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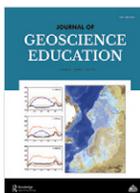
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Cover: National Park Service Geoscientists-in-the-Parks participant, Damian Johns, hiking down the South Kaibab trail above Phantom Ranch, Arizona, USA.

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GeoCorps provides paid, short-term geoscience opportunities that encourage participants to develop professionally by engaging in the science and stewardship of public lands. We sincerely thank the program's participants, mentors, partners, and donors for their outstanding contributions in 2020. The GeoCorps program is a

partnership between the USDA Forest Service, Bureau of Land Management, Aerotek, Inc., and GSA. Prospective participants can review and apply for spring/summer projects beginning in December 2020.

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Clockwise from left: Shelby Short stands on a culvert while holding a measuring pole to take shot measurements for culvert inventories on the Chippewa National Forest; Michael Barrett in Huerfano County, near Gardner, Colorado, performing environmental inspections on a carbon dioxide well on Sheep mountain; Lydia Williams taking the radiation readings with a Geiger counter at a uranium pushpit at Custer Gallatin National Forest; Carli Merrick and Madeline Allen examine field map of Peterson Watershed while doing field work at Huron-Manistee National Forests.

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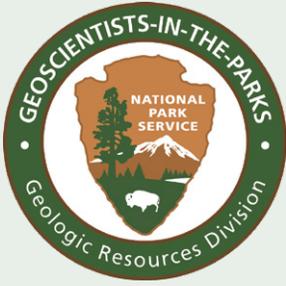
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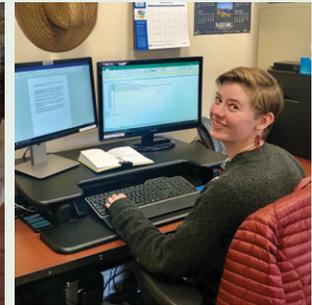


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The National Park Service (NPS) Geoscientists-in-the-Parks (GIP) program places college students and early career professionals in NPS units to assist with short-term projects related to geology and natural resource science. We thank all participants,

mentors, partners, and donors for their incredible work and support. The GIP program is a partnership between Stewards Individual Placement Program, NPS, and GSA.

www.geosociety.org/gip



Clockwise from left: Max Leveridge at Yosemite National Park using a total station as part of a topography survey. Hunter Klein at Carlsbad Caverns National Park, Laura Blackstone at her desk in the Yellowstone Center for Resources, Amelia May at Biscayne National Park.

Partners include:



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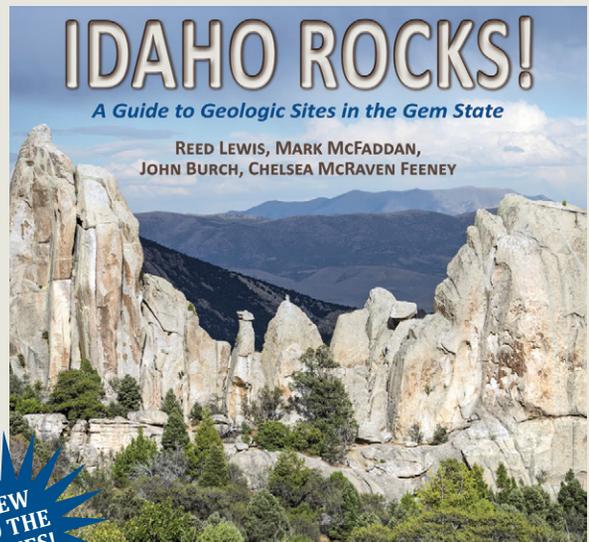
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The deadline for receipt of all medal, award, and recognition nominations is **1 Feb. 2021**. To learn more, see the Oct. 2020 issue of *GSA Today*, <https://www.geosociety.org/gsatoday>, or go to <https://www.geosociety.org/awards>. Nomination form: <https://rock.geosociety.org/forms/Awardform.asp>.

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AGI Marcus Milling Legendary Geoscientist Medal

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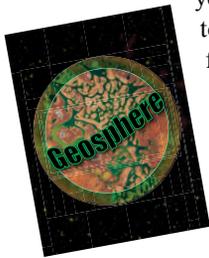
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One of the first things readers will notice is that the Figshare platform provides the ability to view materials without the need to download them first.

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We think you'll be impressed with the ease of use and accessibility of the new open archive at Figshare. Visit <https://gsapubs.figshare.com> to browse supplemental material or click on the Supplemental Material footnote in any GSA digital publication to be taken directly to the corresponding material in Figshare.

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Recent Impacts of GSA's Graduate Student Research Grant Program

GSA has offered research grants continuously since 1933. Over that time, GSA has provided more than 17 million dollars in research funding to more than 22,000 individuals. In the early 1980s, GSA's primary research grants program began to exclusively support graduate students rather than practicing geoscientists. Today, GSA's Graduate Student Research Grant program aims to:

1. Increase opportunities for students of underrepresented communities to achieve success in research;
2. Build career skills of students through gainful experience with grant writing, project management, and research; and
3. Support graduate student research in the geosciences and strengthen the geoscience workforce.

GSA member Joshua Zimmt, a graduate student in the Finnegan/Marshall Lab, University of California Museum of Paleontology, described how his 2019 GSA Graduate Student Research Grants impacted his work:

“While Anticosti Island provides one of the best opportunities to study the Late Ordovician mass extinction, arranging a field season on the island is a challenge. A single field season on Anticosti costs several thousand dollars, posing a major barrier to conducting research on the island for faculty and students alike. The research grants that I received from the Geological Society of America (the 2019 Marland Pratt Billings and Katharine Fowler-Billings Research Award and a 2019 ExxonMobil/GSA Student Geoscience Grant) have transformed my research, providing me with the funding I need to complete two full field seasons on Anticosti Island. In doing so, the grant has directly impacted the trajectory of my dissertation research, allowing me to pursue a comprehensive reassessment of Late Ordovician mass extinction, working with a fossil record unlike anywhere else in the world. Working in such a remote location like Anticosti has allowed me to grow and develop as both an individual and academic. Before my first field season on Anticosti, I had never been camping or conducted field work. Relying on my own knowledge and abilities in the field was both an important learning process and opportunity to push my own boundaries. Reflecting on the field season afterwards allowed me to assess my preparedness, field methods, and hypotheses, to better plan for the next trip to Anticosti. Next summer, I hope to return to Anticosti, fully equipped with a better understanding of myself and the island, to dive back into the Late Ordovician mass extinction!”

You can read more about Joshua's research in his recent post on GSA's Speaking of Geoscience blog: wp.me/pNy1x-1fD.

Here are other comments from 2019 Graduate Student Research Grant recipients, regarding how GSA funding impacted their research:

“The application process for the GSA Graduate Student Research Grant proved to be an excellent exercise for me to provide a detailed explanation of my research project while being



Joshua Zimmt conducting bedding plane counts of fossils on the western coast of Anticosti Island (Québec, Canada). Rocky wave-cut tidal benches along the western coast of Anticosti provide unparalleled access to bedding planes and allow you to walk across the sea floor as it was 445 million years ago!

limited by parameters such as character count, specific sections, and citation style, which can be compared to writing for research journals that require specific formatting. Outlining a concise description of my project, along with the goals associated with its completion, is crucial in both academia (the completion of my MS degree) and in my planned career in industry (environmental consulting), which involves the planning, revision, and completion of several projects every year.”

“As a graduate student, much of the initial work one undertakes as part of their dissertation and degree requirements is funded through a larger grant awarded to their PI. But as the student grows and develops autonomy of their work, additional smaller studies and projects may be added to their research agenda. These research activities often have little to no allocated funds from the original grant awarded to the student's PI. This was the case for me. The GSA student grant allowed me to pursue a supplementary project to the original work that was funded from my PI's grant. This project answers crucial questions regarding the source, transport, and post-depositional alteration of salts in hyper-arid polar environments, and now comprises a chapter of my dissertation. It was also a great experience to add an additional geochemical tool to my working knowledge and establish close relationships with future collaborators.”

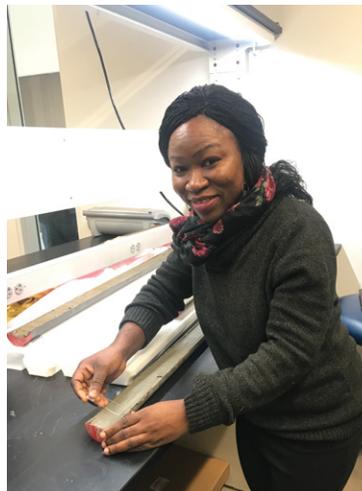
“This project has been an extension of my previous skillset in many ways. This is the first experiment for my Ph.D. that I have designed and carried out without an experimental road map or standardized procedure of previous work, which has been really exciting (but also scary). It has also required a lot of collaboration with other labs and folks in other disciplines (chemistry, environmental engineering) to get access and expertise in the equipment I needed to use.”

