.

REGISTRATION

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, or Rebecca Freeman, rebecca.freeman@ uky.edu. A note about the registration fees: GSA is striving to be inclusive, recognizing that not everyone is able to physically attend meetings. Moreover, the COVID-19 pandemic has resulted in additional constraints on attending meetings in person. The registration fees for this meeting include the costs for the technology that allows participants to attend and present in oral sessions online.

REGISTRATION FEES	(all fees are in U.S.	dollars)
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Member Type	Early		Standard	
	Full Mtg.	One Day	Full Mtg.	One Day
Professional Member	\$280	\$160	\$295	\$200
Professional Member 70+	\$165	\$120	\$200	\$150
Professional Nonmember	\$300	\$200	\$335	\$250
Early Career Professional	\$205	\$145	\$230	\$180
Student Member	\$85	\$65	\$125	\$75
Student Nonmember	\$100	\$80	\$150	\$95
K–12 Professional	\$85	\$65	\$100	\$75
Guest or Spouse	\$65	n/a	\$75	n/a
Field Trip/Short Course Only	\$45	n/a	\$50	n/a

ACCOMMODATIONS

Hotel registration deadline: 15 Feb., 5 p.m. EST 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.

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 or online at https:// www.hyatt.com/en-US/group-booking/CINCI/G-DGSA. In either case, please be sure to identify yourself with the group and that you are attending the GSA Joint North-Central & Southeastern Section Meeting. Both hotels are ADA compliant.

TECHNICAL PROGRAM

Theme Sessions

- T1. Actualistic Paleontology: Learning from the Modern to Better Interpret the Past. Endorsed by SEPM (Society for Sedimentary Geology); 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 Saltzman, 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? Andrew 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 C. 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 R. Dilworth, University of Kentucky, john.dilworth@uky.edu.
- T7. **Recent Advances and Applications in Paleoceanography.** Andrea 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. James Zambito, Beloit College, zambitoj@beloit .edu; Patrick McLaughlin, Indiana Geological & Water Survey, pimclaug@iu.edu.
- T9. Advances in Understanding Processes at or near the Groundwater–Surface Water Interface. Endorsed by GSA Hydrogeology Division. Reza Soltanian, University of Cincinnati, soltanma@uc.edu; Jonathan M. 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. Bradley 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, 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 Arpin, Kentucky Geological Survey, sarah .arpin@uky.edu; Sarah A. Burgess, Indiana Geological & Water Survey, burgesss@iu.edu; Rachel Bosch, Northern Kentucky University, rachelfbosch@gmail.com.
- T13. Water and Agriculture under a Changing Climate. Endorsed by GSA Hydrogeology Division. 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 Arpin, Kentucky Geological Survey, sarah.arpin@uky.edu.
- T15. Down by the River: Recent Interdisciplinary Geoarchaeological and Paleoenvironmental Research in Mid-Continental River Valleys. Benjamin Cross, 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, 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; Matthew 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 Doro, 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 Dept. of Natural Resources, Division of Geological Survey, daniel.blake@dnr.ohio.gov; John Esch, Michigan Dept. of Environment, Great Lakes, and Energy, 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; Katherine Luciano, South Carolina Geological Survey, lucianok@ dnr.sc.gov; Till J.J. Hanebuth, Coastal Carolina University, thanebuth@coastal.edu; Clark Alexander, University of Georgia, clark.alexander@skio.uga.edu.
- T24. Landscape Evolution in Mid-Continental Settings. Jason M. Dortch, Kentucky Geological Survey, 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 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; and Suzanne K. Birner, Berea College, birners@berea.edu.
- T28. **Geoscience in Plain Language.** Andrea Corpolongo, University of Cincinnati, corpolaa@mail.uc.edu; Ezekiel King Phillips, University of Cincinnati, kingphej@mail.uc.edu; Emily Simpson, University of Cincinnati, simpsoey@mail .uc.edu; Megan C. Corcoran, University of Cincinnati, corcormc@mail.uc.edu.
- T29. Undergraduate and Graduate Geoscience Student Showcase. Endorsed by Council on Undergraduate Research Geosciences Division. Claire McLeod, Miami University, mcleodcl@miamioh.edu; Ken Brown, DePauw University, kennethbrown@depauw.edu; James MacDonald, Florida Gulf Coast University, jmacdona@ fgcu.edu; Lee Phillips, University of North Carolina at Greensboro, plphilli@uncg.edu; Jeffrey 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 Geosciences Division. Lee Phillips, University of North Carolina at Greensboro, plphilli@uncg.edu; Jeffrey Ryan, University of South Florida, ryan@mail.usf.edu; Robert 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 S. 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. Richard Bowersox, Kentucky Geological Survey, j.r.bowersox@uky.edu.

- T36. Mineral-Scale Insights on Modern and Ancient Plate Margin Processes. Katherine 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 McGrew, University of Dayton, amcgrew1@udayton.edu; Jeffrey Rahl, Washington and Lee University, rahlj@wlu.edu.
- T39. Intraplate Earthquakes in Central and Eastern USA. Lewis Owen, North Carolina State University, lewis.owen@ ncsu.edu; Ronald C. Counts, Mississippi Mineral Resources Institute, 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 T. 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.** Endorsed by GSA Environmental and Engineering Geology Division; GSA Energy Geology Division. Stephen F. Greb, Kentucky Geological Survey, greb@uky.edu; James McDonald, Ohio Dept. of Natural Resources, Division of Geological Survey, james.mcdonald@ dnr.state.oh.us.
- 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, 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; Katie 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). Endorsed by GSA Environmental and Engineering Geology

Division; GSA Quaternary Geology and Geomorphology Division. Joseph Hannibal, Cleveland Museum of Natural History, jhannibal@uakron.edu; Kevin Evans, Missouri State University, kevinevans@missouristate.edu.

FIELD TRIPS

For additional information, please contact the field trip cochairs: Steve Greb, greb@uky.edu; Claire McLeod, mcleodcl@ miamioh.edu. GSA's Commitment to Care extends to all 2022 Section Meeting field trips. To prioritize your safety, we are implementing the following for all trips:

- Only one person will be allowed per hotel room unless the people are related or are partners.
- If a field trip uses dormitory-style lodging, rooms won't be shared.
- If a field trip uses tent camping for lodging, each person must have their own tent.
- Transportation in minivans, SUVs, vans, and buses will operate at half capacity to allow for social distancing.

Pre-Meeting

- FT1. Hydrogeology and Water Monitoring Technology in Yellow Springs, Ohio, USA. Wed., 6 April. Cost: US\$165. Leaders: Sarah A. Burgess, Indiana Geological & Water Survey, Indiana University, burgesss@iu.edu; Douglas Aden, Ohio Geological Survey, Ohio Dept. of Natural Resources, douglas.aden@dnr.ohio.gov; Brittany Parrick, Ohio Geological Survey, Ohio Dept. of Natural Resources, brittany.parrick@dnr.ohio.gov; Lee Florea, Indiana Geological & Water Survey, Indiana University, Iflorea@ iu.edu; Tracy Branam, Indiana Geological & Water Survey, Indiana University, tbranam@iu.edu.
- FT2. Upper Ordovician and Lower Silurian Facies, Cycles, and Sequences in Southern Ohio: A Field and Core Workshop. Endorsed by Ohio Dept. of Natural Resources, Division of Geological Survey. Wed., 6 April. Cost: US\$70. Leaders: Carlton E. Brett, University of Cincinnati, brettce@ ucmail.uc.edu; Christopher Waid, Ohio Dept. 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.

Post-Meeting

- FT3. Geology of the Central Kentucky Karst and Mammoth Cave. Fri., 8 April (evening departure); return Sun., 10 April (morning). Cost: US\$187. Leaders: 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.
- FT4. Natural Arches in the Red River Gorge Area. Fri.–Sun., 8–10 April. Cost: US\$530. Leader: Steve Martin, Kentucky Geological Survey, smartin401@uky.edu.

- FT5. A Bike Tour: Piecing Together the Surficial Geology and History of Four Mile Creek River Valley, Ohio, USA. Sat., 9 April. Cost: US\$72 if you don't bring your own bike and helmet; US\$52 if you bring your own bike and helmet. Leaders: Christina Tenison, Miami University, tenisocn@ miamioh.edu; Jason Rech, Miami University, rechja@ miamioh.edu.
- FT6. A New Look at the Classic Cincinnatian: Sequences, Cycles, and Events in the Upper Ordovician of the Cincinnati Vicinity. Sat., 9 April. Cost: US\$75. Leaders: 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.
- FT7. Buried-Valley Aquifers and the Theis Environmental Monitoring and Modeling Site. Sat., 9 April. Cost: US\$85. Leaders: Reza Soltanian, University of Cincinnati, soltanma@uc.edu; Alan Fryar, University of Kentucky, afryar1@uky.edu.
- FT8. Defenses of Cincinnati: Geological and Topographical Aspects of Civil War Forts and Batteries, Camp Dennison, and Morgan's Raid. Sat., 9 April. Cost: US\$100. Leaders: 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.
- FT9. Organic-Rich Rocks and Associated Sediments near the Devonian-Mississippian Boundary in Northeastern Kentucky. Sat., 9 April. Cost: US\$215. Leaders: 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.
- FT10. Pleistocene Geology, Paleontology, and History of Science at Big Bone Lick, Kentucky, USA. Sat., 9 April. Cost: US\$85. Leaders: Glenn W. Storrs, Cincinnati Museum Center, gstorrs@cincymuseum.org; Cameron Schwalbach, Cincinnati Museum Center, cschwalbach@cincymuseum.org.
- FT11. Revisiting the Wisconsinian Depositional History of the Southernmost Extent of the Scioto Sublobe, Ohio. Sat., 9 April. Cost: US\$283. Leaders: T. Andrew Nash, Ohio Dept. of Natural Resources, Division of Geological Survey, thomas.nash@dnr.ohio.gov; Tyler Norris, Ohio Dept. of Natural Resources, Division of Geological Survey, tyler .norris@dnr.ohio.gov; Thomas Valachovics, Ohio Dept. of Natural Resources, Division of Geological Survey, thomas .valachovics@dnr.ohio.gov.

