

# Rocky Mountain Section Meeting Program

*Vol. 55, No. 5*



Pineridge Natural Area. Photo credit: Jan Alexander from Pixabay.

23–25 May  
Fort Collins, Colorado, USA

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

2023

## SPONSORS

*We are grateful to the societies, companies, and agencies that made sponsorship contributions to underwrite the cost of the 2023 meeting. Listed below are sponsorships received by time of press in April 2023.*

### GOLD LEVEL



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**PROGRAM  
FOR  
ABSTRACTS WITH PROGRAMS**

**73<sup>rd</sup> Annual Meeting**  
Rocky Mountain Section of The Geological Society of America

——  
*Where the Rockies Rise from the Plains*

**Rocky Mountain Section GSA Officers for 2022–2023**

Chair.....	Liz Balgord
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**Committee for the 2023 Meeting**

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Exhibits and Sponsorships .....	Rick Aster, Ken Sims
Field Trips .....	John Singleton, Yvette Kuiper, Jonathan Caine
Short Course Chair .....	Rick Aster
Student Volunteer Chair.....	John Singleton

**NOTICE**

By registering for this meeting, you have acknowledged that you have read and will comply with the GSA Code of Conduct for Events (the full code of conduct is at the end of the program). If you have any concerns about behavior that may violate the Code, please contact:

GSA Executive Director and CEO, Melanie Brandt, [mbrandt@geosociety.org](mailto:mbrandt@geosociety.org)

GSA Ethics and Compliance Officer, Nan Stout, [ethics@geosociety.org](mailto:ethics@geosociety.org)

You may also stop by the registration desk or the GSA Bookstore to have the named individuals directly contacted via phone. Registration for the meeting requires full vaccination status, and booster shots are strongly advised. Masks are optional for this meeting.

## Welcome



The local committee and the officers of the Geological Society of America Rocky Mountain Section welcome you to the 73<sup>rd</sup> Annual Meeting in Fort Collins, Colorado, held on the Colorado State University campus. It's a great pleasure to finally realize this meeting, and we offer our sincere thanks to our many colleagues who maintained their commitment throughout its two-year postponement.

This meeting is organized by committee members from Colorado State University, Colorado School of Mines, the University of Wyoming, and the US Geological Survey, in partnership with Colorado State University Conference Services. We ask that you have a safe, Respectful, Inclusive Scientific Event (RISE) with an open and constructive exchange of ideas and information. Please be mindful to conduct oneself in a safe and healthy manner, and respect different comfort in a post-pandemic COVID-19 era.

### Location

The 2023 Rocky Mountain Section meeting of the Geological Society of America is on the campus of Colorado State University in Fort Collins Colorado at the university's Lory Center (<https://lsc.colostate.edu/>). The venue is an easy (approximately 0.5-mile) walk across campus from the Hilton meeting hotel and from on-campus housing. Downtown Fort Collins is about 1 mile north of campus and is easily accessible by bicycle, walking, city bus service, rideshare services, and otherwise. All meeting rooms are on the third level of the Lory Center.

### Climate

Late spring Northern Colorado weather is notoriously variable. Please be prepared for all weather possibilities (e.g., ranging from hot temperatures to snowy conditions), and especially if participating in any field trips. Fort Collins is about 5,000 feet above sea level, which may become noticeable to some visitors traveling from lower elevations.

### Transportation and Directions

Fort Collins and Colorado State University are a one to 1.5-hour drive north of the Denver International Airport via CO E470 and Interstate 25. Transportation options to Campus include shuttle (Groome; <https://groometransportation.com/fort-collins-loveland/>), rideshare (e.g., UBER or LYFT), and rental cars. Driving-to-campus directions can be found at <https://admissions.colostate.edu/visit-campus/directionstocampus/>. Transportation options around campus and Fort Collins include the north-south MAX rapid bus service (with a station a few blocks from campus and the Hilton).

### Accommodations

**Fort Collins Hilton.** 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 hotel offers many amenities (restaurants, bar, pool, Wi-Fi), and the convention center is just a short walk. Reservations can be made by calling +1-970-482-2626.

**On-campus Lodging.** Stay on campus during the meeting at the CSU Academic Village (<https://housing.colostate.edu/halls/academic-village/>). All lodging will include high-speed Wi-Fi, bed linens, pillows, blankets, and one (1) towel per person. Breakfast at the Dining Hall will be included with each night stay. To reserve single or double room on-campus lodging use the associated link at the meeting website or to: <https://conferencereg.colostate.edu/Registration/Welcome.aspx?e=D57C0BBA0283988E74EE98909744A51A>.

### Parking

Parking is available at the Hilton, which is within easy walking distance of the meeting. Limited paid parking is available on campus (<https://pts.colostate.edu/driving/hourly-daily/>) and parking can also be reserved with lodging reservations at Academic Village.

### Registration

Registration is required to participate in all events associated with the meeting, including technical sessions, field trips, short courses, exhibits, special meetings, and planned social events. Registration badges must be worn for access to all activities, and guest registration is required for attendance at the welcoming reception, scheduled lunches, breakfasts, dinners, and field trips. A current student ID is required to obtain student registration rates. K–12 professionals are invited to attend at reduced rates.

On-site Registration Fees are in U.S. dollars.

	Full Meeting	One Day
Professional Member	\$400	\$275
Senior Member/Fellow (70+)	*\$250	\$170
Professional Nonmember	\$450	\$300
Early Career Professional	\$250	\$125
Student Member	\$150	\$110
Student Nonmember	\$175	\$120
K-12 Professional	\$250	\$110
Guest/Spouse	\$75	n/a
Field Trip/Short Course Only	\$40	n/a

\*70 years of age or older and a member for 30 or more years.