“Thank you GSA for supporting my research as an aspiring volcanologist. With the amount awarded to me I was able to almost complete a third of my Ph.D. research. In addition, I was able to

attend an international conference with other Lesser Antilles specialists. The community I found there was so wonderful, and the feedback has given great confidence that my research does contribute and has value in the scientific community. I was encouraged by everyone that attended to keep up the analysis and they are all very eager to know what I find. I would not have been able to create invaluable professional connections without the help from GSA. Thank so very much!”

“It helped propel my Ph.D. Other students in my department have been struggling to find grants, and I will admit to this as well during my master’s. But being a first year Ph.D. with some funding to research and really get moving has been very helpful.”

Program details: <https://www.geosociety.org/gradgrants>
Applications accepted from 1 Dec. 2020 through 2 Feb. 2021.



2019 and 2020 GSA Graduate Student Research Grant recipient Erdoo Mongol undertaking core cleaning at the LacCore (National Lacustrine Core) Facility in the University of Minnesota for smear slides and energy dispersive X-ray spectroscopy analysis.

2021 Graduate Student Research Grants

The primary role of the GSA research grants program is to provide partial support for master’s and doctoral thesis research in the geological sciences for graduate students enrolled in universities in the United States, Canada, Mexico, and Central America. In 2020, US\$651,645 was awarded to 358 graduate students (~55% of the 659 who applied), with an average grant of US\$1,820. GSA strongly encourages women, minorities, persons with disabilities, and other groups that are underrepresented in the geosciences to participate fully in this program. Apply online, starting 1 Dec. 2020. Submissions must be completed by 2 Feb. 2021, at 5 p.m. MST. An instructional webinar will take place in Nov. or Dec.; see the website for details. *The GSA Graduate Student Research Grant Program is supported by the National Science Foundation under grant no. 1949901.*

More Research Grants for Graduate Students and Others

GSA provides members with additional opportunities to apply for research funding. Applications for these programs are accepted between 1 Dec. 2020 and 1 Feb. 2021, at 5 p.m. MST.

- Farouk El-Baz Student Research Grant (for desert studies)
- Awards for Geochronology Student Research2 (AGeS2) Program (for geochronology), which is supported by the National Science Foundation under grant no. 1759201.

For more information:

<https://www.geosociety.org/grants>
researchgrants@geosociety.org
+1-303-357-1025



Spotlight: Geology and Public Policy Committee

Lily J. Jackson, Equinor, Austin, Texas 78730, USA; MaryAnn L. Malinconico, Dept. of Geology and Environmental Geosciences, Lafayette College, Easton, Pennsylvania 18042, USA; and Candace L. Kairies-Beatty, Dept. of Geoscience, Winona State University, Winona, Minnesota 55987, USA

Committee Charge: 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 policy-relevant activities at meetings.

Role of the Geology and Public Policy Committee (GPPC)

Within days of the July 2020 announcement by U.S. Immigration and Customs Enforcement of plans to modify an exemption to the Student and Exchange Visitor Program that would not allow many international students to remain in the U.S. if their classes were entirely online, the Geological Society of America (GSA) had joined nearly 100 educational and scientific societies in signing an open letter to the White House, the Department of Homeland Security, and the Department of State requesting that the plans be withdrawn immediately. The foundation for swift responses to policy matters such as this by GSA's Washington, D.C., office is a series of position statements (<https://www.geosociety.org/positionstatements>) developed and maintained by GSA's GPPC about geoscience, education, data, and professional issues that reflect the values of the Society and membership at large. In this case, GSA's position statement, "Visas for Foreign Scientists and Students," first adopted in May 2005, was directly applicable to the situation.

In addition to the 25 current position statements, GPPC facilitates the writing of critical issues papers, which are informational papers that do not take a position but provide background on a topic for "informed participation in the public discourse." Both current critical issues papers, "Hydraulic Fracturing" and "Induced Seismicity," are undergoing updates.

History

The GPPC was founded in 1971 as the Committee on Environment and Public Policy. It consisted of nine at-large members plus two student members. The motivation "stemmed from the visible, national interest in environment... from Earth Day, the passage of the Clean Air and Clean Water Acts, and the formation of the EPA."* The committee focused initially on holding symposia at the GSA Annual Meeting. Later, the committee began writing issue reports as stand-alone GSA documents or *Geology* articles. In 1978, the name was changed to the Geology and Public Policy Committee. By the mid-1980s, while the annual

symposium continued, reports were no longer produced except as symposia summaries, and there was no student representative. Notably, 1986 was the first year of the GSA-USGS Congressional Science Fellowship, and the program still maintains close ties with GPPC (<https://www.geosociety.org/csf>).

Since about 2001, GPPC's primary products have been position statements and critical issues papers, although the committee continues to cosponsor various GSA Annual Meeting sessions. Today, GPPC comprises 19 voting members: four at-large members; one student member; one representative each from the six regional Sections, the international community, and GSA's Geology and Society Division; two past Congressional Science Fellows; a Council representative; plus current leadership (chair, past chair, chair-elect).

Member Opportunities

Members of GSA may propose ideas for position statements by submitting proposals for GPPC consideration. Statement drafts, written by an *ad hoc* expert panel, are publicized to membership for review online and in *GSA Today* during an open comment period. GSA Council approves proposed topics and final statements. After five years, statements must be revised or expire; GSA members are also welcome to suggest revisions to existing statements. The intended reach of position statements is beyond Capitol Hill; members use the statements for educational purposes, leave-behinds for local legislators, or any form of science policy outreach.

GSA public policy activities and member opportunities extend beyond GPPC (https://www.geosociety.org/GSA/Science_Policy/GSA_Policy_Roles/GSA/Policy/roles.aspx). Since 2007, GSA has supported a Washington, D.C., office to provide "leadership in formulating public policy through active involvement in... decision making." The office's Director of Geoscience Policy is assisted by a GSA Science Policy Fellow. GSA, with other earth-science societies, cosponsors the annual citizen-scientist Geosciences Congressional Visits Day (<https://www.geosociety.org/geocvd>). The GSA Geology and Society Division (G&S), founded in 2003, "supports and augments the responsibilities of GSA committees, and especially [GPPC]," and engages members "in those opportunities where the science of geology intersects with the social, economic, and policy interests of modern society." G&S sponsors symposia and an annual meeting distinguished lecture.

**Thank you for insight on initial Committee years to the first student members: Dr. William Schlesinger, James B. Duke Professor Emeritus of Biogeochemistry, Duke University (quote); and Dr. Mary Savina, Charles L. Denison Professor Emerita of Geology, Carleton College.*

GSA-USGS Congressional Science Fellow Named



Charles Gertler

GSA and the U.S. Geological Survey are pleased to announce that Charles Gertler will serve as the 2020–2021 GSA-USGS Congressional Science Fellow. He will spend a year working in the office of Senator Edward Markey (D-MA).

Charles Gertler is a climate scientist with a broad background in the earth sciences and public policy. He has worked on the physics of the atmosphere, glaciers, and sea level, as well as geoenvironment, air quality, and energy policy. Gertler recently earned his Ph.D. at MIT, where his doctoral work focused on the extratropical storm tracks and their response to climate changes. Outside of research, he has been

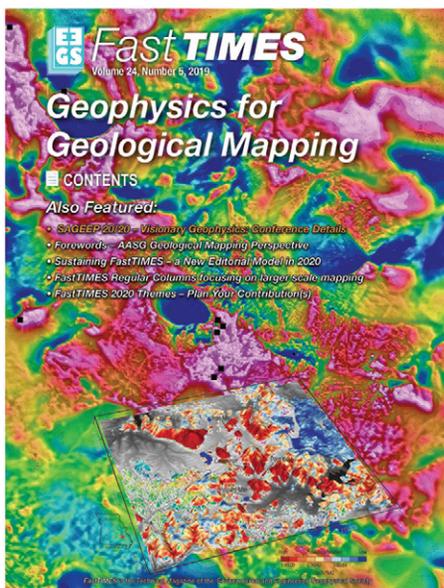
consistently engaged on issues of science policy and community. For instance, as co-chair of the 11th annual Graduate Climate Conference, Gertler helped expand emphasis on the social sciences, science outreach, and the science-policy interface.

Before his Ph.D., Gertler worked for an intergovernmental environmental research organization in Kathmandu, Nepal, where he led a field campaign to assess the effects of air pollution on high-altitude Himalayan glaciers. Gertler holds an M.Phil. from the University of Cambridge in glaciology and an A.B. from Harvard College in Environmental Science and Public Policy, where his thesis addressed the potential for utility-scale solar power in China. He is thrilled to bring these experiences to Capitol Hill and build on them as the GSA-USGS Congressional Science Fellow.



Volume 24, 5 Special Issue Released:
Geophysics for Geological Mapping

FastTIMES



FastTIMES Volume 24, 5 Special Issue on Geophysics for Geological Mapping is available for free download from <https://www.eegs.org/latest-issue>.

Geophysics for Geological Mapping

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Contact: Geoff Pettifer – editorfasttimesnewsmagazine@gmail.com

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Cordilleran Section

117th Annual Meeting of the Cordilleran Section, GSA

12–14 May 2021

Reno, Nevada, USA

www.geosociety.org/cd-mtg



Volcanic geology of the Virginia Mountains, Nevada.
Photo courtesy of Dr. Philipp Ruprecht, UNR faculty member.