SHORT COURSES

For additional information, please contact the short course organizer, Jason Dortch, jason.m.dortch@uky.edu.

- SC1. Designing Instructional Access and Inclusion across Geoscience Learning Environments. Sat., 9 Apr., 9 a.m.–4 p.m., with lunch break. Cost: US\$25 students/ US\$50 professionals. Max. participants: 25. Leaders: 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.
- SC2. Fluvial Terraces: From Modeling to the Field. Sat., 9 Apr., 1–4 p.m. Cost: US\$25 students/US\$50 professionals. Max. participants: 25 people. Leaders: 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.
- SC3. Methods of Metal Pollution Investigation. Sat., 9 Apr., 8:30 a.m.-4 p.m., with lunch break 11:45 a.m.-1:15 p.m. Cost: US\$25 students/US\$50 professionals. Max. participants: 30. Leaders: 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.
- SC4. Professional Registration and Preparation Tips for National Professional Geologist (PG) Exams. Sat., 9 Apr., 9 a.m.–noon. Cost: US\$25 students/US\$50 professionals. Leader: William Andrews, Kentucky Geological Survey, wandrews@uky.edu.
- SC5. Résumé and Cover Letter Clinic: A Workshop for GSA On To the Future (OTF) Students. Sat., 9 April, 8:30 a.m.– 12:30 p.m. Cost: Free for OTF students. Max. participants: 20. Leaders: Stephen K. Boss, University of Arkansas, sboss@uark.edu; Katherine Ellins, University of Texas at Austin, kellins@jsg.utexas.edu.

OPPORTUNITIES FOR STUDENTS AND EARLY CAREER PROFESSIONALS

Mentor Programs

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.

GeoCareers Workshops

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. To learn more about mentors and career workshops, go to **www.geosociety.org/mentors** or contact Jennifer Nocerino at jnocerino@geosociety.org.

SPECIAL EVENTS

- 1. Henry Darcy Distinguished Lecture. Thurs., 7 April. Sponsored by the Groundwater Foundation. Chen Zhu, Indiana University, "Watershed-Scale Hydrological Models as a Community CyberPlatform for Research, Teaching, and Service to Society."
- **2. Sustainability Panel Discussion.** Thurs., 7 April. Corporate, government, and university sustainability officers will discuss current approaches, future directions, and potential career opportunities for geoscientists.
- 3. Directions in Geoscience Research and Careers: Virtual Outreach Event for Local Students. Friday, 8 April. Faculty, graduate students, and geoscience professionals will meet with high school students to discuss geoscience research and careers in a virtual open house event. Please email Andrea Corpolongo at corpolaa@mail.uc.edu or Meg Corcoran at corcormc@mail .uc.edu if you are interested in taking part in this event.
- **4. Midwest MinPet.** Thurs., 7 April. Teachers, researchers, students, faculty, and other practitioners of hard rock geology will meet to socialize, network, and share ideas on how to build connections and collaborations across our region.
- **5. Historic Buildings and Building Stone of Cincinnati.** Fri., 8 April. All meeting registrants are welcome to join an informal post-meeting walking tour of downtown Cincinnati, with optional stops at various locations.

TRAVEL GRANTS

Deadline to apply: 28 Feb.

The Southeastern Section is pleased to offer support for the cost of student travel to the meeting. For more information, go to **www.geosociety.org/gsa/about/sections/GSA/Sections/se/students.aspx.**

The North-Central Section is also pleased to offer support for the cost of student travel to the meeting. For more information, go to www.geosociety.org/GSA/Education_Careers/Grants_ Scholarships/Travel_Grants/GSA/grants/NCgrant.aspx.

PROFESSIONALS

Interested in sharing information about your applied geoscience or hydrology career with students, or interested in earning CEUs by attending the meeting? Being a mentor is a rewarding experience. To learn more about serving as a mentor at the Joint North-Central–Southeastern GSA Section Meeting, contact Jennifer Nocerino at jnocerino@geosociety.org.

The North-Central–Southeastern GSA Section Meeting also offers an excellent opportunity to earn CEUs toward your continuing education requirements for your employer, K–12 school, or professional registration. Please check the meeting website after the meeting to download your CEU certificate.

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, afryar1@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; Claire 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 Sponsorships Chair: David P. Moecher, moker@uky.edu Student Volunteer Chair: Maija Sipola, sipolame@miamioh.edu

GeoCareers Programs at the 2022 Section Meetings

CAREER WORKSHOPS

Geoscience Career Workshop Part 1: Career Planning and Networking. Your job-hunting process should begin with career planning, not when you apply for jobs. This workshop will help you begin this process and practice your networking skills. This workshop is highly recommended for freshmen, sophomores, and juniors. The earlier you start your career planning the better.

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

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

MENTOR PROGRAMS

GSA student members will have the opportunity to discuss career prospects and challenges with applied geoscientists from various sectors.

South-Central Section Meeting

Shlemon Mentor Program: Monday, 14 March Mann Mentors in Applied Hydrology Program: Tuesday, 15 March

Joint Cordilleran and Rocky Mountain Section Meeting

Shlemon Mentor Program: Tuesday, 15 March Mann Mentors in Applied Hydrology Program: Wednesday, 16 March

Northeastern Section Meeting

Shlemon Mentor Program: Sunday, 20 March Mann Mentors in Applied Hydrology Program: Monday, 21 March

Joint North-Central and Southeastern Section Meeting

Shlemon Mentor Program: Thursday, 7 April Mann Mentors in Applied Hydrology Program: Friday, 8 April

MENTORING**365**.

AMS



DEVELOP PROFESSIONAL CONNECTIONS WITH VIRTUAL MENTORING

As a GSA member, you now have access to join Mentoring365 as a mentor or mentee.

Through a three month mentorship, mentees will develop a professional relationship to help grow their network and navigate career opportunities. Mentors benefit by giving back to the geoscience community and helping to advance their communication and leadership skills.



In partnership with





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Sign up now at https://mentoring365.chronus.com/p/p1/

Apply for a GSA Graduate Student Research Grant

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Applying for a graduate student research grant provides career development opportunities, helps you gain experience with grant writing and project development, and supports your research in the geosciences.

We strongly encourage applications from individuals who are Black, Indigenous, or Persons of Color as well as all other groups that are underrepresented in the geosciences so that we can strengthen and prioritize diversity, equity, and inclusion efforts within the geosciences and achieve success in research.

- About 300–400 recipients annually
- Grants range \$500-\$2,500 per student
- Applications accepted 1 Dec.-2 Feb.

"This is the first GSA student research grant that I have received, and it feels in a way like I have been made 'official.' GSA has been an important part of my early career, and I am proud to conduct research under the society's banner. I look forward to completing this funded project and publishing the results." —Fabian Hardy, 2020 Graduate Student Research Grant Recipient

Recently Funded Projects:

A Possible Late Cretaceous Impact Structure in Black Mesa, Arizona

A Geomorphic Analysis of a Rare Southwestern Wetland: Implications for Conservation

Effect of Ephemeral Dissolved Oxygen Fluctuations on Iron and Manganese Cycling in a Drinking Water Reservoir

Understanding Landslide-Induced Reservoir Sedimentation in the Caonillas Reservoir, Puerto Rico

THE GEOLOGICAL SOCIETY OF AMERICA®





www.geosociety.org/gradgrants



J. David Lowell Field Camp Scholarships

GSA and the GSA Foundation are proud to announce that J. David Lowell Field Camp Scholarships will be available to undergraduate geology students for the summer of 2022. These scholarships will provide students with US\$2,000 each to attend the field camp of their choice. Applications are reviewed based on diversity, economic/financial need, and merit.

Application deadline: 25 Mar. 2022

Learn more: **www.geosociety.org/field-experiences Questions?** Contact Jennifer Nocerino, jnocerino@geosociety.org.





CALL FOR APPLICATIONS

2022–2023 GSA-USGS Congressional Science Fellowship

Bring your science and technology expertise to Capitol Hill to work at the interface between geoscience and public policy.

The GSA-USGS Congressional Science Fellowship provides a rare opportunity for a geoscientist to spend a year working for a member of Congress or congressional committee. If you are a geoscientist with a broad scientific background, experience applying scientific knowledge to societal challenges, and a passion



for helping shape the future of the geoscience profession, GSA and the USGS invite your application. The fellowship is open to GSA members who are U.S. citizens or permanent residents. A Ph.D. at the time of appointment or a master's degree in engineering plus five years of

professional experience is required.

APPLICATION DEADLINE:

Learn more at **www.geosociety.org/csf** or by contacting Kasey White, +1-202-669-0466, kwhite@geosociety.org.





Explore Geoscience-Related Opportunities on America's Public Lands

Enhance your skills and connect with professionals working in paleontology, caves and karst, geohazards, mapping and applied GIS, hydrology, fluid and solid minerals, soils, and more. Experience unique projects where you can contribute to the science and management of national forests and federal public lands nationwide.

Spring/Summer 2022 projects now posted— Apply by 3 Feb.

Visit **www.geosociety.org/geocorps** for available opportunities

GSA FOUNDATION





Cultivate your Connection to America's National Parks

Scientists in Parks provides all aspiring professionals especially those underrepresented in science—with a unique opportunity to work on important real-world projects while building professional experience and a life-long connection to America's national parks.

Spring/Summer 2022 opportunities now posted – Apply by 23 Jan.

View and apply for select projects at **www.geosociety.org/sip.**

Learn more from the NPS about the program and related opportunities at https://go.nps.gov/ scientistsinparks.