Guest registration is intended for non-geoscientists accompanying a registered professional, student or K–12 professional. Guest registration does not include attendance at workshops or field trips. All guests, volunteers, exhibitors, GSA staff, service providers and others in attendance are expected to abide by the GSA Events Code of Conduct,

which outlines specific expectations for participants at GSA-supported events (<https://www.geosociety.org/GSA/Events/EventConductCode/GSA/Events/Conduct.aspx>).

### Registration Schedule

On-site registration and badge pick-up is located in the Grand Ballroom Lobby on the upper level of Lory Center with the following schedule.

Monday, 22 May: 4–8 p.m.

Tuesday 23 May: 7 a.m.–5 p.m.

Wednesday, 24 May: 7 a.m.–5 p.m.

Thursday, 25 May: 7 a.m.–10 a.m.

### Cancellations, Changes, and Refunds

Requests for additions, changes, and cancellations must have been made in writing to GSA Headquarter by 25 April. No refunds will be made on cancellation notices received after this date. GSA cannot provide refunds for on-site registration or event ticket sales. Refunds will be mailed from GSA after the meeting; refunds for fees paid by credit card will be credited to the card identified on the registration form.

### Meeting Program and Abstracts

A web-based meeting program is available for this meeting. This program allows you to view and search the entire meeting program and create your own schedule of events to attend. You can also view the full abstracts from here. Please connect to the meeting program at: <https://gsa.confex.com/gsa/2023RM/meetingapp.cgi>.

### Accessibility

GSA and CSU are committed to ensuring full participation for all conference attendees. You may indicate special requirements on your registration form; please inform the local organizing committee of these requirements at least one month prior to the meeting. Accessible rooms at the hotel are available and can be reserved.

### Continuing Education Units (CEU credit)

Continuing Education Unit (CEU) credits are available for attending GSA Meetings, Field Trips, and Short Courses. This is an excellent opportunity to earn CEUs toward your requirements for your employer, K–12 school, or professional license. A contact hour is defined as a typical 60-minute classroom instructional session or its equivalent. Each conference day equals 0.8 CEU, offering 2.4 CEUs for the joint meeting technical program, with additional CEUs available from field trips and short courses. After the meeting, there will be a link on the meeting website for you to generate your CEU certificate.

### Meals

Registration includes the Wednesday noontime buffet and plenary talk by Jim Hurrell. On-campus housing includes breakfast at the CSU Academic Village. For other meals, Fort Collins, including the immediate environs of the Hilton and CSU campus offer many options, and some vendors in the Food Court on the ground floor of Lory Center

may also be open during the meeting. Attendees are encouraged to consider dining options either close to campus or in Old Town Fort Collins, and there are a large number of breakfast, lunch, and dinner options around the periphery of campus on College Ave, W. Prospect Rd., S. Shields St, and Laurel St.. We have also designated two of the larger Fort Collins breweries for Tuesday and Wednesday evenings where you may choose to informally relax with colleagues after sessions end within easy walking distance of downtown restaurants.

### Monday, 22 May

**Welcoming Reception.** 5:30–7 p.m. Join us in the Grand Ballroom to visit with friends and colleagues and officially kick-off the meeting. Exhibits are open, and hors d'oeuvres and one drink ticket are included with each registration. A cash bar is also available. Posters open.

### Tuesday, 23 May

**Session Chair Orientation.** 7–7:30 a.m., Longs Peak 302A. This meeting will include a review of session time management, AV procedures, and other information affecting the conduct of the day's sessions.

**GSA RM Section Management Board Meeting.** 7–8 a.m., Lory 312.

**Ethnicity and Identity Meetup.** 8–9 a.m., Lory 312. Social hour for members of groups historically minoritized in STEM. We love allies, but we ask that this hour be a time for folks with these identities to get together to talk, socialize, and network. Question? Contact GSA's Associate Director for DEI, Elizabeth Long, [elong@geosociety.org](mailto:elong@geosociety.org).

**Geoscience Career Program Workshop Part 1: Career Planning and Informational Interviewing.** 9–10 a.m., Lory 312.

**Morning Coffee and Tea.** 9:30–10:30 am, Grand Ballroom Lobby.

**Geoscience Career Program Workshop Part 2: Geoscience Career Exploration.** 10–11 a.m., Lory 312.

**Roy J. Shlemon Mentors Program in Applied Geoscience.** Noon–1:30 p.m., Lory 312.

**Geology Club Meetup.** 2–3 p.m., Lory 312.

**Posters and refreshments.** 4–5:30 p.m., Grand Ballroom.

**Tuesday Evening Informal Downtown Gathering Spot.** 6 p.m., New Belgium Brewery, 500 Linden Street.

### Wednesday, 24 May

**Session Chair Orientation.** 7–7:30 a.m., Longs Peak 302A. This meeting will include a review of session time management, AV procedures, and other information affecting the conduct of the day's sessions.