LOCATION

The 2021 GSA Cordilleran Section Meeting will be held in Reno, Nevada, USA—a modern boomtown—situated within the Basin and Range at the foot of the Sierra Nevada Batholith. Nevada, the Silver State, got its nickname from the historical Comstock Lode near Reno, and the state presently hosts world-class gold deposits in the Carlin trend. Reno and the surrounding high desert have much to offer in terms of exciting nearby geology: active faulting within the Walker Lane and Basin and Range, records for ancient glacial outburst floods and vast pluvial lakes, abundant evidence for extrusive and intrusive igneous activity, and windows into the deep crust within the Ruby Mountains and Snake Range metamorphic core complexes. In addition, with great and growing geothermal resources and the only domestic lithium deposits, Nevada is pushing the green-energy revolution! Reno offers affordable housing and abundant restaurants, bars, parks, and the Truckee river to relax in or near at the end of the day. We hope you can join us for an exciting meeting in Reno in May 2021!

CALL FOR PAPERS

Abstract deadline: 9 Feb. 2021

Submit online at www.geosociety.org/cd-mtg

Abstract submission fee: GSA members: professionals: US\$30; students: US\$18. Non-members: professionals: US\$60; students: US\$36.

For more information, contact the Technical Session co-chairs: Wendy Calvin (wcalvin@unr.edu); Kait Keegan (kkeegan@unr.edu); Philipp Ruprecht (pruprecht@unr.edu); Matthieu Harlaux (mharlaux@unr.edu).

In addition to the following Theme Sessions, we are soliciting abstracts for general discipline sessions.

THEME SESSIONS

- T1. **Chemical and Thermal Changes in Cordilleran Arc Systems: Insights from the Metamorphic Record.** Joshua Schwartz, California State Univ. Northridge, joshua.schwartz@csun.edu; Jade Star Lackey, Pomona College, JadeStar.Lackey@pomona.edu; Stacia Gordon, Univ. of Nevada, Reno, staciag@unr.edu.
- T2. **Petrology, Geochemistry, and Structure of Cordilleran Batholiths through Space and Time.** *Endorsed by GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division; GSA Structural Geology and Tectonics Division.* Madeline Lewis, Caltech, mjlewis@caltech.edu; Claire Bucholz, Caltech, cbucholz@caltech.edu; Jade-Star Lackey, Pomona College, JadeStar.Lackey@pomona.edu; Juliet Ryan-Davis, Caltech, jrd@caltech.edu.
- T3. **Exhumation and Topographic Evolution of the Sierra Nevada and Tehachapi Mountains.** Ann Blythe, Occidental College, ablythe@oxy.edu; Jeffrey Lee, Colorado School of Mines, leel@mines.edu; Danny Stockli, Univ. of Texas at Austin, stockli@jsg.utexas.edu.
- T4. **Quaternary Volcanic Centers of the Cordillera.** Seth Burgess, U.S. Geological Survey, sburgess@usgs.gov; Jorge Vazquez, U.S. Geological Survey, jvazquez@usgs.gov; Andrew Calvert, U.S. Geological Survey, acalvert@usgs.gov.
- T5. **Understanding the Sierra Nevada through New Regional Geologic and Geophysical Syntheses (Virtual).** *Endorsed by U.S. Geological Survey; California Geological Survey.* Warren J. Nokleberg, U.S. Geological Survey, wnokleberg@usgs.gov; Matt D. O'Neal, California Geological Survey, Matt.ONeal@conservation.ca.gov.
- T6. **Active versus Ancient Crustal Extension in the North American Cordillera: How Does One Inform the Other?** Drew A Levy, Univ. of Nevada, Reno, drewlevy@nevada.unr.edu; Jeffrey Lee, Colorado School of Mines, leel@mines.edu.
- T7. **The Tectonic Evolution of the Basin and Range Province: A Session in Honor of Ernie Anderson.** *Endorsed by GSA Structural Geology and Tectonics Division.* Paul J. Umhoefer, Northern Arizona Univ., paul.umhoefer@nau.edu; L. Sue Beard, U.S. Geological Survey, sbeard@usgs.gov; James E. Faulds, Nevada Bureau of Mines and Geology, Univ. of Nevada, Reno, jfaulds@unr.edu; David M. Miller, U.S. Geological Survey, dmiller@usgs.gov.
- T8. **Tectonic and Magmatic Thickening of Mesozoic North American Cordillera.** Andrew Zuza, Univ. of Nevada, Reno, azuza@unr.edu; Wenrong Cao, Univ. of Nevada, Reno, wenrongc@unr.edu; Sean Long, Washington State Univ., sean.p.long@wsu.edu.

- T9. **Recent Advances in Describing the Evolution of the North American Cordillera from Magnetic Methods.** Cristina García-Lasanta, Western Washington Univ., cristina.garcialasanta@wwu.edu; Bernard Housen, Western Washington Univ., bernard.housen@wwu.edu.
- T10. **The Kinematics, Dynamics, and Surface Expression of Faults within the Walker Lane–Eastern California Shear Zone, Nevada and Eastern California: Improving Hazard Forecasts and Long-Term Slip Histories.** Elizabeth K. Haddon, U.S. Geological Survey, ehaddon@usgs.gov; Richard D. Koehler, Nevada Bureau of Mines and Geology, Univ. of Nevada, Reno, rkoehler@unr.edu.
- T11. **Geology and Geophysics of the Coso Geothermal Field and Source Areas of the 2019 Ridgecrest and 2020 Lone Pine Earthquake Sequences: A Tribute to the Career of Francis C. (“Frank”) Monastero.** Allen F. Glazner, Univ. of North Carolina at Chapel Hill, afg@unc.edu; J. Douglas Walker, Univ. of Kansas, jdwalker@ku.edu.
- T12. **The Enigmatic Late Cretaceous–Paleogene Tectonic Evolution of the Southwestern United States.** Richard Heermance, California State Univ. Northridge, richard.heermance@csun.edu; John Singleton, Colorado State Univ., John.Singleton@colostate.edu; Scott Johnston, Cal Poly San Luis Obispo, scjohnst@calpoly.edu.
- T13. **Magma Emplacement from Arcs to Outcrops: Patterns, Processes, and Rates across Multiple Scales.** Cullen Scheland, Univ. of Southern California, scheland@usc.edu; Scott Paterson, Univ. of Southern California, paterson@usc.edu.
- T14. **Igneous Minerals as Capsules of Length and Time-Scale Information for Magma Processes in Magma Plumbing Systems.** *Endorsed by GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division.* Vali Memeti, California State Univ. Fullerton, vmemeti@fullerton.edu; Cal Barnes, Texas Tech Univ., cal.barnes@ttu.edu.
- T15. **Physical and Chemical Processes of Arc Magmatism and Their Impacts on Crustal Evolution.** Wenrong Cao, Univ. of Nevada, Reno, wenrongc@unr.edu; Katie Ardill, California State Univ. Sacramento, ardill@csus.edu; Keith Putirka, California State Univ. Fresno, kputirka@csufresno.edu.
- T16. **Novel Applications of Microstructural and Geochemical Analyses to Understand Crustal Evolution.** Joel DesOrmeau, Univ. of Nevada, Reno, jdesormeau@unr.edu; Michael Eddy, Purdue Univ., mpeddy@purdue.edu; Andrew Zuza, Univ. of Nevada, Reno, azuza@unr.edu; Wenrong Cao, Univ. of Nevada, Reno, wenronc@unr.edu.
- T17. **Large Silicic Systems: Uncovering Their Histories Using Whole-Rock, Mineral-Scale, and Textural Analysis.** Heather Winslow, Univ. of Nevada, Reno, hwinslow@nevada.unr.edu; Ellyn G. Huggins, Univ. of Nevada, Reno, eghuggins@nevada.unr.edu; Brad Pitcher, Vanderbilt Univ., bradley.w.pitcher@vanderbilt.edu.
- T18. **From the Miogeocline to the Sagebrush Ocean: Life through Time in the Basin and Range Province.** Joshua Bonde, Nevada Science Center, joshua.bonde@nsvscicenter.org; Rebecca Hall, Nevada Science Center, becky.hall@nsvscicenter.org; Paula Noble, Univ. of Nevada, Reno, noblepj@unr.edu.
- T19. **The Dynamics of Hydrovolcanic and Geothermal Systems.** Erin Fitch, Univ. of Oregon, erinpfitch@gmail.com; Nicole Lautze, Univ. of Hawai‘i, lautze@hawaii.edu; Jessica Ball, California Volcano Observatory, jlball@usgs.gov; Christopher Waythomas, Alaska Volcano Observatory, cwaythomas@usgs.gov.
- T20. **Contaminant Transport and Fate in Aquatic Systems.** Priya M. Ganguli, California State Univ., Northridge, priya.ganguli@csun.edu; Scott C. Hauswirth, California State Univ., Northridge, scott.hauswirth@csun.edu; Joanna R. Blaszcak, Univ. of Nevada, Reno, jblaszcak@unr.edu.
- T21. **Celebrating Indigenous Voices and Perspectives in Geoscience.** Diamond Tachera, Univ. of Hawai‘i at Mānoa, diamonddt@hawaii.edu; Brytne Okuhata, Univ. of Hawai‘i at Mānoa, bokuhata@hawaii.edu; Jennifer Wong-Ala, Oregon State Univ., wongalaj@oregonstate.edu.
- T22. **Undergraduate Research (Posters).** *Endorsed by Council on Undergraduate Research (CUR)–Geological Sciences.* Jeff Marshall, Cal Poly Pomona, marshall@cpp.edu.
- T23. **Professional Pathways within the Geosciences.** Jennifer Wilson, Six Rivers Geosciences, jwilson@sixriversgeosciences.com.