Questions? Contact us at sip@geosociety.org









GSA FOUNDATION



Help Shape the Future of Geoscience

Deadline: 15 June 2022

Terms begin 1 July 2023 (unless otherwise noted)

GSA has opportunities for you to network, build your skillset, and work toward common goals. We invite you to volunteer or nominate a fellow GSA member to serve on a committee or as a representative to another organization. Volunteers are the lifeblood of GSA.

Go to https://rock.geosociety.org/Nominations/CS.aspx to volunteer or nominate. Open positions and qualifications are also detailed online at https://rock.geosociety.org/forms/ viewopenpositions.asp. Questions? Contact Dominique Olvera, dolvera@geosociety.org; P.O. Box 9140, Boulder, CO 80301-9140, USA; fax: +1-303-357-1060. You can volunteer at any time; terms begin 1 July 2023 unless otherwise noted.

Academic and Applied Geoscience Relations Committee

Member-at-Large Industry (3-year term; E, M)

This committee is charged with strengthening and expanding relations between GSA members in applied and academic geosciences. As such, it proactively coordinates the Society's effort to facilitate greater cooperation between academia, industry, and government geoscientists. **Qualifications:** Committee members must work in academia, industry, or government and be committed to developing a better integration of applied and academic science in GSA meetings, publications, short courses, field trips, and education and outreach programs. Professional interest: environmental and engineering geology, hydrogeology, karst, quaternary geology and geomorphology, structural geology and tectonics, and/or sedimentary geology. Members must also be active in one or more GSA scientific Divisions.

Annual Program Committee Two Members-at-Large (4-year term; B, E, M); Member-at-Large Student (2-year term)

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

Arthur L. Day Medal Award

Two Members-at-Large (3-year term; E, T)

This committee selects candidates for the Arthur L. Day Medal. **Qualifications:** Members should have knowledge of those who have made "distinct contributions to geologic knowledge through the application of physics and chemistry to the solution of geologic problems." All the committee's work will be accomplished during the months of February and March. Committee decisions must be made by 1 April.

Bascom Mapping Award Committee

Member-at-Large Government; Member-at-Large; Member-at-Large Industry (3-year term; E, T)

This committee selects candidates for the Florence Bascom Geologic Mapping Award. This award acknowledges contributions in published high-quality geologic mapping that led the recipient to publish significant new scientific or economicresource discoveries, and to contribute greater understanding of fundamental geologic processes and concepts. **Qualifications:** Members should be knowledgeable in the field of mapping.

Diversity in the Geosciences Committee Two Members-at-Large; Member-at-Large Student; Member-at-Large Industry (3-year term; E, M)

This committee provides advice and support to GSA Council, raises awareness, and initiate activities and programs that will increase opportunities for diverse groups in the geosciences particularly in the dimensions of race, ethnicity, gender, and physical abilities. The committee is also charged with stimulating recruitment and promoting positive career development. **Qualifications:** Members of this committee must have professional or experiential knowledge of issues relevant to the goals of the committee. GSA strongly encourages members who are from the communities for which this committee is expected to serve.

Education Committee

4-Year College Faculty Representative (4-year term; E, M); Member-at-Large (4-year term; E, M); Graduate Student Representative (2-year term; B, E, M)

This committee works with GSA members representing a wide range of education sectors to develop informal, pre-college (K–12), undergraduate, and graduate earth-science education and outreach objectives and initiatives. **Qualifications:** Members of this committee must have the ability to work with other interested scientific organizations and science teachers' groups.

Geology and Public Policy Committee Two Members-at-Large (3-year term; E, M); Member-at-Large Student (3-year term; E, M)

This committee provides advice on public policy matters to Council and GSA leadership by monitoring and assessing international, national, and regional science policy; formulating and recommending position statements; and sponsoring topical white papers. This committee also encourages the active engagement in geoscience policy by GSA members. **Qualifications:** Members should have experience with public-policy issues involving the science of geology; ability to develop, disseminate, and translate information from the geologic sciences into useful forms for the public and for GSA members; and familiarity with appropriate techniques for the dissemination of information.

B-Meets in Boulder or elsewhere; E-Communicates by phone or video; M-Meets at the Annual Meeting; T-Extensive time commitment required during application review period.

GSA International

Chair (4-year term; E, M); Member-at-Large (4-year term; E, M); Secretary (4-year term; E, M)

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

Membership and Fellowship Committee Two Members-at-Large Industry (3-year term; B); Member-at-Large Student (3-year term; B)

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

Nominations Committee

Two Members-at-Large (3-year term; B, E)

This committee recommends nominees to GSA Council for the positions of GSA Officers and Councilors, committee members, and Society representatives to other permanent groups. **Qualifications:** Members must be familiar with a broad range of well-known and highly respected geoscientists.

North American Commission on Stratigraphic Nomenclature

GSA Representative (3-year term; E, M)

This committee develops statements of stratigraphic principles, recommends procedures applicable to classification and nomenclature of stratigraphic and related units, reviews problems in classifying and naming stratigraphic and related units, and formulates expressions of judgment on these matters. **Qualifications:** Members must be familiar with of the fields of paleontology, biostratigraphy, and stratigraphy.

Penrose Conferences and Thompson Field Forums Committee

Member-at-Large (3-year term; E)

This committee reviews and approves Penrose Conference and Thompson Field Forum proposals and recommends and implements guidelines for the success of these meetings. **Qualifications:** Committee members must be early-career scientists/professionals.

Penrose Medal Award Committee

Two Member-at-Large (3-year term; E, T)

Members of this committee select candidates for the Penrose Medal Award. Emphasis is placed on "eminent research in pure geology, which marks a major advance in the science of geology." **Qualifications:** Members should be familiar with outstanding achievers in the geosciences worthy of consideration for the honor. All of the committee's work will be accomplished during the months of February and March. All decisions must be made by 1 April.

Professional Development Committee

Two Members-at-Large (3-year term; E)

This committee directs, advises, and monitors GSA's professional development program; reviews and approves proposals; recommends and implements guideline changes; and monitors the scientific quality of courses offered. **Qualifications:** Members must be familiar with professional development programs or have adult education teaching experience.

Public Service Award Committee

Member-at-Large (3-year term; B, E, M)

The purpose of this committee is to generate, receive, and evaluate candidates for the GSA Public Service Award and the AGI Outstanding Contributions to the Public Understanding of the Geosciences Award. These awards are in recognition of outstanding individual contributions to either public awareness of the earth sciences or the scientific resolution of earth-science problems of significant societal concern.

Publications Committee

Member-at-Large (4-year term; B, E, M)

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

Research Grants Committee

Eleven Members-at-Large with various specialties (3-year term; B, T)

The primary function of this committee is to evaluate about 800 graduate student research grant applications and award specific grants to chosen recipients, including some named grants supported by funds within the GSA Foundation. **Qualifications:** Members may come from any sector (academia, government, industry, etc.) and should have experience in directing research projects and in evaluating research grant applications. GSA strongly encourages nominations of geoscientists from diverse backgrounds and institutions, particularly from minority-serving institutions. **Extensive time commitment required 15 Feb.–15 April.** Each member reviews about 40 applications. Learn more about the grants program at **www.geosociety.org/gradgrants.**

Young Scientist Award (Donath Medal) Committee Three Members-at-Large (3-year term; E,T)

Committee members investigate the achievements of young scientists who should be considered for this award and make recommendations to GSA Council. **Qualifications:** Members should have knowledge of young scientists with "outstanding achievement(s) in contributing to geologic knowledge through original research which marks a major advance in the earth sciences." All the committee's work will be accomplished during the months of February and March. All decisions must be made by 1 April.

GSA Today Science Editor Changes



Outgoing science editor **Mihai N. Ducea** is a professor of geology at the University of Arizona and also holds a courtesy appointment at the University of Bucharest. He received a Ph.D. at the California Institute of Technology. Ducea's research is aimed at understanding the links between igneous and metamorphic petrologic processes and the tectonic evolution of continents. He is interested in continental mar-

gin processes and conducts fieldwork at various locations in the western North American Cordillera, the central Andes, the Carpathians, and southern Tibet. He runs a geochemical and radiogenic isotope laboratory at the University of Arizona. Ducea is a GSA Fellow who has published 50 papers in GSA journals (*Geology, GSA Today, GSA Bulletin, Geosphere*, and *Lithosphere*) over the past 20 years and has co-edited a GSA Memoir (2015) and a GSA Special Paper (2005).



Incoming science editor **Jim Schmitt** is professor emeritus of geology at Montana State University. His research has focused primarily on tectonic controls on sedimentation, depositional systems, and paleontology. He is a GSA Fellow who has served as science editor of *Geology* (2016–2020), associate editor of *GSA Bulletin* (2006–2009). and co-author of a GSA Special Paper (2017). He has also served on the GSA Publications

Committee and the Research Grants Committee and is a member of the Federal Advisory Committee for the National Cooperative Geological Mapping Program (NCGMP).



Peter Copeland continues his work at science editor through Dec. 2022. He is a professor in the Dept. of Earth and Atmospheric Sciences at the University of Houston. His research has focused primarily on thermochronology and its application to continental tectonics. He is the author of *Communicating Rocks: Writing, Speaking, and Thinking about Geology* (2012, Pearson). From 2001–2004, he was the co-editor of the *GSA Bulletin*.

2022 GSA Science Editors

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

GSA thanks the editors whose terms ended 31 December 2021 for their service to the Society and to the science: **Rob Strachan**, *GSA Bulletin*; **Chris Clark**, *Geology*; **Shanaka de Silva**, *Geosphere*; and **Mihai N. Ducea**, *GSA Today*.