**Geoscience Career Program Workshop Part 3: Cover Letters, Résumés, and CVs.** 9–10 a.m., Lory 322.

**Morning Coffee and Tea.** 9:30–10:30 am, Grand Ballroom Lobby.

**Meeting Luncheon and Plenary Speaker: Dr. James Hurrell.** Noon–1:30 p.m., C/D Ballroom. Join everyone for a buffet lunch (included in your registration) and a plenary presentation by Dr. James Hurrell: *Climate Intervention*

**(Geoengineering) to Cool a Warming Planet: Can Science Fix Climate Change? Is It Ethical?**

**Abstract.** *There are no quick fixes to the climate crisis. Increased and urgent action to slash greenhouse gas emissions is necessary, as is investment into adapting to the impacts of climate change. Yet, current efforts remain insufficient. As a result, there is increasing interest and research on climate intervention (CI) methods to potentially avoid some of the worst consequences of global warming. A key recommendation from a recent National Academies of Science, Engineering and Medicine report is that the U.S. should establish a transdisciplinary research program into one specific form of CI - Solar Radiation Modification (SRM) - as an important component of the nation's overall research portfolio related to climate change. A primary SRM strategy considered is stratospheric aerosol injection (SAI), which would increase the number of small reflective particles (aerosols) in the upper atmosphere to cool the climate by reflecting more incoming solar radiation away from Earth. The potential benefits and risks of SAI will be discussed, relative to the risks posed by climate change.*

**Dr. James (Jim) W. Hurrell** is the Scott Presidential Chair of Environmental Science and Engineering at Colorado State University. Previously, Dr. Hurrell served as the Director of the National Center for Atmospheric Research (NCAR), where he was also a Senior Scientist in the Climate and Global Dynamics Laboratory (CGD). He formerly served as Chief Scientist of the Community Earth System Model, and Director of CGD as well. Dr. Hurrell's research has centered on empirical and modeling studies and diagnostic analyses to better understand climate, climate variability, climate predictability. His current research includes analyzing the possible risks and benefits of climate intervention strategies. Dr. Hurrell has received numerous professional awards, including the Warren Washington Research and Leadership Medal from the American Meteorological Society (AMS). He is a Fellow of the AMS, the U.K. Royal Meteorological Society, and the American Geophysical Union. Dr. Hurrell received a Ph.D. in Atmospheric Science from Purdue University (1990).

**Posters and Refreshments.** 4–5:30 p.m., Grand Ballroom

**GSA Townhall Meeting.** 5–6 p.m., Lory 312. Join us to meet the new GSA Executive Director and CEO Melanie Brandt for greetings and updates on happenings at GSA and for a community townhall discussion.

**Wednesday Evening Informal Downtown Gathering Spot.** 6 p.m., Odell Brewery, 800 E Lincoln Ave.

**Thursday, 25 May**

**Session Chair Orientation.** 7–7:30 a.m., Longs Peak 302A. This meeting will include a review of session time management, AV procedures, and other information affecting the conduct of the day's sessions.

**Morning Coffee and Tea.** 9:30–10:30 am, Grand Ballroom Lobby.

**John Mann Mentors Program in Applied Hydrogeology.** Noon–1:30 p.m., Lory 312.

**OPPORTUNITIES FOR STUDENTS**

*Cosponsored by GSA Foundation.*

Questions? Contact Jennifer Nocerino at [jnocerino@geosociety.org](mailto:jnocerino@geosociety.org).

**Career Mentoring Luncheons**

**Roy J. Shlemon Mentor Program in Applied Geoscience.**

Tuesday, 23 May, noon–1:30 p.m., Lory 312. The Shlemon Mentor Program is designed to extend the mentoring reach of individual professionals from applied geology to students attending GSA section meetings. Over free lunches, mentors and attendees discuss real-life issues including professional opportunities and challenges. This is a ticketed event and GSA student members will receive priority; any remaining space will be offered on a first-come, first-served basis.

**John Mann Mentors in Applied Hydrogeology Program.**

Thursday, 25 May, noon–1:30 p.m., Lory 312. The Mann Mentor Program presents mentoring opportunities for undergraduate and graduate students, as well as recent graduates, with a declared interest in applied hydrogeology as a career to interact and network with practicing hydrogeology professionals. This relaxed, small-scale event features a free lunch for attendees and mentors. This is a ticketed event and GSA student members will receive priority; any remaining space will be offered on a first-come, first-served basis.

**Career Workshop Series**

Students and early career professionals are welcome to attend the career workshops and no registration is necessary.

**Geoscience Career Workshop Part 1: Career Planning and Networking.**

Tuesday, 23 May, 9–10 a.m., Lory 312. Your job-hunting process should begin with career planning, not when you apply for jobs. This workshop will help you begin this process and will help you to practice your networking skills. This section is highly recommended for freshman, sophomores, and juniors. The earlier you start your career planning the better.

**Geoscience Career Workshop Part 2: Geoscience Career Exploration.**

Tuesday, 23 May, 10–11 a.m., Lory 312. What do geologists in various sectors earn? What do they do? What are the pros and cons to 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.**

Wednesday May 24, 9–10 a.m., Lory 312. How do you prepare a cover letter? Does your résumé need a good edit? Whether you are currently on the job market or not, learn how to prepare the best résumé possible. You will review numerous examples to help you learn important résumé do's and don'ts.

**Geology Club Meetup.** Tuesday May 23, 2–3 pm, Lory 312. If you are a geology club member or are interested in

starting a club on your campus, plan to meet up and chat with other representatives about their activities, goals, and accomplishments.

Learn more at <http://www.geosociety.org/mentors/>.

### **Student Volunteers**

Students accepted as meeting volunteers must check in at the Student Volunteer and Information Desk, located at Meeting Registration.

### **Exhibits**

Exhibits are located in the Grand Ballroom. Hours of Exhibits are:

Set up: Monday, 22 May, noon–5 p.m.

Open: Monday, 22 May, 5:30 p.m.–7:30 p.m. (during meeting Icebreaker).

Open: Tuesday, 23 May, 8 a.m.–5 p.m.

Open: Wednesday, 24 May, 8 a.m.–5 p.m.

Open: Thursday, 24 May, 8 a.m.–noon

Tear Down: Thursday, 24 May, noon–5 p.m.