SHORT COURSE

Short Course registration will open in Feb. 2021. For additional information, please contact the Short Course chair: Rich Koehler, rkoehler@unr.edu.

Assessing Contaminant Sources/Release Ages and Aquifer Continuity in Soil/Groundwater Systems using Stable Radiogenic Isotopes of Strontium (Sr) and Lead (Pb). Richard W. Hurst, California Lutheran Univ., rhurst@callutheran.edu.

REGISTRATION

Early registration deadline: 5 Apr. 2021

Cancellation deadline: 12 Apr. 2021

Registration opens in Feb. 2021. For further information or if you need special accommodations, please contact the meeting general chair, Stacia Gordon, staciag@unr.edu.

ACCOMMODATIONS

A block of rooms has been reserved at the Whitney Peak Hotel at 255 North Virginia Street, Reno, NV 89501, USA, which is where the conference will be held. The meeting room rate is US\$102 per night (single/double occupancy) (prevailing government per diem rate) plus tax. Make reservations online at <https://bit.ly/3bkmgPe>. Once on the website, simply add your check-in and check-out dates, and the conference rate will be applied to

those dates. Alternatively, please call the direct sales line phone number at +1-775-398-5400 to make a reservation. When booking, please use the group code GSACORD21.

OPPORTUNITIES FOR STUDENTS AND EARLY CAREER PROFESSIONALS

Career Mentoring Luncheons

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

Career Workshop Series

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

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

ORGANIZING COMMITTEE

Meeting General Chair: Stacia Gordon, staciag@unr.edu

Technical Session Co-Chairs: Wendy Calvin, wcalvin@unr.edu; Kait Keegan, kkeegan@unr.edu; Philipp Ruprecht, pruprecht@unr.edu; Matthieu Harlaux, mharlaux@unr.edu

Field Trip Co-Chairs: Basil Tikoff, basil@geology.wisc.edu; David Greene, greened@denison.edu; Andy Barth, ibsz100@iupui.edu; Jim Faulds, jfaulds@unr.edu

Short Course Chair: Rich Koehler, rkoehler@unr.edu

Student Volunteer Co-Chairs: Wenrong Cao, wenrongc@unr.edu; Mike Darin, mdarin@unr.edu

Exhibits Chair: Lisa Stillings, stilling@usgs.gov

Sponsorship Chair: John Louie, louie@seismo.unr.edu

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2021 GSA Section Meetings



Northeastern

14–16 March
Online Meeting
<https://www.geosociety.org/ne-mtg>

The skyline of Hartford, Connecticut, as seen from across the Connecticut River. Image by Jimaro Morales from Pixabay.



Southeastern

1–2 April
The Hotel at Auburn University
and Dixon Conference Center
Auburn, Alabama
<https://www.geosociety.org/se-mtg>

William J. Samford Hall, Auburn University. The George F. Landegger Collection of Alabama Photographs in Carol M. Highsmith's America, Library of Congress, Prints and Photographs Division.



Joint North-Central/South-Central

18–20 April
University Plaza Hotel
Springfield, Missouri
<https://www.geosociety.org/nc-mtg>

Downtown Springfield Park Central Square. Photo courtesy of the Springfield, Missouri, Convention and Visitors Bureau.



Cordilleran

12–14 May
Whitney Peak Hotel
Reno, Nevada
<https://www.geosociety.org/cd-mtg>

Volcanic geology of the Virginia Mountains, Nevada. Photo courtesy of Dr. Philipp Ruprecht, UNR faculty member.



Rocky Mountain

25–27 May
Colorado State University
Fort Collins, Colorado
<https://www.geosociety.org/rm-mtg>

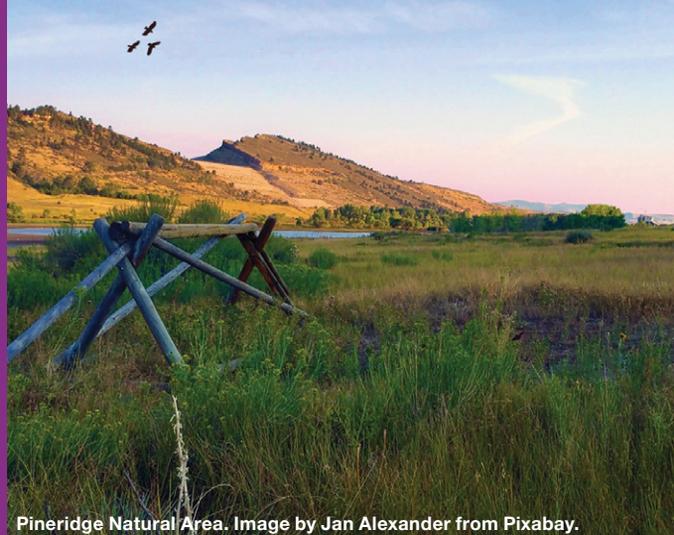
Pineridge Natural Area. Image by Jan Alexander from Pixabay.

Rocky Mountain Section

72nd Annual Meeting of the Rocky Mountain Section, GSA
Fort Collins, Colorado, USA

25–27 May 2021

www.geosociety.org/rm-mtg



Pineridge Natural Area. Image by Jan Alexander from Pixabay.

LOCATION

We are excited to announce that the GSA 2020 Rocky Mountain Section Meeting will be held in Fort Collins, Colorado, USA, on the campus of Colorado State University. This meeting site is near the foothills of the geologically diverse Front Range, which includes complex Proterozoic rocks and shear zones, well-exposed Pennsylvanian to Cretaceous strata, spectacular Laramide structures, Late Cretaceous–Paleogene intrusive bodies and associated mineral deposits, and a wide range of geomorphic features. Fort Collins is about a one-hour drive from Denver International Airport and is a small, dynamic city with a nationally renowned and very walkable downtown, arts, restaurant, and outdoor recreational scene (including a very large number of notable breweries).

CALL FOR PAPERS

Abstract deadline: 23 Feb. 2021

Submit online at www.geosociety.org/rm-mtg

Abstract submission fee: GSA members: professionals: US\$30; students: US\$18. Non-members: professionals: US\$60; students: US\$36.

TECHNICAL PROGRAM

Theme Sessions

- T1. **Quaternary Paleoclimate Records of the Rocky Mountain Region.** Peter Fawcett, Univ. of New Mexico, fawcett@unm.edu; Shannon Mahan, U.S. Geological Survey, smahan@usgs.gov.
- T2. **Cenozoic Volcanism of the Four Corners States.** Tiffany Rivera, Westminster College of Salt Lake City, trivera@westminstercollege.edu; Brian Jicha, Univ. of Wisconsin–Madison, brina.jicha@wisc.edu.
- T3. **Insights into the Evolution of the Rocky Mountains from Geophysical Imaging of the Crust and Upper Mantle.** Brandon Schmandt, Univ. of New Mexico, bschmandt@unm.edu; Rick Aster, Colorado State Univ., rick.aster@colostate.edu.
- T4. **Induced and Tectonic Seismicity in Colorado and Surrounding States.** Jolante van Wijk, New Mexico Institute of Mining and Technology, jolante.vanwijk@nmt.edu; Susan Bilek, New Mexico Institute of Mining and Technology, susan.bilek@nmt.edu.
- T5. **Rocky Mountain Precambrian Tectonism.** Graham Baird, Univ. of Northern Colorado, graham.baird@unco.edu; Tim Grover, Univ. of Northern Colorado, timothy.grover@unco.edu; Nigel Kelly, Bruker Nano Inc., nigel.kelly@bruker.com; Kevin Mahan, Univ. of Colorado Boulder, kevin.mahan@colorado.edu; Andreas Möller, Univ. of Kansas, amoller@ku.edu.
- T6. **Carbon Capture, Utilization, and Storage (CCUS) in the Rocky Mountain Region.** Lisa Stright, Colorado State Univ., lisa.stright@colostate.edu; Breck Johnson, Occidental Petroleum Corporation, breck_johnson@oxy.com.
- T7. **Mining in the Rocky Mountain Region and Beyond: Risks and Opportunities.** Steven H. Emerman, Malach Consulting, SEmerman@gmail.com.
- T8. **Linking the Rocky Mountains to the World of Ore Deposits.** Nikki Seymour, Stanford Univ., nseymour@stanford.edu; John Ridley, Colorado State Univ., jridley@colostate.edu; Erin Marsh, U.S. Geological Survey, emarsh@usgs.gov; Simone Runyon, Univ. of Wyoming, srunyon@uwyo.edu.
- T9. **Late Paleozoic Stratigraphy and Tectonics of the Rocky Mountain Region.** John Singleton, Colorado State Univ., john.singleton@colostate.edu; Sven Egenhoff, Colorado State Univ., sven.egenhoff@colostate.edu; Ryan Leary, New Mexico Institute of Mining and Technology, ryan.leary@nmt.edu.
- T10. **From When to Whence: Deciphering Laramide Tectonic Processes through Spatiotemporal Variation in the Geologic Record.** Jacob Thacker, New Mexico Bureau of Geology, jacob.thacker@nmt.edu; Kevin Hobbs, New Mexico Bureau of Geology, kevin.hobbs@nmt.edu; Theresa Schwartz, U.S. Geological Survey, tmschwartz@usgs.gov; Nikki Seymour, Stanford Univ., nseymour@stanford.edu.
- T11. **North American Sevier and Laramide Foreland Basins.** Jolante van Wijk, New Mexico Tech, jolante.vanwijk@nmt.edu; Majie Fan, Univ. of Texas at Arlington, mfan@uta.edu.