Thank you to our continuing editors:

GSA books, **Joan Florsheim,** University of California, Santa Barbara

GSA books, **Christian Koeberl**, University of Vienna and Natural History Museum, Vienna

GSA books, **Nancy Riggs,** Northern Arizona University

GSA Bulletin, Brad Singer, University of Wisconsin–Madison

GSA Bulletin, **Wenjiao Xiao**, Chinese Academy of Sciences

Geology, Kathleen C. Benison, West Virginia University

Geology, **William Clyde**, University of New Hampshire

Geology, **Gerald Dickens**, Trinity College Dublin

Geology, **Marc D. Norman**, Australian National University

Geology, **Urs Schaltegger**, University of Geneva

Geosphere, **David E. Fastovsky**, University of Rhode Island (appointed to a second term)

Geosphere, **Andrea Hampel**, Leibniz University Hannover

GSA Today, **Peter Copeland,** University of Houston

Environmental & Engineering Geoscience, Eric Peterson, Illinois State University Please join us in welcoming the science editors beginning terms this month:

GSA Bulletin, **Mihai Ducea**, University of Arizona

Geology, **Rob Strachan**, University of Portsmouth

Geosphere, **Chris Spencer**, Queen's University

GSA Today, **Jim Schmitt**, Montana State University

Find the current list of editors at www.geosociety.org/editors.

Four Position Statements Updated

In October 2021, GSA Council approved a major revision to the Water Resources position statement, now titled Water Resources: Quantity. Minor revisions to three other statements were also approved: Supporting Planetary Exploration, Teaching Evolution, and Rewarding Professional Contributions in Public Spheres. Summary statements are below and full versions of all position statements are online at **www.geosociety.org/positionstatements**. GSA members are encouraged to use the statements as geoscience communication tools when interacting with policy makers, students, colleagues, and the general public.

WATER RESOURCES: QUANTITY

Population growth drives decisions about water use for industrial, agricultural, municipal, and recreational purposes. Increasing demands and a changing climate pose significant, immediate challenges to ensuring sustainability of surface- and groundwater resources in the United States and globally. Broad, outcome-oriented water-resource science policies and initiatives are needed to address these issues.

SUPPORTING PLANETARY EXPLORATION

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

TEACHING EVOLUTION

Evolution and the directly related concept of deep (geologic) time are essential parts of science curricula at all levels of education. The evolution of life on Earth stands as one of the central concepts of modern science that is accepted by the scientific community. Two centuries of research in geology, paleontology, and biology have produced an increasingly detailed, consistent, and robust picture of how life on Earth evolved. Creationism, whether presented as creation "science" or intelligent design, attempts to explain complicated phenomena of the natural world by invoking a supernatural creator or designer. Creationism cannot be tested using the scientific method and therefore has no place in a science curriculum.

REWARDING PROFESSIONAL CONTRIBUTIONS IN PUBLIC SPHERES

GSA encourages, affirms, and supports positive contributions of geoscientists and earth-science educators to the public spheres. The time, effort, talent, and intellectual capital that are invested by geoscientists and earth-science educators in public policy, education, and research on teaching and learning are critically important for educating and safeguarding local, regional, national, and global populations. GSA welcomes these professional contributions to the public sphere and encourages the broader professional community to support, prioritize, and acknowledge this vital work as scholarly activity. As such, GSA recommends that geoscientists in academia, government service, and professional practice receive formal recognition and reward for such efforts through positive performance evaluations, reappointments, promotions, and tenure reviews. GSA also encourages support, by means of appropriate reassigned time or travel assistance to conferences, workshops, and other appropriate endeavors, to those individual geoscientists engaged in substantive professional activity on issues of public policy, education, and research on teaching and learning.

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

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



Position Statement Draft

GSA members are invited to submit comments and suggestions regarding the following new position statement by 15 February. Go to **www.geosociety.org/PositionStatements** to learn more and submit comments.

ETHICS OF RESPONSIBLE GEOLOGIC FIELDWORK

Position Summary. This position statement provides guidance on the Geological Society of America's (GSA) best geologic fieldwork practices. GSA urges its members to conduct fieldwork in an ethical, respectful, and sustainable manner that (1) provides a safe, equitable, and inclusive environment for conducting responsible fieldwork; (2) respects the land rights and laws of local, state, and federal jurisdictions, tribal, Indigenous peoples, and local communities, and private landowners; (3) obtains the proper fieldwork and collection permission and follows all agreed-upon work as specified; and (4) minimizes destruction of outcrop and disturbance of the landscape. In active conflict zones, GSA opposes fieldwork and the collection of geological samples (e.g., rock, mineral, sediment, soil samples, etc.) and fossils of any type for any purpose, such as research, education, and public display (e.g., museums, publication, and sale).

CONCLUSIONS AND RECOMMENDATIONS

- Plan all fieldwork carefully to provide a safe, respectful, equitable, and inclusive field environment for all. Make clear upfront that discrimination, harassment, and/or bullying will not be tolerated.
- Obtain all necessary permits and permissions to access and collect geological samples and fossils on public or private lands. Be aware of all laws related to the disturbance and restoration of cultural and historical areas or where there may be cultural artifacts and human remains.
- Educate yourself on the historical and current geopolitical events in a region in which you plan to conduct research.
- Include, where possible, researchers from local universities and institutions, local cultural knowledge-holders, and domain experts in fieldwork. Give authorship and/or financial compensation to collaborators regardless of affiliation or educational status.
- Determine if specimens collected in a given area may have been collected illegally or during a period of conflict.
- Consider the following questions in advance of conducting fieldwork:
 - Who is connected to and knowledgeable of the areas in which you do fieldwork? (Consider that knowledge and expertise come in many forms.) How will you compensate collaborators and community members for their contributions?
 - What are the benefits of your research to the people and places connected to your work? What are the potential harms?
 - How might research activities physically impact the places in which you work? How will your research impact future access to the place or resources you use?
 - ° What safety risks might arise during fieldwork?

RATIONALE

Conduct in the Field. Fieldwork has traditionally been one of the least diverse and inclusive activities in geology. Yet inclusion, diversity, and equity are as important in fieldwork as any other area of research. GSA requires field-trip leaders and field-trip participants to be aware of the large differences that exist in individuals' exposure to outdoor activities. Leaders and participants are to work actively to assure everyone in a field party is operating at the same level of comfort, acceptance, awareness, and safety. Everyone in a field party is equally part of the group. This will require pre-trip checking ahead of time as to attitudes and to make sure everyone has appropriate field gear.

Fieldwork often occurs in remote settings with cultural norms different from host institutions. Field-trip leaders are to prepare themselves in advance by anticipating problems that might arise. Field-trip leaders should inform and set expectations for both the field party and local stakeholders before the field trip. Once in the field, it is too late.

Field parties are to operate at all times under the same codes of conduct applicable to meetings and academic institutions, such as those adopted by the American Geoscience Institute, American Geophysical Union, and GSA, despite operating independently and/or in isolated areas. Furthermore, field-trip leaders need to familiarize themselves with local laws and jurisdictions that are likely different from home jurisdictions and communicate them to the group before the field trip to ensure everyone is aware of them.

Field parties are to have a mechanism for reporting behavioral misconduct. The attitude that "what happens in the field, stays in the field" is unacceptable and is an invitation for abuse and harassment. All members of a field party are to be aware that any incidents will be reported. Research shows that setting rules and providing outlets for reporting up front reduces the occurrence of behavioral misconduct (see reference).

The safety of the group and each individual is the number-one priority during fieldwork. Sampling, movement to and in remote locations, and rapidly changing weather conditions can be challenging—even dangerous. Field-trip leaders are to stress safety and to recognize that individuals have different levels of awareness of safety. First aid kits, First aid training, CPR training, and cellular or satellite phone emergency communications are essentials whose procurement is the leader's responsibility. The leader is also to assure that multiple people in the field party have the skills and knowledge to use these items or perform these activities. The names and emergency contact information for all individuals in the field party should be on hand and made available to the host institution prior to departure for the field.

Illegal Collecting. Illegal collecting is the collection of any material without obtaining the proper permissions from relevant authorities prior to site access. Permissions may be in the form of collecting permits from government agencies or explicit permission by a private landowner (preferably in writing). It is often illegal to remove resources from the country of origin. It is the responsibility of the collector to know the legality of collecting in the region in which they wish to work.

Regardless of whether fieldwork is conducted domestically or internationally, the necessary permits and permissions are essential to collect geological samples and fossils on public or private lands. If proper permits and/or permissions are not obtained for any reason (e.g., absence of permitting office due to unstable government, or requests denied), fieldwork and collection should not occur. Collection from field localities includes mindful and respectful retrieval of samples that preserves the outcrop for further study and does not disturb cultural artifacts or human remains. It is critical to have full documentation of provenance in terms of stratigraphic, structural, geographic, taphonomic, and paleoenvironmental information where appropriate. If cultural artifacts or human remains are disturbed, geologists should be fully aware of all laws and expectations for restoration or repatriation.

Human Remains and Cultural Artifacts. Human remains must always be treated with dignity and respect. Cultural artifacts, particularly those belonging to Indigenous groups and artifacts found in or near burial sites, should also be treated with respect, because these objects hold high cultural and spiritual importance.

GSA members should understand the laws and ethical codes that govern archeological, biological, and human or cultural fields of study outside of the typical scope of the GSA. Human remains and cultural artifacts are protected under international, U.S. federal, and tribal law. Indigenous groups have jurisdiction because they are lineal descendants of the deceased individual(s) or the groups who produced the artifact(s). If GSA members encounter human remains or cultural artifacts on federal or tribal lands, regardless of the purpose of the fieldwork, they are required to leave these objects where they are and report their existence to the appropriate lineal descendants (e.g., Native American governing organizations, local cultural stewards and practitioners, etc.) and to follow the Native American Graves Protection and Repatriation Act (NAGPRA).