As of March 22, Meeting Exhibitors include:

2024 Cordilleran/Rocky Mtn Joint Section Meetings

American Institute of Professional Geologists- AIPG

Authentic Drilling Inc

Bruker

Brunton

CSU Geosciences and Warner College

GSA Bookstore

GSA Foundation

Guideline Geo-ABEM MALA

National Association of State Boards of Geology

(ASBOG)

Nu Instruments

Oxford Instruments NanoAnalysis

Paleo West

Rocky Mountain Association of Geologists

U.S Geological Survey

U.S Geological Survey Core Research Center

University of Wyoming, Department of Geology  
& Geophysics

### **Technical Program**

The technical program consists of oral and poster sessions. The technical program begins at 8 a.m., Tuesday, 23 May and concludes at noon on Thursday, 25 May. All technical sessions (oral and poster) are located in the upper-level rooms of the Lory Center. For more information, please contact Ken Sims, [ksims7@uwyo.edu](mailto:ksims7@uwyo.edu).

### **Oral Sessions**

Oral sessions have 20 minutes allotted per presentation (up to 17 minutes for presentation; 3 minutes for question and discussion). Presentations must be prepared using PowerPoint or PDF formats, using a 16:9 screen ratio. One laptop with Windows 7 (no Macs available) with PowerPoint, one LCD projector, and one screen is provided for all oral sessions. In

addition, each room is equipped with a lectern, microphone, wireless computer mouse and slide advancer, and a speaker timer.

### **Speaker Ready Room**

All oral session presenters must visit the Speaker Ready Room in Lory 322 before their scheduled presentation to ensure their PowerPoint or PDF file is properly configured and operating and load it on one of the laptops. Failure to do so may result in presentations being omitted from sessions.

Speaker Ready Room hours are as follows:

Monday, 22 May 4–8:30 p.m.

Tuesday, 23 May 7 a.m.–6 p.m.

Wednesday, 24 May 7 a.m.–6 p.m.

Thursday, 25 May 7 a.m.–11 a.m.

Each speaker must bring his or her PowerPoint or PDF presentation on a USB-compatible flash drive (a.k.a. thumb drive or memory stick) to the Speaker Ready Room to upload to the appropriate session folder according to the following deadlines. Morning presentations must be uploaded by the end of the day prior to the presentation. All afternoon presentations must be uploaded by noon on the day of the presentation.

### **Session Chair Orientations**

Each Session Chair is requested to attend the “Session Chair Orientation” held in the Longs Peak 302A room, from 7–7:30 a.m. on the morning of the day on which your session is to take place. This meeting will include a review of session time management, AV procedures, and other information affecting the conduct of the day’s sessions.

Session chairs are asked to strictly adhere to the technical program schedule and to limit speakers to their allotted time. If a speaker does not appear for an assigned time slot, session chairs should call a break or discussion period and begin the following presentation at its scheduled time.

A student volunteer is assigned to each oral session. Session chairs are asked to meet with the assigned student volunteer before the start of the session. The volunteers are there to help the sessions run smoothly and to contact the AV Coordinator in the speaker ready room, or otherwise, in the event of technical problems.

### **Poster Sessions**

Poster Sessions are located in the C/D Ballroom. Poster presenters have one 4’ x 8’ horizontal (landscape) poster display surface. Posters will remain up for the entirety of the meeting, from 8 a.m. Tuesday morning until noon on Thursday. Each poster session will also have an assigned meeting time in the program that does not conflict with any integrally associated oral session. Presenters should put up their posters before 8 a.m. on Tuesday and remove them after noon on Thursday. Please check the program for specific times and locations. Numbers on the display surfaces correspond to the poster booth numbers listed in the Program. Push pins are recommended to mount posters, and some pins are furnished for each poster board.

## FIELD TRIPS

All field trips except FT2, FT5, and FT11 will depart from the GSA Field Trip Check-In Desk located in the Hilton Fort Collins (425 W. Prospect Rd., Fort Collins, CO 80526). Please check below for specific information on field trip departure and return.

### Pre-Meeting

**FT1. Why is Kilometer-Scale Exhumation Diachronous across the Colorado Rockies and Great Plains?** Sat.–Mon., 20–22 May. Cost: US\$422. *Endorsed by GSA Structural Geology and Tectonics Division; GSA Geochronology Division.* Lon Abbott, University of Colorado, lon.abbott@colorado.edu; Rebecca Flowers, University of Colorado, rebecca.flowers@colorado.edu; James Metcalf, University of Colorado, james.metcalf@colorado.edu; Sabrina Kainz, University of Colorado, sabrina.kainz@colorado.edu.

**Description:** A three-day trip. Low-temperature thermochronologic data reveal that different segments of the Colorado Rockies and Great Plains experienced exhumation at different times. Less than 1–2 kilometers of exhumation has occurred since the Carboniferous in some areas, whereas 4–6 km of material has been stripped from others since the Late Miocene. We explore evidence for and possible causes of this phenomenon. *Field trip will depart on May 20 at 8:30 a.m. and will return on May 22 around 2:30 p.m.*

**FT2. After the Asteroid: Stratigraphy and Paleontology of the K-Pg Succession at Corral Bluffs, Colorado.** Mon., 22 May. Cost: US\$33. *Endorsed by GSA Sedimentary Geology Division.* James Hagadorn, Denver Museum of Nature & Science, jwhagadorn@dmns.org; Gussie MacCracken, Denver Museum of Nature & Science, gussie.maccracken@dmns.org.