- T12. **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 Univ., jeremy.rugenstein@colostate.edu; Jason W. Ricketts, Univ. of Texas at El Paso, jricketts@utep.edu.
- T13. **Past and Present Stable Isotopes of the Rocky Mountains.** Tyler Kukla, Stanford Univ., tykukla@stanford.edu; Jeremy Caves Rugenstein, Colorado State Univ., Jeremy.Rugenstein@colostate.edu; Daniel E. Ibarra, Brown Univ., daniel_ibarra@brown.edu.
- T14. **Advances and Applications of River Science in the West.** Sharon Bywater-Reyes, Univ. of Northern Colorado, sharon.bywaterreyes@unco.edu; Alan Kasprak, Fort Lewis College, akasprak@fortlewis.edu.
- T15. **A Changing Cryosphere: The Rocky Mountains and Beyond.** Daniel McGrath, Colorado State Univ., daniel.mcgrath@colostate.edu; Bob Anderson, Univ. of Colorado, Robert.S.Anderson@colorado.edu; Mylène Jacquemart, Univ. of Colorado, Mylene.Jacquemart@colorado.edu; Irina Overeem, Univ. of Colorado, irina.overeem@colorado.edu.
- T16. **Challenges to Tribal Water Resources and the Health of the Diné and Hopi Peoples in the Rocky Mountains and the Southwest.** Malcolm Siegel, Univ. of New Mexico, msiegel51@yahoo.com; Margaret Redsteer, Univ. of Washington Bothell, mredst@uw.edu.
- T17. **The Effects of Wildfire on Hydrology and Geomorphology.** Francis Rengers, U.S. Geological Survey, frengers@usgs.gov; Paul Santi, Colorado School of Mines, psanti@mines.edu; Danica Roth, Colorado School of Mines, droth@mines.edu; Sandra Ryan-Burkett, U.S. Forest Service, sandra.e.ryan-burkett@usda.gov.
- T18. **Chronostratigraphy and Paleoclimatology of Mesozoic Terrestrial Systems.** Andreas Möller, Univ. of Kansas, amoller@ku.edu; Marina B. Suarez, Univ. of Kansas, mb.suarez@ku.edu; Greg A. Ludvigson, Kansas Geological Survey, gludvigson@kgs.ku.edu.
- T19. **Groundwater Contribution Flow in Headwater Streams.** William Sanford, Colorado State Univ., william.sanford@colostate.edu.
- T20. **Landscape Evolution across Timescales from the High Plains to the Colorado Plateau.** Eyal Marder, Colorado State Univ., eyal.marder@colostate.edu; Sean Gallen, Colorado State Univ., Sean.Gallen@colostate.edu.
- T21. **Federal and State Geologists of the Rocky Mountain Section: Who Are They, What Are They Working on, and How Can Everyone Collaborate?** Cianna Wyshnytzky,

USDA–Natural Resources Conservation Service, cianna.wyshnytzky@usda.gov.

SHORT COURSES

- S1. **Practical Python for Earth Scientists.** Matthew W. Bauer, 2M Energy, matthew.w.bauer.pg@gmail.com; Zane Jobe, Colorado School of Mines, zanejobe@mines.edu; Thomas Martin, Colorado School of Mines, thomasmartin@mymail.mines.edu.
- S2. **Subsurface Data Management and Analysis using Python and JupyterLab.** Allie Jackson, Anthropocene Analytics, aajack777@gmail.com; Lisa Stright, Colorado State Univ., lisa.stright@colostate.edu; David Advocate, Geonol-ij, dmadvoc@gmail.com.

REGISTRATION

Early registration deadline: 26 April

Cancellation deadline: 3 May

Registration opens in November. For further information or if you need special accommodations, please contact the organizing chair, Rick Aster, rick.aster@colostate.edu.

ACCOMMODATIONS

Hotel registration deadline: 4 May 2021

A block of rooms has been reserved at the Fort Collins Hilton located next to the Colorado State University campus and within easy walking distance of the Lory Center meeting venue. The meeting rate is US\$189 per night plus tax. The hotel offers many amenities (restaurants, bar, pool, Wi-Fi), and the convention center is just steps away. Reservations can be made by calling +1-970-482-2626. Please reference group code **RMGSA21**.

OPPORTUNITIES FOR STUDENTS AND EARLY CAREER PROFESSIONALS

Career Mentoring Luncheons

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

Career Workshop Series

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

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

Student Volunteers

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

PROFESSIONALS

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

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

SPONSORSHIP OPPORTUNITIES

If you, your organization, or someone you would recommend have an interest in highlighting their organization or business while supporting the GSA community by sponsoring at the meeting, please contact Rick Aster, rick.aster@colostate.edu.

LOCAL COMMITTEE

Organizing Chair: Rick Aster, Colorado State Univ., rick.aster@colostate.edu

Technical Program Co-Chairs: Ken Sims, Univ. of Wyoming, ksims7@uwyo.edu; Peter Fawcett, Univ. of New Mexico, fawcett@unm.edu; Jeremy Caves Rugestein, Colorado State Univ., jeremy.rugestein@colostate.edu

Field Trip Co-Chairs: John Singleton, Colorado State Univ., john.singleton@colostate.edu; Yvette Kuiper, Colorado School of Mines, ykuiper@mines.edu; Jonathan Caine, U.S. Geological Survey, jscaine@usgs.gov

Get the Jump on New Books

Environmental & Engineering Geoscience (E&EG) seeks an enthusiastic member of either the Association of Environmental and Engineering Geologists (AEG) or GSA to serve as its book review editor. It's a great opportunity to see what's new in books.

Duties include finding newly published books on environmental geology, engineering geology, hydrology, and related fields, and soliciting reviewers.

For more information and to indicate your interest in this voluntary position, contact co-editors Abdul Shakoor (ashakoor@kent.edu) or Brian Katz (eegeditorbkatz@gmail.com).

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In Memoriam

The Society notes with regret the deaths of the following members (notifications received between 1 May 2020 and 31 August 2020). Memorials to deceased members are published open access at www.geosociety.org/memorials. Visit that page for links to information on how to honor someone with a memorial.

Alfred A. Aya Jr.

Cannon Beach, Oregon, USA
Notified: 20 May 2020

Christina L. Baack

Arlington, Texas, USA
Notified: 17 June 2020

James T. Bales Jr.

Buies Creek, North Carolina,
USA
Date of death: 3 Nov. 2019

James D. Carl

Potsdam, New York, USA
Date of death: 10 Apr. 2020

Keith A.W. Crook

Eden, New South Wales,
Australia
Date of death: 18 Feb. 2020

William J. Furlong

New Orleans, Louisiana, USA
Date of death: 14 Apr. 2020

Mark Lawrence Holmes

Seattle, Washington, USA
Notified: 8 May 2020

Stephen A. Kish

Tallahassee, Florida, USA
Notified: 27 May 2020

Carl A. Morck

Green River, Wyoming, USA
Date of death: 1 May 2020

Harvey W. Parker

Bellevue, Washington, USA
Date of death: 5 May 2020

J. Preston Prather

Laramie, Wyoming, USA
Date of death: 25 Apr. 2020

Malcolm M. Roeber Jr.

Creede, Colorado, USA
Date of death: 6 Dec. 2019

Meyer Rubin

Vienna, Virginia, USA
Date of death: 2 May 2020

Frederick A. Schilling Jr.

Union, Kentucky, USA
Notified: 5 May 2020

B. Charlotte Schreiber

Seattle, Washington, USA
Date of death: 17 July 2020

Ove J. Stephansson

Berlin, Germany
Date of death: 1 Feb. 2020

Edmund G. Wermund Jr.