Illegal Trade. Illegal trade is defined herein as barter, sale, and/ or acquisition of fossils and other geological samples in a fashion that is against the laws of the country or region from which those samples and fossils were collected. GSA members shall not contribute, directly or indirectly, to the illegal trade of geological samples and fossils. Direct contributions to illegal trade would include the sale or purchase of geological samples or fossils when the provenance or mode of acquisition is known to be nefarious. Knowingly buying and selling geological samples and fossils that were obtained illegally is the worst of these offenses. Indirectly promoting illegal trade can include conducting research on geological samples or fossils that were collected through illegal means. In this case, the researcher may be unaware a given sample or fossils were acquired illegally. Researchers can avoid cases like this by knowing the full provenance of a geological sample or fossil before conducting research. Research on geological samples or fossils illegally collected and traded must be avoided, because adding research value to those specimens ultimately will increase their monetary value and encourage future illegal trade of similar specimens. Beyond jeopardizing the paleontological and geological resources of a given country, the illegal trade of geological samples and fossils can drive unsafe work conditions and, in some examples, even slave labor.

Conflict Zones. Conflict zones are not formally defined by the United Nations or by other international organizations but are rather described by general criteria that can include the presence of an international or domestic armed conflict; the transition from an armed conflict to peace; widespread or serious human rights violations and abuses; political and social instability or repression; or institutional weakness or collapse of state infrastructure. Fieldwork and collection in conflict zones may increase the risks of scientists being complicit in human rights abuses committed by other actors and might further encourage exploitation of these resources (refer to Illegal Trade–Direct and Indirect). GSA does not condone fieldwork in active conflict zones.

Collaborative Endeavors. GSA recommends members include international collaborations or involve the appropriate Indigenous groups (including those groups without federal recognition) and cultural stewards who are living and working in the research study region. These collaborations can foster a shared learning experience, promote cultural awareness, and build capacity in the local community, if appropriate. Collaborations not only make our field more inclusive by building, strengthening, and maintaining a community of diverse views and experiences, but will also help to increase awareness of issues surrounding sample and fossil collecting laws, norms, and potentially underreported conflicts in a region.

GSA members conducting fieldwork and collection abroad are ambassadors for the GSA community and our field of science. Our international fieldwork and research can serve as examples of good scientific diplomacy, highlighting the potential for science to build relationships across disciplines and geopolitical borders. As part of the privilege of working within an international community of researchers, it is our responsibility to behave legally, ethically, and respectfully.

OPPORTUNITIES FOR GSA AND GSA MEMBERS TO HELP IMPLEMENT RECOMMENDATIONS

All GSA members can adopt and adhere to GSA's Ethics of Responsible Geologic Fieldwork. Academic universities and colleges and research institutions can similarly adopt GSA's fieldwork ethics or draft their own document outlining how members of their community shall behave and operate in the field.

REFERENCE

National Academies of Sciences, Engineering, and Medicine, 2018, Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine: Washington, D.C., The National Academies Press, https://doi.org/10.17226/24994.

The Geological Society of America, founded in 1888, is a scientific society with members from academia, government, and industry in more than 100 countries. Through its meetings, publications, and programs, GSA enhances the professional growth of its members and promotes the geosciences in the service of humankind. Headquartered in Boulder, Colorado, USA, GSA encourages cooperative research among earth, life, planetary, and social scientists, fosters public dialogue on geoscience issues, and supports all levels of earth science education.



You Made an Impact on Future Geoscientists

Every year, the GSA Foundation is extremely thankful to all of our friends and donors who contribute time, resources, ideas, and financial support toward the Geological Society of America's programs.

One program that has made a significant impact in the lives of aspiring geologists is the J. David Lowell Field Camp Scholarship. Recognizing the significant role that field camp has in the development of geoscientists, a generous donor issued a matching challenge that launched on Giving Tuesday, 30 November. They matched oneto-one, up to US\$10,000, every gift made to the J. David Lowell Field Camp Scholarship Program between Giving Tuesday and New Year's Eve. We extend our sincerest thanks to all of you who contributed to help us reach that match, and a special thanks to the donor who provided the matching funds. Your support will go directly to help students attend field camp in 2022.

Many of the students who received the 2021 J. David Lowell Field Camp Scholarship shared how much your generosity means to them and the impact it has had on their career development. You can read their full responses in our Community of Support (https://gsa-foundation.org/news-events/) series on the Foundation blog.



"The generosity of GSA donors made it possible for me to fully engage with the field camp experience without worrying about my financial situation. Given that I was chosen to receive the scholarship out of a large applicant pool, I feel honored that the selection committee believed in my potential as a geoscientist and recognized my academic efforts." —Cissy Ming



"I'm so grateful for what this scholarship has provided me: not only a geology field experience, but with 30 other geology students who motivated me into believing that I was doing the right thing and was exactly where I needed to be." —Alina Hernandez





"Receiving this scholarship alleviated



"Receiving the scholarship allowed me to buy the hiking and camping gear I needed for the variable and sometimes severe Alaskan weather. I was especially appreciative of the high-quality hiking shoes I bought that kept my feet safe and dry during even the longest, wettest days." —Lauren Livers

Thank you for your generous support that helps sustain vibrant, life-changing opportunities like these field camp scholarships.



Call for Short Course and Technical Session Proposals



GSA Connects 2022 being held on 9–12 October in Denver, Colorado, USA, will bring the geological community together to share ideas, best practices, and state-of-the-art knowledge. Share your scientific findings with colleagues, network with leaders in the field, and keep your skills relevant in a rapidly changing world. Plan now to be part of this gathering and amplify your research with your community by submitting a proposal for a short course and/or a technical session.

Present your evidence-based knowledge to a large international audience by chairing a technical session.

Deadline: 1 Feb. 2022 Proposals are being taken for Pardee Symposia and Topical Sessions. https://gsa.confex.com/gsa/2022AM/cfs.cgi

Gain recognition as an expert in your topic of research as an instructor of a short course.

Deadline: 1 Feb. 2022

Courses run the Friday and Saturday before the meeting and are a half day to two full days. Both online and in-person proposals are sought.

https://gsa.confex.com/gsa/2022AM/shortcourse/cfs.cgi

Dear Colleagues,

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

I invite you to prepare a proposal for a technical session for GSA Connects 2022 that reflects your expertise and research but also pushes the boundaries of the discipline. Without expanding our horizons we will not move the geosciences forward and maintain our relevance. I challenge you to also broaden your reach with whom you collaborate by including diversity in all ways: discipline, career progression, and individuals.

Thank you for considering sharing your science and work at GSA Connects 2022.

Vicki S. McConnell, GSA Executive Director

GEOSCIENCE JOBS AND OPPORTUNITIES

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

OPEN POSITIONS

Postdoctoral Researcher, University of Southern Mississippi

The University of Southern Mississippi invites applications for a postdoctoral researcher within the School of Biological, Environmental, and Earth Sciences (BEES). We seek expertise in fluvial geomorphology, hydraulic modeling, and/or sediment/soil quality for a project emphasizing sedimentation along river-floodplain systems of interest to the U.S. Army Corps of Engineers - Engineer Research and Development Center (USACE-ERDC). The successful candidate will have opportunities to collaborate with researchers in the Schools of Coastal Resilience and Ocean Science and Engineering and, if desired, instruct classes within the School of BEES. The appointment is for one year with a salary up to \$55,000 and benefits; two additional years could be available if a continuing agreement is approved. Additional research support, including funds for conference and/or workshop travel, is available. The start date would commence as early as January 1, 2022.

Primary duties and responsibilities for this position include:

- 1. Work closely with PI and the multi-disciplinary research team to plan, design, and execute field, lab, and analytical research activities.
- 2. Utilize analytical software applicable to candidate's expertise.
- 3. Facilitate development of project-related reports and manuscripts.
- 4. Communicate research findings to collaborators, scientists, and students.
- 5. If applicable to candidate's expertise -Conduct field work in variable and difficult conditions.
- 6. Perform other duties as assigned.

Review of applications will begin immediately and the position will remain open until filled. Applicants must submit: 1) a cover letter detailing qualifications and relevant experience, 2) CV, 3) a statement of research interest (not to exceed 2 pages), and 4) names and contact information for three professional references. The successful candidate will have completed their Ph.D. in Geoscience, Environmental Science, Soil Science, Environmental Engineering, or related field. For inquiries about the position, please contact Dr. Frank Heitmuller at Franklin.Heitmuller@usm.edu. Apply at https:// usm.csod.com/ATS/CareerSite/JobDetails .aspx?id=2351&site=1&c=usm.

Lowell Chair in Economic Geology, University of Arizona

The Department of Geosciences invites applications for the Lowell Chair in Economic Geology, a tenure-track faculty position to be filled by May 2022 at Assistant Professor level. Exceptional candidates will be considered at Associate Professor level. We seek applicants interested in carrying out innovative teaching and research in the area of economic geology including applied issues directly related to the discovery, development and production of mineral deposits as well as remediation of mining sites. We are looking for individuals who approach broad-based applied issues from a geological perspective and can combine academic and industry interests. A requirement of the position is to coordinate innovative graduate professional training programs related to mineral exploration and production. A Ph.D. or equivalent degree is required. A desire to work with industry, through collaborations and established or planned partnerships, is welcome/preferred.

The successful candidate is expected to actively engage in multidisciplinary research and teaching through the Department of Geosciences, the partnerships and initiatives of the Lowell Institute for Mineral Resources. and related professional programs. Areas of interest are very broad and include but are not limited to: fluid processes in crustal environments; structural and tectonic controls on ore-forming systems; geothermal or active and fossil magmatic or metamorphic systems; and isotope geochemistry, petrology, or biogeochemistry of metal systems as well as planetary exploration for metals and other economic resources. Approaches can include field, experimental or theoretical work in settings from surficial to magmatic, scales from microscopic to global, topics from basic science to applications and policy.