**Description:** This trip will focus on the D1 Sequence at Corral Bluffs. The succession at this protected site preserves one of the most exceptional fossil records from the first million years after the Cretaceous Paleogene extinction event. The emerging geochronological, biostratigraphic, and paleoenvironmental framework for these strata are impactful for understanding biotic recoveries and earth-system succession. *Field trip will depart 22 May at 10 a.m. from the parking lot of the Loaf 'n Jug convenience store at 1019 Space Center Drive, Colorado Springs, CO 80915, and will return around 3 p.m.*

**FT3. An Examination of Late Paleozoic Stratigraphy, Laramide Folds, and the Rocky Mountain Erosion Surface.** Mon., 22 May. Free. Michael Kendrick, Retired Petroleum Geoscientist, mkendrick9@icloud.com; John Singleton, Colorado State University, john.singleton@colostate.edu.

**Description:** Tucked up against the Wyoming border in northern Larimer County, Colorado, Red Mountain Open Space offers 25 square miles of geologic theater, presenting late Paleozoic stratigraphy, Laramide tectonics, Eocene erosion, burial by Oligo-Miocene strata, and ongoing erosion. A scenic hiking tour will examine all these features. *Field trip will depart 22 May at 8 a.m. and will return around 3 p.m.*

**FT4. Overview and Geologic History of Quaternary Fluvial and Eolian Deposits in the Northern Colorado Piedmont.** Mon., 22 May. Cost: US\$170. *Endorsed by GSA Quaternary Geology and Geomorphology Division.* Stephen M. Keller, Colorado Geological Survey, skeller@mines.edu; Kassandra O. Lindsey, Colorado Geological Survey, kolindsey@mines.edu; Alexander E. Marr, Colorado Geological Survey, alexmarr131@gmail.com; Matthew L. Morgan, Colorado Geological Survey, mmorgan@mines.edu; Michael K. O'Keeffe, Colorado Geological Survey, okeeffe@mines.edu.

**Description:** This field trip will examine Pleistocene-Holocene exposures of alluvium, eolian sand, and loess and will be based on 17 geologic quadrangle maps done by the Colorado Geological Survey since 2015. The lithology, geochronology, hydrogeology, geologic hazards, and mineral resources of the deposits will be presented. *Field trip will depart 22 May at 8:30 a.m. and will return around 5:45 p.m.*

### Mid-Meeting

**FT5. A VIP Behind-The-Scenes Tour at the Denver Museum of Nature & Science.** Tues., 23 May. Cost: US\$10. James Hagadorn and others, Denver Museum of Nature & Science, jwhagadorn@dmns.org.

**Description:** Evening tour of the extensive fossil, mineral, rock, and meteorite collections, plus some creepy-crawly spaces in the bowels of the Denver Museum of Nature & Science. *Field trip will start at the Denver Museum of Nature and Science (2001 Colorado Blvd., 80205) in front of the gift shop at 6:30 pm and will finish around 8 p.m.*

### Post-Meeting

**FT6. Proterozoic Tectonics of the Northern Colorado Front Range.** Fri., 26 May. Cost: US\$50. *Endorsed by GSA Structural Geology and Tectonics Division; GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division.* Graham Baird, University of Northern Colorado, graham.baird@unco.edu; Tim Grover, University of Northern Colorado, timothy.grover@unco.edu; Kevin Mahan, University of Colorado Boulder, kevin.mahan@colorado.edu.

**Description:** The Big Thompson Canyon and surrounding areas offer excellent exposure of rocks generated during Paleoproterozoic accretionary tectonism and modified by Mesoproterozoic magmatism. This field trip will explore the tectonic setting of accretion and subsequent modification of the variably metamorphosed and deformed clastic sedimentary rock sequences and plutonic suites. *Field trip will depart on 26 May at 8 a.m. and will return around 7 p.m.*

**FT7. Stratigraphy and Structural Geology of the Front Range near Fort Collins, Colorado.** Fri., 26 May. Free. John Singleton, Colorado State University, john.singleton@colostate.edu; Jeremy Rugenstein, Colorado State University, jeremy.rugenstein@colostate.edu.

**Description:** This trip will visit outcrops of Paleozoic and Mesozoic sedimentary rocks in the Front Range surrounding Fort Collins. Topics covered include the formation of clastic dikes and paleosols in the Fountain Formation, depositional environments of Pennsylvanian-Permian strata, and the



geometry and kinematics of Laramide deformation. *Field trip will depart on 26 May at 8 a.m. and will return around 2:30 p.m.*

**FT8. Geomorphology and Structures in the Epicentral Area of the 1882 M6.6 Earthquake.** Fri., 26 May. Cost: US\$90. James P. McCalpin, GEO-HAZ Consulting, Inc., mccalpin@geohaz.com.

**Description:** On 7 Nov. 1882, the largest earthquake in Colorado history shook the Front Range. Spence et al (1996) place the epicenter just north of Estes Park, with a magnitude of Mw 6.6 (i.e., large enough for surface rupture). We will examine bedrock structures and anomalous landforms within a few hundred meters of roads. *Field trip will depart on 26 May at 8:15 a.m. and will return around 5 p.m.*

**FT9. Cenozoic Geology and Geomorphology of the Laramie Mountains, Wyoming.** Fri.–Sat., 26–27 May. Cost: US\$119. *Endorsed by GSA Quaternary Geology and Geomorphology Division; Wyoming Geological Survey.* Emmett Evanoff, University of Northern Colorado, emmett.evanoff@unco.edu.