Austin, Texas, USA
Date of death: 15 July 2020

Eberhard W. Werner

Morgantown, West Virginia,
USA
Date of death: 19 Sept. 2019

Mary C. Woodland

Homewood, Illinois, USA
Date of death: 18 Feb. 2020

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

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Fellowship Opportunities	\$9.35	\$9.30
Opportunities for Students		
First 25 lines	FREE	\$5.00
Additional lines	\$5.00	\$5.00

POSITIONS OPEN

Faculty Position, Paleoclimatology, Auburn University

The Department of Geosciences at Auburn University invites applications for a new tenure-track Assistant Professor position in Paleoclimatology, beginning in the Fall Semester 2021. Applicants are expected to hold a Ph.D. in geosciences or a related field at the time of appointment. Areas of research focus may include, but are not limited to, (1) utilization of key geological (e.g., sediments, tree rings, corals, speleothems) and geochemical (e.g., stable isotope and trace element paleoclimate proxies) records to investigate the mechanisms and rates of Earth's climate change; (2) modeling the sensitivity of Earth's climate system to changes and uncertainties in natural (e.g., volcanic emissions, methane hydrate stability, etc.) and anthropogenic forcing (e.g., greenhouse gas emissions); (3) connecting past climate of various time scales to the present and predicting future climate; and/or (4) validation of climate and earth system models. Preference will be given to data-based paleoclimatologists who use isotope ratio-MS as their primary research tool. We seek a dynamic individual who will play a strong role in propelling our growing Earth System Science (ESS) Ph.D. program and participate actively in the Auburn University Climate, Human, and Earth System Science (CHESS) Interdisciplinary Initiative. Collaborative CHESS research programs that are regional or global in scope are currently active with faculty in the College of Sciences and Mathematics, School of Forestry and Wildlife Science, College of Engineering, College of Agriculture, and College of Liberal Arts. New faculty with expertise in Paleoclimatology will complement the University's considerable existing expertise in the areas of climate change sciences, geochemistry, sedimentology, hydrology, and petroleum geology. The successful candidate is expected to develop a vigorous, externally funded research program, publish scholarly work, and advise graduate and undergraduate students. The successful candidate will also teach graduate and undergraduate courses based on their expertise. Preference will be given to applicants who have experience of teaching Earth system and global change related courses to support our ESS Ph.D. program. Excellent written and interpersonal communication skills are necessary. The candidate selected for this position must meet

eligibility requirements to work in the United States on the date the appointment is scheduled to begin (August 2021) and must be able to continue working legally for the proposed term of employment.

Applications must include the applicant's curriculum vitae, copies of transcripts, and the names and contact information of at least three references, as well as up to 2 pages each for the cover letter/letter of application, the statement of research interests, the statement of teaching philosophy and interests, and the statement of inclusion. The College of Sciences and Mathematics is committed to providing resources to enhance awareness and appreciation of cultural and individual diversity, promote community, and prepare students, faculty, and staff to have a global impact in STEM. In the statement of inclusion, describe how your past and/or potential contributions in teaching, research, and/or service will advance COSAM's mission of creating an inclusive environment. This should include (1) statement of values as they relate to your understanding and commitment to inclusion, equity, and diversity in STEM fields; (2) examples of experiences that demonstrate your commitment to fostering the success of traditionally underrepresented groups in STEM (students, staff, and/or peers) and supporting a diversity of perspectives in the classroom, lab, campus, and/or community; and (3) future plans for continuing to advance inclusive excellence, equity, and diversity in your research, teaching, and service. Please see <https://www.auburn.edu/cosam/about/mission-vision-oied.htm> for more information.

To apply for the position please go to <http://www.auemployment.com/postings/19434>, complete the online form and upload the required application documents.

Applicants are encouraged to visit the AU website to learn more about Auburn University and Geosciences program <http://www.auburn.edu/cosam/departments/geosciences/>. Review of applications will begin November 16, 2020 and will continue until a candidate accepts appointment. In support of our strategic plan, Auburn University will maintain its strong commitment to diversity with standards to help ensure faculty, staff, and student diversity through recruitment and retention efforts.

Auburn University is an R1 Doctoral University and one of the nation's premier land, sea and space grant institutions. It maintains high levels of research activity and high standards for teaching excellence. Its 2019 enrollment of 30,460 students includes 24,594 undergraduates and 5,866 graduate and professional students. Organized into 12 academic colleges and schools, Auburn's 1,600+ faculty members offer more than 200 educational programs. Auburn University is ranked in the top 50 public universities in the country for its undergraduate programs. For more information on faculty life at Auburn University, please visit: <http://www.auburn.edu/academic/provost/facultyjobs/>.

Auburn University is understanding of and sensitive to the family needs of faculty, including dual-career couples. Please visit the following link for more information on Auburn's guidelines for dual-career services: <http://www.auburn.edu/academic/provost/pdf/guidelines-dual-career-services.pdf>.

Auburn University is an EEO/Vet/Disability employer and committed to building a diverse and inclusive community.

Assistant Professor, Geology, Carleton College

The Geology Department at Carleton College invites applications for a tenure-track position in surface processes at the level of Assistant Professor to begin fall 2021. The successful candidate will demonstrate an ability to incorporate authentic research experiences into all levels of the undergraduate curriculum, and pursue an active research program that may involve students from a variety of academic disciplines. We are especially interested in applicants who can foster already strong ties between Geology and Environmental Studies at Carleton.

We welcome applications from geoscientists with expertise in terrestrial surface processes broadly, including but not limited to: geomorphology, groundwater and surface hydrology, Quaternary geology, landscape evolution, the intersection of geomorphology and variously climate and/or tectonics. We encourage applications from scientists who would make the most of our rural Minnesota locale to incorporate field experiences into their courses and to foster student-faculty research.

The successful candidate will complement existing strengths in the Carleton College Geology Department. Teaching expectations include 100-level courses (Introduction to Geology and Introduction to Environmental Geology), and 200-level and 300-level courses in surface studies that are of interest to a broad cross section of students. The new faculty will also advise senior theses, participate in semiannual Geology Department field trips, and co-teach our biennial off-campus geology field studies program in New Zealand.

Carleton College is a highly selective liberal arts college with a student body of 2,000, located forty-five miles south of the Twin Cities of Minneapolis & St. Paul. Our academic year consists of three ten-week terms. The Geology Department includes a dedicated Technical Director who facilitates laboratory and field-trip planning and logistics. We are particularly interested in applicants who will contribute to a vibrant college-wide culture of undergraduate research, and who have a commitment to attracting and retaining students from underrepresented groups. Carleton College does not discriminate on the basis of race, color, creed, ethnicity, religion, sex, national origin, marital status, veteran status, actual or perceived sexual orientation, gender identity or expression, status with regard to public assistance, disability, or age in providing employment or access to its educational facilities and activities. We are particularly interested in candidates committed to teaching a diverse student body. Carleton is com-

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mitted to developing its faculty to better reflect the diversity of our student body and American society. Women and members of minority groups are strongly encouraged to apply.

Applicants should submit: (1) a cover letter, (2) a curriculum vitae, (3) a statement of teaching goals and interests (4) a statement of research goals, (5) one sample of scholarly writing, and (6) the names and contact information of three references (letters will be requested for short-listed candidates). For full consideration, all application materials should be posted to <https://jobs.carleton.edu> by November 23, 2020.

FELLOWSHIP OPPORTUNITIES

Mendenhall Postdoctoral Research Fellowships, U.S. Geological Survey

Various Locations

The U.S. Geological Survey (USGS) is seeking candidates for Mendenhall Research Fellows. The postdoctoral fellows are appointed to the USGS for two years and receive full salary and benefits at the GS-12 level, step 1. Mendenhall Fellow appointments are time limited, not to exceed two years, and are full-time. Under certain circumstances, the appointment may be extended up to an additional two years.

Open – Thursday 10/1/20, Close – Monday 1/4/21.

The USGS Mendenhall Research Fellowship Program provides an opportunity for postdoctoral fellows to conduct concentrated research in association with USGS scientists, often as a final element to their formal career preparation. The Program also provides: (1) research experiences that enhance the scientific stature and credentials of the Fellows; and (2) scientific expertise to assist in the implementation of the USGS Strategic Plan and the science strategy of its programs. Mendenhall Fellows are

expected to publish their results in peer-reviewed scientific outlets.

Applicants are encouraged to contact the Research Advisor(s) for the Research Opportunity of interest to coordinate the development of a research proposal.

More information on Research Opportunities and specific application requirements can be found at <https://www.usgs.gov/centers/mendenhall/research-opportunities>.

For more information, contact the Mendenhall mailbox at mendenhall@usgs.gov.

The U.S. Geological Survey is an Equal Opportunity Employer.

OPPORTUNITIES FOR STUDENTS

Graduate Student Opportunities at Case Western Reserve University.

Students with backgrounds in geology, physics, chemistry, biology, engineering, and related fields are encouraged to apply for our Ph.D. and MS programs in Earth, Environmental, and Planetary Sciences. Areas of active research in the Department include planetary geology and geodynamics, planetary materials, high-pressure mineral physics and geochemistry, core and mantle processes, environmental science, sedimentary geology, and sediment transport. For more information, please visit <http://eeps.case.edu> or write to eeps-gradinfo@case.edu. Financial assistance is available. Application deadline: 1/15/2021.