The Department is seeking an individual who is able to work with diverse students and colleagues. Review of applications will begin on January 15, 2022, and continue until the search is completed. A full posting for this position and online application instructions are available at: https://arizona.csod.com/ux/ats/careersite/4/home/requisition/7600?c=arizona

Outstanding UA benefits include health, dental, and vision insurance plans; life insurance and disability programs; paid vacation, sick leave, and holidays; UA/ASU/NAU tuition reduction for the employee and qualified family members; state and optional retirement plans; access to UA recreation and cultural activities; and more!

At the University of Arizona, we value our inclusive climate because we know that diversity in experiences and perspectives is vital to advancing innovation, critical thinking, solving complex problems, and creating an inclusive academic community. As an Hispanic-serving institution and a Native American/Alaska Native-serving institution, we translate these values into action by seeking individuals who have experience and expertise working with diverse students, colleagues, and constituencies. Because we seek a workforce with a wide range of perspectives and experiences, we provide equal employment opportunities to applicants and employees without regard to race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. As an Employer of National Service, we also welcome alumni of AmeriCorps. Peace Corps. and other national service programs and others who will help us advance our Inclusive Excellence initiative aimed at creating a university that values student, staff and faculty engagement in addressing issues of diversity and inclusiveness.

In addition to a cover letter, CV, statements of teaching and research interests, and a statement documenting the applicant's plan for promoting diversity, equity, and inclusion, please submit up to five reprints of published work and provide the names and contact of three or more references.

Associate or Full Professor in Geological Hazards, Department of Geology, University at Buffalo

The Department of Geology at University at Buffalo (UB), The State University of New York, invites candidates to apply for the position of Professor of Empire Innovation, at the rank of Associate Professor or Full Professor. The selected candidate will receive support through the SUNY Empire Innovation Program (EIP), which recognizes exceptional scholars with a proven track record of externally funded research and offers a generous compensation and start-up package.

We invite applications from researchers who have exceptional track records in any type of geological hazard, including: (1) Active tectonics, using the recent geological record to establish earthquake histories and probabilistic hazards assessments. (2) Earth surface hazards, focusing on slope stability, landslides, and debris flows, including some combination of fieldwork, modeling, and experimentation to understand underlying physical processes and translating these into hazards assessments. (3) Volcanic hazards, using field observations, numerical modeling, and experimental approaches to advance our understanding of, and ability to predict, hazardous eruption processes and their consequences.

The Professor of Empire Innovation will teach courses at the graduate and undergraduate levels, mentor graduate students, and maintain an active externally funded research program which will complement existing Departmental strengths in volcanology, geodynamics, paleoclimate and climate-change hazards, and water and the environment. This position is part of a cluster hire that includes the Department of Civil, Structural, and Environmental Engineering, and the School of Architecture and Planning, aimed at enhancing research and education in community resilience in the face of natural and climate-change hazards. The successful candidate is thus expected to work across the University to build interdisciplinary approaches to strengthen societal resilience to geological hazards, including with existing expertise in resilient infrastructure engineering, urban planning, communications, and crisis management. To facilitate this integration, the successful candidate will be a core member of the Center for Geological and Climate Hazards Advisory Committee.

Minimum Qualifications: Candidates must hold a doctorate in geology or a closely related field. Candidates must demonstrate excellence in research, teaching, service, and mentoring. Candidates should be internationally recognized scholars as evidenced by impactful publications and a sustained externally funded research program.

Preferred Qualifications: Demonstrated highly productive and creative record in geological hazards research, including active tectonics (neotectonics), Earth surface hazards, and/or volcanic hazards.

Applications must be submitted through the UB Jobs website: https://www.ubjobs.buffalo .edu/postings/31621. Additional information and special instructions for applications is included at this site. We will begin to review applications immediately and continue until the position is filled. Inquiries concerning these positions should be made to Prof. Greg Valentine (gav4@ buffalo.edu). University at Buffalo is an affirmative action/equal opportunity employer and, in keeping with our commitment, welcomes all to apply including veterans and individuals with disabilities. We are particularly looking for candidates who can operate effectively in a diverse community of students and faculty members and share our vision of helping all constituents reach their full potential within a professional culture that values equity, diversity, and inclusion.

Assistant Professor, Mineralogy/ Petrology/Structural Geology, Eastern Michigan University

The Department of Geography and Geology at Eastern Michigan University is seeking applications for a tenure-track faculty position at the assistant professor level in mineralogy, petrology, and/or structural geology with an expected start date of Fall 2022.

The candidate will be expected to: (1) be committed to excellence in teaching in the classroom, the research lab, and the field, (2) conduct an active research program in mineralogy, petrology and/or structural geology, (3) be able to contribute enthusiastically to both the intellectual and collegial life of the department, and (4) be committed to working with a diverse student and community population. Instruction responsibilities include teaching upper-level undergraduate courses in Mineralogy and Petrology; ability to teach Structural Geology and Global Tectonics is preferred but not required. Additionally, the candidate will be expected to teach introductory-level geoscience courses and direct undergraduate research projects.

Additional information about the department may be found at www.emich.edu/geo Requirements:

- Ph.D. in Geology or a related field at the time of appointment.
- Demonstrated experience in teaching at the undergraduate level
- Record of research, publications, and grantsDemonstrated ability or potential for working
- in interdisciplinary teams The review of applications will begin January 4, 2022, and will continue until the position is

4, 2022, and will continue until the position is filled. A full posting for this position and online application instructions are available at: https:// www.schooljobs.com/careers/emichedu/ jobs/3312446/assistant-professor-mineralogypetrology-structural-geology

Eastern Michigan University is an equal opportunity employer, and the institution is regularly recognized by U.S. News and World Report for its diversity. EMU is committed to building a culturally diverse educational environment. Women, minorities, individuals with disabilities, and veterans are encouraged to apply.

Full Professor and Department Chair, San Diego State University

The Department of Geological Sciences and the Environmental Sciences Program at San Diego State University invite applications from associate or full professors to join the department as a tenured full professor, either serving as incoming chair or expecting to serve as chair in coming years. Position details and instructions to apply can be found at https://apply .interfolio.com/98399. Application review will begin January 24th, 2022, and continue until the position is filled. Questions about the position may be directed to geology@sdsu.edu. SDSU is an equal opportunity/Title IX employer.

Tenure-Track Faculty Cluster Search, Yale Center for Natural Carbon Capture, Yale University

The Yale Center for Natural Carbon Capture (YCNCC) invites applications for up to four tenure-track appointments, at any rank (assistant, associate, or full professor) in the natural sciences. The focus of the Center is to foster research on carbon capture and greenhouse gas reduction using ecological and geological approaches. Areas of interest include, but are not restricted to conservation, restoration, and management of forest and grassland ecosystems; blue carbon; agricultural practices; enhanced silicate weathering; and ocean alkalinity enhancement. We encourage applicants from disciplines as diverse as ecology, plant physiology, soil science, geochemistry, petrology, sedimentology, earth and biogeochemical system modeling, and physical, chemical, and biological oceanography. The search is a partnership between the Center, the Yale School of the Environment, and the Faculty of Arts &

Sciences, primarily the Departments of Earth & Planetary Sciences and Ecology & Evolutionary Biology. The locus of appointments will be in a School or Department (based on a mutual fit between applicant experience and school/ departmental interests), but new faculty will play a critical role in the development and success of the YCNCC.

We seek candidates with outstanding prospects for research, scholarly excellence, and teaching excellence who will complement the existing strengths of the Center and the participating university units. Applicants should have a doctoral degree in a relevant natural science or engineering field and will be expected to teach and mentor students at the graduate and undergraduate level, to develop an internationally-recognized and externally-funded research program, and to facilitate interdisciplinary research and contribute to building an inclusive academic environment. Moreover, as an Affirmative Action/Equal Opportunity employer, Yale University values diversity among its students, staff, and faculty and strongly welcomes applications from women. persons with disabilities, protected veterans, LGBTQ community members, and persons from racial/ethnic groups historically underrepresented in earth and environmental sciences.

Applicants should submit (1) a letter of application, (2) a curriculum vitae including a full list of publications, (3) a statement of teaching interests, and (4) a statement of research interests and plans, including how the applicant's research program would contribute to scalable solutions for greenhouse gas reduction. Applicants should also provide the names and contact information of three professional references who can provide letters of recommendation upon request. Applications should be submitted online at apply.interfolio.com/98686. For information regarding the YCNCC visit our website at https://planetarysolutions.yale.edu/centernatural-carbon-capture. Questions regarding the faculty search can be sent to vcncc@vale .edu. Review of applications will begin January 7, 2022.

Assistant Professor, University of Miami

The Department of Marine Geosciences at the Rosenstiel School of Marine and Atmospheric Science (RSMAS), University of Miami, invites applications for a tenure-track Assistant Professor position in Geological Sciences (broadly defined) focusing on Earth's structure, properties, and processes. To build on our existing strengths in this area, we aim to recruit an accomplished and innovative scientist whose work in the geosciences brings expertise in any of our core research areas, including hydrogeology, structural geology, sedimentology, geochemistry, paleoceanography, geophysics, and remote sensing. Candidates with a vision for developing an interdisciplinary research program bridging our core research areas are especially encouraged to apply. The

GEOSCIENCE JOBS AND OPPORTUNITIES

University of Miami offers a unique tropical location and the opportunity to integrate oceanographic, atmospheric, and biological expertise into process-oriented geological research through collaboration with faculty in the departments of Marine Biology, Environmental Science and Policy, Atmospheric Sciences, and Ocean Sciences.

Applicants should have a Ph.D. (or equivalent) and demonstrated ability to conduct compelling independent research and are expected to establish an externally funded research program. Further, applicants should be prepared to vigorously contribute to the department's undergraduate and graduate teaching missions.