**Description:** The Laramie Mountains in southeast Wyoming is a northern extension of the Front Range. The range was not glaciated and retains the Cenozoic deposits along its flanks and in the mountains. This trip will use Cenozoic stratigraphy and geomorphology to illustrate the late Cenozoic tectonic history and development of landforms along the Rocky Mountain front. *Field trip will depart on 26 May at 8:30 a.m. and will return the evening of 27 May.*

**FT10. From Mantle to Mountain Top—Palinspastic Restoration of the I-70 Transect across the Basement Uplifts of Central Colorado.** Fri.–Sat., 26–27 May. Cost: US\$480. *Endorsed by GSA Structural Geology and Tectonics Division.* Ned Sterne, independent geologist, nedsterne@aol.com; Bob Raynolds, Denver Museum of Nature & Science, bobraynolds1@gmail.com; Jim Granath, consulting structural geologist, jwgranath@q.com.

**Description:** A two-day trip exploring data and techniques used to inform the Interstate 70 transect. Magnetotellurics, low-temperature thermochronology, seismic, wells, outcrop and strike analogs constrain the interpretation of Ancestral Rockies, Laramide, and post-Laramide deformation. Palinspastic restoration reveals ~50 miles of horizontal translation across the basement uplifts of central Colorado. *Field trip will depart on 26 May at 7:15 a.m. and will return on 27 May around 7 p.m.*

**FT11. Introduction to the Stratigraphy and Depositional Settings of the Classic Outcrops of the Book Cliffs.** Fri.–Mon., 26–29 May. Cost: US\$700. *Endorsed by GSA Sedimentary Geology Division.* Howard Feldman, Colorado State University, howard.feldman@colostate.edu; Vitor Abreu, Act Geosciences, vitor@act-geo.com.

**Description:** A two-day trip. The Book Cliffs exposes a depositional dip cross section through a succession of shoreface and fluvial deposits in the Cretaceous upper Blackhawk

and Castlegate formations. We will visit the classic outcrops starting in proximal settings near Green River, Utah, and ending near Grand Junction, Colo., over the course of two days. The outcrops will be supplemented with recently released high-resolution core photographs. The trip begins and ends in Grand Junction, Colo. *Field trip will depart on 27 May at 8 a.m., from the Quality Inn in Grand Junction, CO (733 Horizon Dr., 81506) and will finish in Grand Junction the morning of 28 May.*

## SHORT COURSES

Short courses are located in two CSU Warner College of Natural Resources Geosciences Department classrooms, and at the USGS Core Research Center in Lakewood, Colorado. Please see below for specific locations and times.

**SC1. Practical Python for Earth Scientists,** Mon., 22 May 9 a.m.–4 p.m., CSU Warner College MSNR 345. US\$15 Student, \$50 professional. *Endorsed by Rocky Mountain Association of Geologists.* Matthew W. Bauer, PG, Colorado School of Mines and V.P. Data Science & Analytics, Energy Royalty Partners, matthew.w.bauer.pg@gmail.com.

**Description:** Practical Python for Earth Scientists is a hands-on course intended to introduce basic concepts and give working examples of python code that can be used in daily geoscience workflows. No prior knowledge of python or other programming languages is necessary to attend this course. This course is tailored for geologists, geophysicists, petrophysicists, petroleum engineers, production engineers, landmen, and anyone else that would like to gain skills in practical python programming, data mining, and machine learning. While this course will use examples from the petroleum industry, any earth scientist will benefit from learning about geospatial and subsurface data analysis.

**SC2. Core Workshop: Recent Advances in Stratigraphy and Origin of Mid-Carboniferous Strata, Heath and Tyler Formations, Central Montana, USA.** Mon., 22 May 8:30 a.m.–3:30 p.m., USGS Core Research Center, Lakewood, Colorado. US\$40 course only (lunch included). *Endorsed by GSA Sedimentary Geology Division.* Richard J. Bottjer, Denver Museum of Nature & Science, rjbottjer@coalcreekresources.com; Christopher Fielding, University of Connecticut Department of Earth Sciences, christopher.fielding@uconn.edu; Mercedes Di Pasquo, Laboratorio de Palinoestratigrafía y Paleobotánica, CONICET, Buenos Aires, Argentina.

**Description:** This workshop (the USGS Core Research Center in Lakewood, Colorado, has been reserved for Monday, 22 May) will illustrate lithologies, facies, and stratigraphic relationships of late Mississippian–early Pennsylvanian strata in central Montana. New palynological dating, excellent core, and detrital zircon analyses allow a fresh look at the Heath and Tyler formations that document climatic changes associated with onset of the Late Paleozoic Ice Age. Access to the USGS requires U.S.-government-approved REAL-ID identification to get on the federal center campus.

**SC3. Luminescence (OSL) Dating Short Course: Essential Guide for Sampling and Dark Secrets Behind the Technique.** Monday, 22 May, 9 a.m.–4 p.m., CSU Geosciences Dept. MSNR 320. US\$35 with meeting registration; US\$40 course only. *Endorsed by GSA Quaternary Geology and Geomorphology Division; GSA Geochronology Division.* Shannon Mahan, U.S. Geological Survey, smahan@usgs.gov; Tammy Rittenour, Utah State University, tammy.rittenour@usu.edu.

**Description:** This short course is designed for researchers, professionals, and students interested in applying luminescence in their research. We will review the scientific basis for luminescence dating, outline sample collection, talk about “dose rates,” describe a broad range of suitable applications, and have practical demonstration during a field trip (if possible). This course will feature luminescence researchers and laboratory directors from Utah State University, the U.S. Geological Survey, Kansas State University, and from our newest lab in the U.S., University of Texas at Arlington. Topics of discussion will include hands-on methods for sample collection and applications of luminescence dating to geological, paleontological, and archaeological settings as well as rock surface dating features. The course will also provide a primer on how the technique works, the nuts and bolts behind how the equivalent dose and dose rate are calculated (the two components of the age equation), and new advances like the portable OSL and rock surface dating. Class will likely be in a place where we can easily attend a happy hour to discuss our new-found knowledge. If possible, we will show a demonstration of sample collection in the field, perhaps while filming. Or maybe we will just show the film as a science comedy.