Graduate Research Opportunities, Purdue University.

The Department of Earth, Atmospheric, and Planetary Sciences (EAPS) at Purdue University is looking for enthusiastic and motivated graduate students for a variety of research projects in Geology and Geophysics, and Planetary, Environmental, and Atmospheric Sciences. As a multidisciplinary department within the College of Sci-

ence, EAPS draws students from a variety of STEM backgrounds. Students with demonstrated academic and research excellence are invited to explore funded opportunities at <http://www.eaps.purdue.edu/gradresearch>.

Fall 2021 MS Student Opportunity, Mississippi State University.

The Planetary Structural Geology and Tectonics Group at MSU is seeking a new MS student to begin Fall 2021. The selected student will be provided 1 year of RA support and if successful, a potential second year of TA support (including stipend and tuition remission). Students should be interested in research topics related to Earth analogue landforms of tectonic or structural features on other solar system bodies. More information about the group can be found at <https://cranekelsey.wixsite.com/geology>. MSU, its Department of Geosciences, and this research group are committed to amplifying the voices of scientists from under-represented groups. We are excited for applications from students with diverse backgrounds and perspectives. For more information about this opportunity, please email Dr. Kelsey Crane (kelseycrane@geosci.msstate.edu), group advisor.

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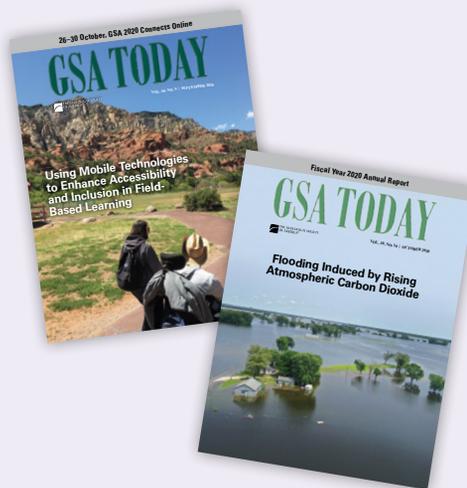
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Predicting the Water Balance from Optimization of Plant Productivity

A.G. Hunt*, Dept. of Physics, Wright State University, Dayton, Ohio 45435, USA; **B. Faybishenko**, Energy Geosciences Division, Lawrence Berkeley National Laboratory, University of California, 1 Cyclotron Road, Berkeley, California 94720, USA; and **B. Ghanbarian**, Porous Media Research Lab, Dept. of Geology, Kansas State University, Manhattan, Kansas 66506, USA

How soil-water flows and how fast it moves solutes are important for plant growth and soil formation. The relationship describing the partitioning of precipitation, P , into run-off, Q , and evapotranspiration, ET , is called the water balance. Q incorporates both surface runoff and subsurface flow components, the latter chiefly contributing to soil formation. At shorter time intervals, soil-water storage, S , may change, dS/dt , due to atmosphere-soil water exchange; i.e., infiltrating and evaporating water and root uptake. Over sufficiently long time periods, storage changes are typically neglected (Gentine et al., 2012). Percolation theory from statistical physics provides a powerful tool for predicting soil formation and plant growth (Hunt, 2017) by means of modeling soil pore space as networks, rather than continua.

In heterogeneous soils, solute migration typically exhibits non-Gaussian behavior, with statistical models having long tails in arrival time distributions and velocities decreasing over time. Theoretical prediction of solute transport via percolation theory that generates accurate full non-Gaussian arrival time distributions has become possible only recently (Hunt and Ghanbarian, 2016; Hunt and Sahimi, 2017). A unified framework, based on solute transport theory, helps predict soil depth as a function of age and infiltration rate (Yu and Hunt, 2017), soil erosion rates (Yu et al., 2019), chemical weathering (Yu and Hunt, 2018), and plant height and productivity as a function of time and transpiration rates (Hunt, 2017). Expressing soil depth and plant growth inputs to the crop net primary productivity, NPP , permits optimization of NPP with respect to the hydrologic fluxes (Hunt et al., 2020). Some remarkable conclusions also arise from this theory, such as that globally averaged ET is almost twice Q , and that the topology of the network

guiding soil-water flow provides limitations on solute transport and chemical weathering. Both plant roots and infiltrating water tend to follow paths of least resistance, but with differing connectivity properties. Except in arid climates (Yang et al., 2016), roots tend to be restricted to the thin topsoil, so lateral root distributions are often considered two-dimensional (2D), and root structures employ hierarchical, directional organization, speeding transport by avoiding closed loops. In contrast, infiltrating water (i.e., the subsurface part of Q) tends to follow random paths (Hunt, 2017) and percolates through the topsoil more deeply, giving rise to three-dimensional (3D) flow-path structures. The resulting distinct topologies generate differing nonlinear scaling, which is fractal, between time and distance of solute transport.

On a bi-logarithmic space-time plot (Hunt, 2017), optimal paths for the different spatio-temporal scaling laws of root radial extent (RRE) and soil depth, z , are defined by their radial divergence from the same length and time positions. RRE relates to NPP , which is a key determinant of crop productivity, through root fractal dimensionality, d_f , given by $RRE \propto NPP^{1/d_f}$, with predicted values of d_f of 1.9 and 2.5 for 2D and 3D patterns, respectively (Hunt and Sahimi, 2017). Basic length/time scales are given by the fundamental network size (determined from the soil particle size distribution) and its ratio to mean soil-water flow rate. Yearly average pore-scale flow rates are determined from climate variables (Yu and Hunt, 2017). Each scaling relationship has a spread, representing chiefly the range of flow rates as controlled by P and its partitioning into ET and Q . This conceptual basis makes possible prediction of the dependence of NPP on the hydrologic fluxes, Q (which modulates the soil and root depths),

and evapotranspiration, given by $ET = P - Q$ (which modulates RRE).

Consider the steady-state soil depth (Yu and Hunt, 2017), $z \propto Q^{\frac{1}{D_b-1}} = Q^{1.15}$, with $D_b = 1.87$, governing solute transport, which is the backbone fractal dimension of percolation. Optimization of $NPP \propto RRE \propto Q^{1.15} (P - Q)^{d_f}$ with respect to Q by setting $d(NPP)/d(Q) = 0$ yields $ET = P d_f / (1.15 + d_f) = 0.623P$, within 1–2% of the mean of global estimates (Hunt et al., 2020).

The ratio ET/P may be represented using the aridity index, AI , often defined as PET/P (sometimes as its inverse), with PET being the potential evapotranspiration (Budyko, 1958). In arid regions, where soil depths are yet increasing, $z \propto Q^{\frac{1}{D_b}} = Q^{0.53}$ (Yu and Hunt, 2017). For a bare land area, the fraction of the surface that plants occupy may be only P/PET , which is the inverse of the AI . Both tend to increase ET as a fraction of P . For high AI , roots are also less confined near the surface, searching water more deeply, and also increasing ET . Under ideal conditions of neither energy nor water limitation ($AI = 1$), Levang-Brilz and Biondini (2003) determined that for 16 grass and 39 Great Plains forb species the mean d_f for all forbs was 2.49, but grasses separated into two distinct groups with $d_f = 2.65$ and 1.67, in accord with percolation predictions (Hunt and Sahimi, 2017). In the studied biome, grasses constitute more than 90% of the biomass.

Figure 1 shows our predicted upper bound (dotted line) of ET/P as a function of AI . At low AI (<1) the known limit $ET \leq PET$ is applied. For large AI , $d_f = 2.5$, appropriate for deeper, more isotropic, root systems. Levang-Brilz and Biondini's (2003) experimental d_f values generate the spread in predicted ET at selected AI values (though experimental

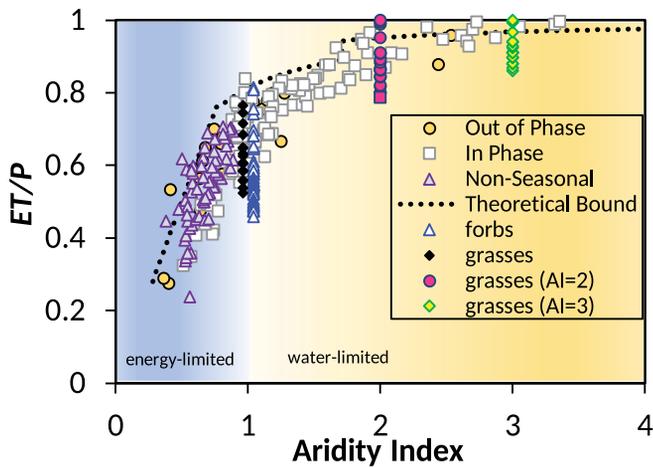


Figure 1. Predicted and observed variability of precipitation, P , and evapotranspiration, ET , ET/P , as a function of $PET/P = AI$ (aridity index). Data from Gentine et al. (2012). Figure is modified from Hunt et al. (2020).

values $d_f > 3$ that generate $ET > P$ are not used). What is new is the representation of predicted variability in ET based on experimental d_f value at larger AI , not just $AI = 1$.