Questions should be directed to Dr. Sam Purkis, Chair of the Department of Marine Geosciences (spurkis@rsmas.miami.edu). Applications will only be accepted electronically via the UM Careers website.

Applications shall include:

- Letter of interest that describes your anticipated contributions to scholarship, teaching, and service in the Department of Marine Geosciences;
- Current CV;
- · Research statement;
- · Teaching statement;
- The names of five colleagues who can provide us with a reference.

The positions will remain open until filled. The University of Miami is an equal opportunity employer.

Three Research Associates/ Research Scientists, University of Texas, Institute for Geophysics

The University of Texas Institute for Geophysics [https://www.ig.utexas.edu/] (UTIG) seeks to hire three Research Staff members in the following two broadly defined areas: (1) Global Change, including but not limited to: climate, extreme weather, sea level, coastal processes, and cryosphere: and (2) Solid Earth Geophysics, including but not limited to: earthquake processes, geodesy, marine geophysics and tectonics, and solid earth-cryosphere interaction. We seek colleagues who creatively use theoretical, computational, observational and/ or experimental approaches to address fundamental problems and processes on Earth or other planets. Current areas of research at UTIG include climate modeling and dynamics. paleoclimatology, ice sheet and ocean dynamics, marine geology and geophysics, plate tectonics and mantle convection, theoretical geophysics, earthquake processes, and planetary geophysics. We are interested in candidates who will bring new research expertise and perspectives to UTIG. Successful applicants will be expected to contribute to a dynamic and diverse research community at the University of Texas at Austin through the development of a vigorous, internationally recognized, and externally funded research program, and through engagement with colleagues, postdoctoral scholars, and students. Candidates must hold a Ph.D. or be near completion of this degree in Earth Science or a related field. We particularly welcome applications from candidates from nontraditional research backgrounds and from scientists who understand the experiences of those underrepresented in higher education and research.

We anticipate hiring at the Research Associate or Research Scientist rank. Research Associates and Scientists are part of the research staff at UTIG and receive six months of institutional salary support, with the rest obtained from externally funded research programs. Research appointments at UTIG follow a career track similar to that of academic faculty, in which the rank of Research Associate is analogous to that of Assistant Professor and the rank of Research Scientist is analogous to that of Associate Professor. Research staff at UTIG can advise or co-advise postdoctoral scholars as well as graduate and undergraduate students.

UTIG is part of the Jackson School of Geosciences, which houses top research programs across all areas of the Earth Sciences. UTIG is also closely allied with the Texas Advanced Computing Center [https://www.tacc.utexas .edu/], and it is involved in several research centers and programs at UT focused on emerging Earth Science problems, such as the Center for Planetary Systems Habitability [https:// habitability.utexas.edu/], the Center for Space Research [https://www.csr.utexas.edu/], and the Oden Institute for Computational Engineering and Sciences [https://www.oden.utexas .edu/]. UTIG employs both computational- and field-based technical support staff, and operates a variety of field equipment and lab facilities [https://ig.utexas.edu/facilities/].

Applications should include a cover letter, curriculum vitae, a two-page statement of research interests, a one-page diversity statement, up to three recent peer-reviewed publications, and the names and contact information of three qualified persons who can provide the search committee a reference letter upon request. For full consideration, applications should be submitted by January 15, 2022. You can view and apply for the position on the University's job page [https://utaustin .wd1.myworkdayjobs.com/en-US/UTstaff/ details/Research-Associate R 00016687]. For additional information about the application process, please contact Rosalind Gamble (rgamble@ig.utexas.edu). For additional information about the position, please contact the search committee chair: Yuko Okumura (yukoo@ig.utexas.edu).

Assistant Professor, Earth Surface Processes, School of the Environment, Washington State University

The School of the Environment (SoE) at Washington State University invites applica-

tions for an Assistant Professor in the field of Earth Surface Processes, to begin August 16, 2022. We seek applicants who will develop an internationally recognized and externally funded program of research and teaching focused on the fundamental role that Earth surface dynamics and sedimentary processes play in molding Earth systems and landscapes. The SoE is an interdisciplinary academic unit with faculty that specialize in Earth, environmental, and ecosystem sciences, who investigate problems ranging from Earth formation and evolution to present-day processes connecting Earth's diverse environments and habitats. We are committed to excellence through diversity and faculty-friendly policy action, and to cultivating a welcoming, inclusive, and supportive departmental culture. Earth science research at the SoE is supported by world-class analytical facilities, including the Peter Hooper GeoAnalytical and Radiogenic Isotope and Geochronology Laboratories (www.environment.wsu.edu/facilities). The successful candidate will be expected to: (i) work collaboratively with faculty, staff, and students from a wide range of disciplines, cultures, and academic backgrounds; (ii) teach undergraduate and graduate courses related to Earth Surface Processes; (iii) publish quality research in high-impact, peer-reviewed outlets; (iv) develop an externally-funded research program; (v) mentor diverse graduate and undergraduate students; and (vi) serve university, professional, and/or public organizations from an ethical and evidence-based position. Screening of applications begins on January 3, 2022. To learn more and apply, visit www.wsu .edu/jobs and enter R-3361 in the search bar.

WSU is an EO/AA Educator and Employer.

OPPORTUNITIES FOR STUDENTS

Jonathan O. Davis Fellowship, Quaternary Geology of the Great Basin, Desert Research Institute, Nevada. One Masters student will be funded up to \$2500 and one PhD student will be funded up to \$5,000. The national fellowship is open to graduate students enrolled in an M.S. or Ph.D. program at any university in the United States. Applications must be submitted as a single PDF to JODfellowship@dri.edu by January 15, 2022. Details on application and submission requirements can be found at https://www.dri .edu/about/awards-and-scholarships/davis -fellowship/. Proposals will not be returned.

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Department Chair- Earth and Planetary Sciences

Location: San Antonio, TX Regular/Temporary: Regular Job ID: 6933 Full/Part Time: Full Time

Department Marketing Statement

The Department of Earth and Planetary Sciences in the College of Sciences at The University of Texas at San Antonio (https://www.utsa.edu/sciences/earth-planetary-sciences/) is a dynamic expanding department in a diverse community with intent and resources to be a national leader. We have initiated an international search for a dedicated and resourceful Tenured Professor/Chair beginning Fall 2022 and are accepting nominations and applications for this position. Initial screening of applications will begin on November 12th, but applications will be accepted until the position is filled. This is an open search for which administrative capabilities and research experience are criteria. We are seeking exceptional candidates with (1) a record of high-quality research and scholarship, (2) excellence in undergraduate and graduate education, (3) leadership experience and (4) a demonstrated commitment to diversity and inclusion. The Chair is a 12-month administrative appointment accompanied by a tenured faculty appointment and full University benefits.

Responsibilities

The Chair is expected to fulfill the duties and responsibilities of administrator while maintaining an active and productive research group. The Chair will lead efforts to grow the department in anticipated faculty hiring at all levels, in the growth of its graduate programs, and in the enlargement of its undergraduate student body.

Org Marketing Statement

The University of Texas at San Antonio is a Hispanic Serving University specializing in cyber, health, fundamental futures, and social-economic development. With more than 34,000 students, it is the largest university in the San Antonio metropolitan region. UTSA advances knowledge through research and discovery, teaching and learning, community engagement and public service. The university embraces multicultural traditions and serves as a center for intellectual and creative resources as well as a catalyst for socioeconomic development and the commercialization of intellectual property–for Texas, the nation and the world.

UTSA is situated in a global city that has been a crossroads of peoples and cultures for centuries, values diversity and inclusion in all aspects of university life. As an institution expressly founded to advance the education of Mexican Americans and other underserved communities, our university is committed to ending generations of discrimination and inequity. UTSA, a premier public research university, fosters academic excellence through a community of dialogue, discovery and innovation that embraces the uniqueness of each voice.

Posting End Date

Initial screening of applications will begin on November 12th, but applications will be accepted until the position is filled.

Required Application Materials

• CV

- Statements of research interests (4-page limit), teaching interests (1-page limit), and "vision and leadership"
- (2-page limit), all of which include discussion of the role diversity and inclusion.
- Complete contact information for three to five professional references.

Please submit all documents together in a single PDF in order to be considered.

Nominations should be sent to Dr. Audrey Lamb, search committee chair, at mailto:audrey.lamb@utsa.edu.

Required Qualifications

A doctorate in a discipline related to earth and planetary sciences (e.g., geosciences, geophysics, geology, physical and/or chemical oceanography, hydrology and water resources, atmospheric science, planetary science/planetary geology, etc.);

A strong service record with demonstrated administrative experience;

Outstanding research and teaching records that warrant an appointment at the rank of full professor with tenure (contingent upon Board of Regents approval) in an allied field

Preferred Qualifications

Preferred qualifications are experience in an academic supervisory capacity/leadership position. Knowledge of innovative curriculum development and implementation and leadership in professional organizations. Intellectual contributions in the areas of diversity, inclusion and prior experience teaching and mentoring students from diverse cultural backgrounds are also desirable.

Working Conditions

On Campus: Primary work location will be on campus

Additional Information

- UTSA is a tobacco free campus.
- This is a security sensitive position. Employment is contingent upon a successful background check.
- Applicants selected must be able to show proof of eligibility to work in the United States by time of hire.

EO/AA Statement

As an equal employment opportunity and affirmative action employer, it is the policy of The University of Texas at San Antonio to promote and ensure equal employment opportunity for all individuals regardless of race, color, religion, sex, gender identity, sexual orientation, national origin, age, disability or genetic information, and veteran status. The University is committed to the Affirmative Action Program in compliance with all government requirements to ensure nondiscrimination. Women, minorities, people with disabilities and veterans are encouraged to apply. UTSA campuses are accessible to persons with disabilities.