1. History and physics of luminescence dating.
2. The wonder of the equivalent dose.
3. The often-forgotten dose rate.

4. Sampling strategies (current to geology, paleontology, and archeology).

5. Future sampling strategies and research directions.

There will be short (10–15 minute) breaks between modules. Lunch will be provided. Class will be limited to 35 participants.

### **Cultural and Recreational Attractions**

Fort Collins is a dynamic Front Range Colorado community. Points of interest and places to visit include.

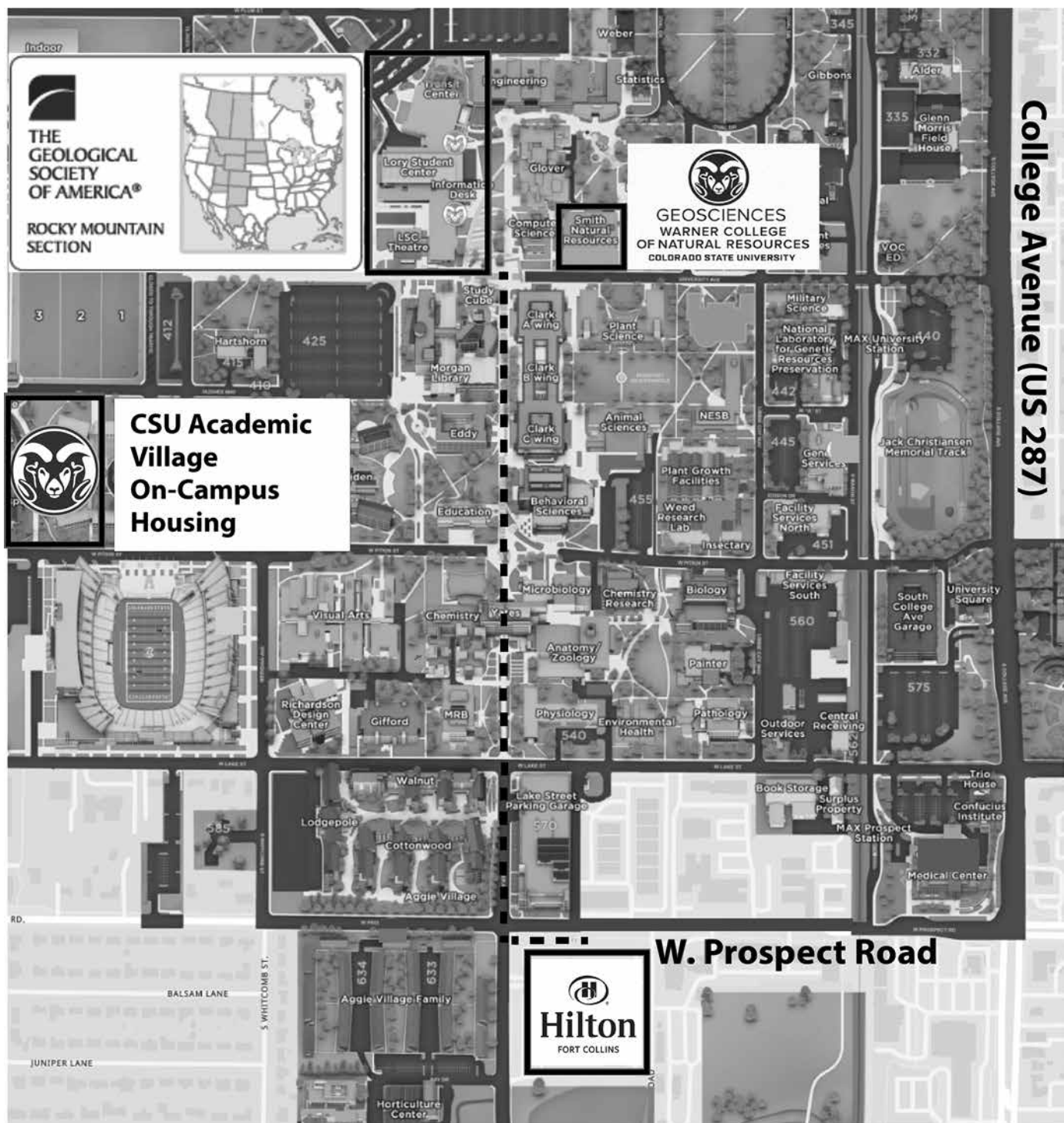
**Rocky Mountain National Park.** Classic Colorado Rocky Mountain scenery and spectacular glacial and Proterozoic geology. In addition to spectacular hiking and wildlife viewing, it is possible to drive to over 12,000 feet on Trail Ridge Road, the highest elevation through paved road in the US, which is typically cleared of snow and open by the time of this meeting. Entry reservations are highly recommended in May (<https://www.nps.gov/romo/planyourvisit/timed-entry-permit-system.htm>).

**Cache la Poudre River.** The Cache la Poudre River, beginning high in the front range, offers a scenic canyon with rafting, fishing, and hiking, and runs through the center of Fort Collins at the Poudre River Whitewater Park just north of downtown.