Values of d_f for grasses generate almost the exact observed variability in ET/P at $AI = 1$, but overestimate variability at larger AI . We attribute the discrepancy at larger AI mostly to the fact that low-end ET/P values come from grass species with d_f around 1.9, typical for nearly 2D structures, being less adapted to arid conditions, and more likely absent at larger AI . Our theoretical framework, together with experimentally determined parameters d_f , generates a good upper bound for ET/P from theory and its variability as a function of AI .

The most important theoretical limitations of applying percolation theory to water balance modeling arise from the partitioning of surface run-off and subsurface flow (and transpiration and interception), because these processes are not obviously regulated by plants for optimizing NPP . The ability to predict contributions of surface run-off, plant interception, and subsurface flow would also

be important in evaluation of sequestering carbon and coupling global water and carbon cycles. Incorporating observations helps estimate these complementary fluxes. We found that variability in the predicted water balance due to variation in plant root fractal dimensionality outweighs uncertainties/variation in interception and surface run-off. Coupling our long-term percolation model with the short-term stochastic infiltration model (e.g., Rodriguez-Iturbe et al., 1999) might improve predictions of water balance components and optimization of plant productivity.

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Field Camp by the Glow of a Laptop?

Field camp is a critical component for students pursuing geoscience. However, many hoping to complete this requirement had their plans derailed by the COVID-19 pandemic. Students were faced with the difficult choice of postponing or venturing into the unknown and attending field camp by the glow of a laptop rather than a campfire. To help navigate this unprecedented decision, recipients of GSA's 2020 J. David Lowell Field Camp Scholarships were given the option to defer their awards or use them to attend a virtual field camp. We spoke with two of the students who chose the virtual option, and they shared the difficulties and rewards of their experiences.



Priscilla Martinez

Priscilla Martinez attended California State University, Fullerton's, first-ever virtual field camp course. She shared, "These four weeks of rigorous training have prepared me to work effectively to solve geologic problems, both collaboratively and independently. I learned how to design a field strategy and collect data using satellite imagery, aerial photography, three-point problems, and unit

descriptions. Using the data collected from each site, I produced geologic maps, cross sections, and stratigraphic columns to better understand the depositional and regional tectonic history of the field sites. Above all, participating in field camp enabled me to grow more confident in my ability to map geologic features and present my findings in an articulate manner. Although I did not experience the long days hiking in the field nor did I get to bond with my classmates over a bonfire, I gained invaluable knowledge and skills that will allow me to excel in a new technologically driven era of the geoscience world. I also now feel equipped and excited to begin my master's program at California State University, Northridge."



Quentin Burgess

Quentin Burgess, a student at the University of Nevada, Reno, told us, "In the face of adversity, my department devised a memorable field experience that challenged the traditional approach; instead of going into the field, the field was brought to us. Even though we were behind a screen, each day ran like a normal field camp; in the morning we discussed regional geology and goals of the day, and by the afternoon we were drafting our geologic maps and cross sections. At the day's end, we huddled

around the glow of our monitors like the glow of a campfire, comparing notes on assumptions, postulating subsurface structures, and creating plans for meet-ups once the world returns to normal. Overall, this virtual experience taught me the ability to better communicate with individuals that are not in the same room, it pushed my critical thinking skills in geology since I could not physically stand atop an outcrop, and most importantly showed me a new way to study the earth without ever leaving home."

The next generation of geoscientists is resilient. As the world continues to shift and change, with our support, they are ready to shift and change with it. We realize these are uncertain times for many, and yet we hope to help students continue navigating through their career paths during this time. Will you make a gift to the J. David Lowell Field Camp Scholarship Program (<https://gsa-foundation.org/fund/field-camp-opportunities/>)? Your support will help students like Priscilla and Quentin attend field camp to gain the skills and knowledge to pursue geoscience in a changing world.

Science Editor Openings for 2022

GSA seeks applications for science co-editors for *GSA Today*, *GSA Bulletin*, *Geosphere*, and *Geology* (one position each). The four-year terms begin 1 January 2022. Duties include: ensuring stringent peer review and expeditious processing of manuscripts; making final acceptance or rejection decisions after considering reviewer recommendations; and, along with your co-editors, setting the editorial tone of the journal and maintaining excellent content through publication of a diverse range of papers.

POSITION DETAILS

GSA Today editors can expect to handle papers on a wide range of topics, and editors are also responsible for soliciting submissions of papers they feel would be of interest to GSA members and other readers. Areas of expertise that best complement the continuing editor include, but are not limited to: surface geology; modern processes; climate issues; environmental concerns.

Geosphere editors should be broadly interdisciplinary with specialization in a range of possible disciplines, such as: volcanology; magmatism; igneous petrology; geochemistry; geochronology; sedimentary geology; stratigraphy; planetary geology; geoscience education.

Research interests that complement those of the continuing *GSA Bulletin* editors include, but are not limited to: deformation; petrology; sedimentary geology; stratigraphy; geochemistry; marine geology; neotectonics; planetary geology; Precambrian geology; tectonics; tectonophysics; high-T thermochronology.

Geology editors should expect to handle 200–250 manuscripts each year, with ~35 active manuscripts on any given day. Research interests that complement those of the continuing editors include, but are not limited to: deformation; geodynamics; petrology; Precambrian geology; structural geology; tectonophysics; accessory minerals; economic geology; geochemistry–high-T isotopes; high-T geochronology.

Editors work out of their current locations at work or at home. The positions are considered voluntary, but GSA provides an annual stipend and funds for office expenses.

Evaluation Process: The GSA Publications Committee will evaluate applications and make its recommendations to GSA Council based on the combination of how a candidate's disciplinary expertise fits with the needs of the journal and on the candidate's application, which should provide documentation of the required and preferred qualifications listed here.

GSA affirms the value of diverse scientific ideas and the connection between diverse scientific ideas and a diverse group of contributors of those ideas. Accordingly, GSA welcomes applications from all qualified persons and encourages applications that highlight diversity.

To Apply: In a single PDF, submit your curriculum vitae and a letter of application that demonstrates how your interests and experience fulfill the required and preferred qualifications listed below to Jeanette Hammann, jhammann@geosociety.org. **Deadline: 1 March 2021.**

REQUIRED QUALIFICATIONS

- Experience as an editor or associate editor for a geoscience journal. Include details of the duties and duration of the position(s) held.
- Demonstrated expertise in two or more fields in the geosciences or in interdisciplinary fields broadly related to the geosciences.
- Demonstrated experience handling a significant editorial workload and ability to make timely decisions.
- Because of the breadth of topics covered in GSA journals, the applicant must clearly express willingness to handle papers outside of their main disciplines.
- Demonstrated ability to communicate clearly and be responsive to author needs

PREFERRED QUALIFICATIONS

- Experience with a GSA journal as a reviewer, associate editor, or editor.
- Breadth of interdisciplinary experience to complement that of existing editors; demonstrated interest in interdisciplinary research.
- International reputation and connections with the geoscience communities.
- Interest in encouraging innovation; willingness to take risks.
- Ability to support a positive team dynamic; ability to work with GSA staff and other editors to enhance the reputation of the journal.



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Call for Field Trip, Short Course, and Technical Session Proposals



It's time to plan for the GSA 2021 Annual Meeting in Portland, Oregon, USA. We challenge you to propose a Field Trip, Short Course, and/or a Technical Session that reflects your expertise and pushes the boundaries of the discipline. Share your science with your community, teach your colleagues, and promote discussion of the incredible regional geology.

Show the geology by leading a Field Trip.

Field Trip proposal deadline: **1 Dec. 2020**

Trips can be anywhere from a half day to five days long. Field-trip proposals may be submitted by anyone. We are accepting proposals for virtual field trips also. The selection can be made within the proposal submission form.

<https://gsa.confex.com/gsa/2021AM/fieldtrip/cfs.cgi>

Exchange the geology by organizing and chairing a Technical Session.

Technical Session deadline: **1 Feb. 2021**

Proposals are being taken for Pardee Keynote Symposia and Topical Sessions. Please make your selection on the proposal submission form.

<https://gsa.confex.com/gsa/2021AM/cfs.cgi>

Share the geology as an instructor of a Short Course.

Short Course proposal deadline: **1 Feb. 2021**

Courses run the Friday and Saturday before the meeting and are typically a half day to two full days.

<https://gsa.confex.com/gsa/2021AM/shortcourse/cfs.cgi>



A MESSAGE FROM GSA's EXECUTIVE DIRECTOR

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 the 2021 annual meeting that reflects your expertise and research but also pushes the boundaries of the discipline. Without expanding our horizon, we will not move the geosciences forward and keep our relevance. I challenge you to also broaden your reach to those you collaborate with by including diversity in all ways—discipline, career progression, and individuals.

Thank you for considering sharing your science and work at the GSA 2021 Annual Meeting.

—Vicki S. McConnell



<https://www.geosociety.org>