To view the full job posting and apply for this position, go to https://apptrkr.com/2593432



Print Your Compass: Using 3D Printed Geological Compasses for Teaching and Research Purposes

Antoine Triantafyllou, Lyon Geology Laboratory—Earth, Planets and Environment (LGL-TPE), Université Lyon 1, ENS de Lyon, CNRS, UMR 5276, Villeurbanne, France; antoine.triantafyllou@univ-lyon1.fr

MOTIVATION

A geological compass is an essential tool in the geologist's field kit. It is used in various geosciences disciplines, including geological mapping and structural geology. The past decade has seen the emergence of digital geological compasses through excellent smartphone or tablet apps (e.g., FieldMove Clino, eGeoCompass, Stereonet Mobile), the reliability of which has been demonstrated for teaching and research purposes (e.g., Novakova and Pavlis, 2019; Lundmark et al., 2020). Although these digital compasses are highly ergonomic and have greatly improved the speed and the rate of data collection (Zobl et al., 2007; Allmendinger et al., 2017), it is essential that undergraduate students learn how analog geological compasses work and how to use them to characterize the orientation of given geological structures (i.e., foliations, lineations, or a combination of both) and transcribing this information in the right format in a notebook. What is the minimum requirement for a geological compass? It must be equipped with a clinometer, a precision magnetometer-ideally with a fixed circular graduation-a measuring reference trench, and a bubble level. Various geological compasses are available on the market (e.g., Brunton, Freiberg, Topochaix brands) with several models in different price ranges. Nevertheless, equipping large student groups with robust, accurate, semito fully professional models of geological compasses still represents a significant cost. This is why I initiated the PYC (Print Your Compass) project, building upon the emergence of affordable digital fabrication tools such as 3D printing, which is particularly facilitated by the development of shared workspaces such as FabLabs and creation networks in academic institutions and/or universities (Hasiuk, 2014; de Lamotte et al., 2020; Reynolds et al., 2020).

This paper aims to provide detailed 3D plans of compass pieces, guidelines for printing materials, magnets and pivot system, and validating the accuracy of printed compasses. I hope that such initiatives will allow students from their first degree to master's level, teachers, and geoscientists in general, to print their geological compass at a lowered cost, adapted to their specific needs, and with sustainable manufacturing.

HOW TO PRINT YOUR COMPASS

The PYC compass (v.0.94) presented in Figure 1A is designed in five modules. Part 1 is the core of the compass, printed here using Selective Laser Sintering (SLS) in rigid Nylon Polyamide (PA12) with a printing resolution <80 µm. The front side of Part 1 is made of a cylindrical cavity embedding the precision compass, and the back side is marked by a circular gully in which a 2-mm-wide brass ball will be used as a clinometer. Part 2 comprises the magnet and pivot system. It is made of a pile of three stacked pieces printed using SLS-PA12 (Fig. 1A) in which a brass pivot and four Nd-magnets (15 mm long \times 3 mm in diameter) are enclosed. The magnet and pivot system is ultimately stacked and sealed by two vertical nylon screws. The magnet and pivot system is balanced on a brass nail crossing Part 1 vertically. Part 3 and Part 4 are the closing windows placed on each side of the PYC compass. They both consist of a 2-mm-thick and 80-mm-side square plexiglass window. They are crucial parts of the compass as they display the graduations for precise measurements. Part 3 comes with inclination degrees from 0 to 90° (with a

precision of 2°), and Part 4 is graduated from 0 to 360° for azimuth measurement respective to north (with a precision of 1°). Graduations can be directly printed onto plexiglass pieces or as transparent flipped vinyl stickers placed on their inner side. Small nylon screws are used to fix these windows to the main part of the PYC compass. Part 5 comprises two levels and the casing of the PYC compass. One rounded level (15 mm in diameter and 8 mm in height) can be embedded on the front side of the PYC compass to enable levelling, along with a second cylindrical level on the side of the PYC compass to improve finding the line of slope on a planar structure. The protection case, printed here in a flexible resin (thermoplastic polyurethane), is designed to laterally slide the PYC compass in it and act as a shock absorber. The whole compass is $10 \times 10 \times 2.3$ cm in size and weighs less than 0.25 kg. It can be easily disassembled, and each of the constitutive pieces can be replaced. The 3D models can be found in the supplemental material¹ or here: https:// skfb.ly/opCJY. These are licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0).

VALIDATING THE PYC COMPASS ACCURACY IN THE FIELD

I tested the PYC compass in the field and compared measurements against reliable compasses, including the Topochaix Universelle compass and the FieldMove Clino app running on a Samsung S7 smartphone. The test was conducted on the Moulin de Cezinieux orthogneissic unit located in the northern Pilat region (eastern French Massif Central; Fig. 1B). This outcrop is made of low-dipping metamorphic foliations from the late Hercynian orogenic

GSA Today, v. 32, https://doi.org/10.1130/GSATG523GW.1. CC-BY-NC.

¹Supplemental Material. 3D models (as .obj filetype) for each part of the PYC compass. For more details about these files, please contact the author: antoine.triantafyllou@ univ-lyon1.fr. Go to https://doi.org/10.1130/GSAT.S.16900333 to access the supplemental material; contact editing@geosociety.org with any questions.



Figure 1. (A) Disassembly view of the "Print Your Compass" (PYC) 3D models. (B) Field picture showing the outcrop on which the PYC compass was tested. The outcrop displays an augen orthogneiss massif with foliations slightly dipping to the NNW, itself crosscut by late joints and faulted structures. Lower left is a sketch map of the French basement in blue locating the French Massif Central and the investigated outcrop (yellow star). (C) Two columns of comparative Stereonet plots. The first column shows measurement of the subvertical joints and faults, the second shows the measurement of foliations. Poles of planes are shown with the average value as a blank square. Rose diagrams show the distribution of strikes' azimuths. These plots were done using the Geolokit app (Triantafyllou et al., 2017).

collapse (e.g., Gardien et al., 2021). These ductile structures are crosscut by recent subvertical joints and faults. Tests were made on these two types of structures with twenty planar measurements for each compass: (i) Concerning foliation measurements, using the FieldMove digital compass, the mean strike direction is N229.0 \pm 6.6° (95% polar confidence), and the mean dipping value is 22.2° to the NW. For the Topochaix Universelle compass, the mean strike direction is N231.3 \pm 5.0°, and the mean dip is at 20.9° to the NW. For the PYC printed compass, the mean strike direction is at N232.7 \pm 4.9° and the averaged dipping value was 20.7° to the NW with a radius of polar confidence at 5% of 2.35° (Fig. 1C). (ii) Concerning the subvertical joints and faults measurements, the FieldMove digital compass provides an averaged strike direction of N344.2 \pm 2.7° and a mean dip at 87.2° to the E. For the Topochaix Universelle compass, the mean

strike direction trends to N339.6 \pm 1.5°, and the mean dipping value is 89.9° to the E. The PYC compass provides a mean strike direction at N341.9 \pm 1.7° and an averaged dipping value at 86.1° to the E (see Fig. 1C). The reliability of the PYC compass is attested first by the small polar differences between PYC mean pole values and those measured with the Topochaix and the FieldMove Clino app, which yields 4.4° and 2.5°, respectively, for the foliation structures and 0.2° and 15.0°, respectively, for the joint/faulted structures; and second by the small radius of polar confidence at 5% of 2.35°, indicating a reduced data spread and a good reproducibility during structures measurement.

ACKNOWLEDGMENTS

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Geology Celebrates 50 Years in 2022

Volume 1, issue 1, of *Geology* was published in September 1973. This month, the journal publishes the first issue of its 50th volume. A bit of an upstart at the time, *Geology*'s mission was to be a "short-note, rapid publication journal." Along with short, peerreviewed articles, early issues included book reviews, letters, and summaries of *GSA Bulletin* papers. In 1975, a section called "GSA news & information" was added. (*GSA News & Information* became its own publication in 1979; was ultimately replaced with *GSA Today* in 1991.) Read more about *Geology*'s beginnings at https://pubs.geoscienceworld.org/ geology/issue/50/1.

September 1973 cover. Lunar Orbiter V, Photo 65 M, showing Hess Lunar Crater.

January 2022 cover, celebrating Geology's 50th year of publication.



Large Meteorite Impacts and **Planetary Evolution VI**

Edited by Wolf Uwe Reimold and Christian Koeberl

This volume represents the proceedings of the homonymous international conference on all aspects of impact cratering and planetary science, which was held in October 2019 in Brasília, Brazil. The volume contains a sizable suite of contributions dealing with regional impact records (Australia, Sweden), impact craters and impactites, early Archean impacts and geophysical characteristics of impact structures, shock metamorphic investigations, post-impact hydrothermalism, and structural geology and morphometry of impact structures—on Earth and Mars. Many contributions report results from state-of-theart investigations, for example, several that are based on electron backscatter diffraction studies, and deal with new potential chronometers and shock barometers (e.g., apatite). Established impact cratering workers and newcomers to the field will appreciate this multifaceted, multidisciplinary collection of impact cratering studies.

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Field Excursions from the 2021 GSA Section Meetings

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The 2021 GSA Northeastern, Southeastern, joint North-Central/South-Central, and Cordilleran Section Meetings were held virtually in spring 2021 during continued restrictions on travel and large gatherings due to COVID-19. Eleven groups put together field guides, taking participants on treks to states from Connecticut to Nevada in the United States, to Mexico, and to Italy, and covering topics as varied as bedrock geologic mapping, geochemistry, paleodrainage, barrier islands, karst, spring systems, a southern Appalachian transect, Ordovician and Mississippian stratigraphy, high-energy events, Cretaceous arc granites and dextral shear zones, and Mesoproterozoic igneous rocks. This volume serves as a valuable resource for those wishing to discover, learn more about, and travel through these geologically fascinating areas.

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