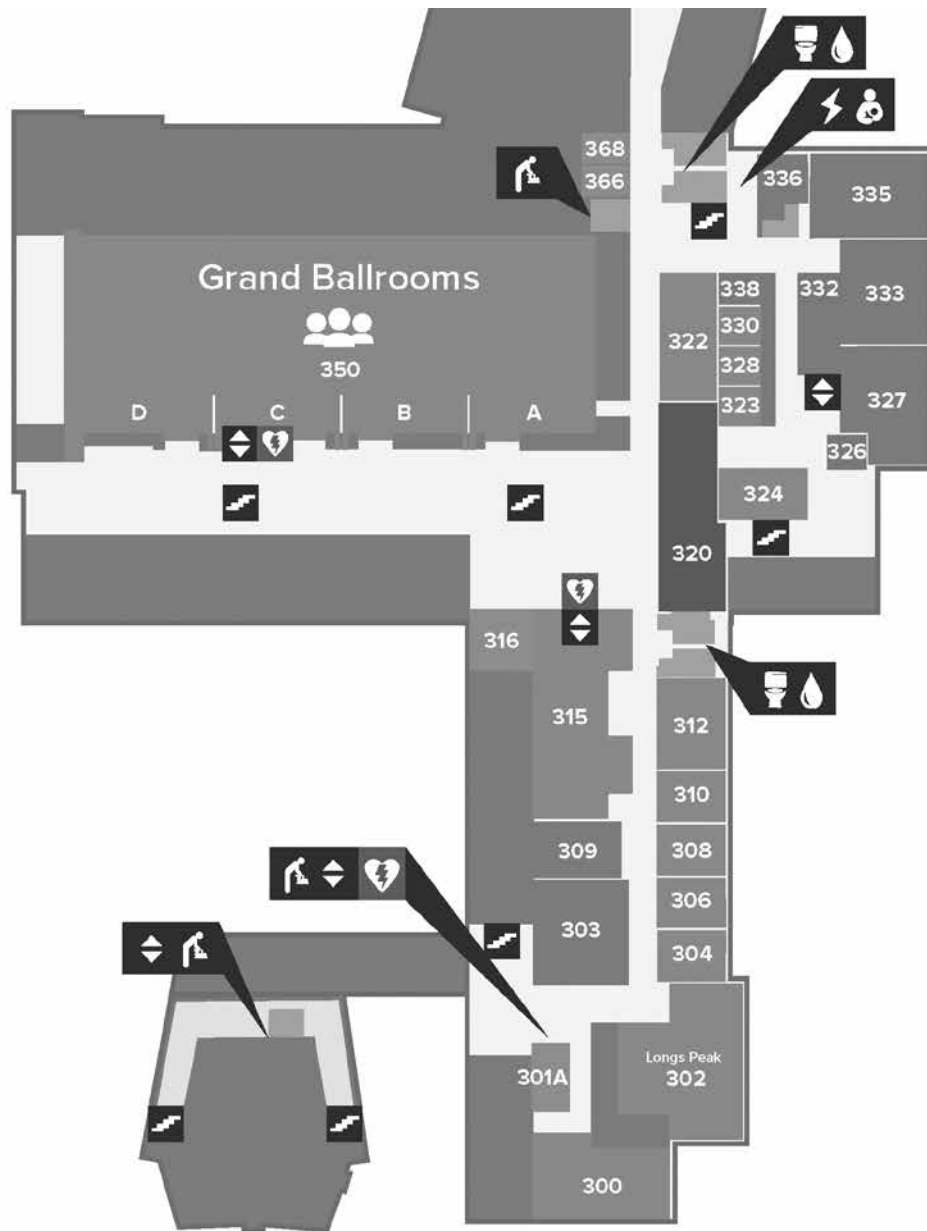
**Local Parks.** Foothills hiking, running, and biking is available just a few miles from campus the Horsetooth Reservoir and Mountain County, and Lory State Parks, as well as at multiple local and regional City of Fort Collins-managed areas (<https://www.larimer.gov/naturalresources/parks>; <https://cpw.state.co.us/placestogo/parks/Lory>; <https://www.fcgov.com/parks/trails>).

**Biking.** Fort Collins has an extensive bike trail system for recreation and around-town transportation (<https://www.fcgov.com/bicycling/bike-maps>).

**Breweries.** Fort Collins is noted for its over 20 craft breweries (<https://www.visitftcollins.com/breweries/>), some of which (e.g., New Belgium) also offer extensive tours.



Colorado State University campus and Hilton location map, with direct walking route (0.5 miles) and major campus access roads noted. The Lory Center Meeting site is at upper left, and the Geosciences/Warner College meeting room site for two of the short courses is at upper right. The location for on-campus housing is at left. For a more detailed interactive campus map see: <https://catalog.colostate.edu/general-catalog/welcome/map/>.



Third level floor plan for Lory Center.

## Schedule of Events

EVENT	TIME	LOCATION
<b>SATURDAY, 20 MAY</b>		
CANCELED FT1. Why is Kilometer-Scale Exhumation Diachronous across the Colorado Rockies and Great Plains? CHECK-IN (Field Trip)	8–8:30 a.m.	Hilton Fort Collins, 425 West Prospect Road, Fort Collins, CO 80526
<b>MONDAY, 22 MAY</b>		
FT3. An Examination of Late Paleozoic Stratigraphy, Laramide Folds, and the Rocky Mountain Erosion Surface CHECK IN (Field Trip)	7:30–8 a.m.	Hilton Fort Collins, 425 West Prospect Road, Fort Collins, CO 80526
CANCELED FT4. Overview and Geologic History of Quaternary Fluvial and Eolian Deposits in the Northern Colorado Piedmont CHECK IN (Field Trip)	8–8:30 a.m.	Hilton Fort Collins, 425 West Prospect Road, Fort Collins, CO 80526
CANCELED FT2. After the Asteroid: Stratigraphy and Paleontology of the K-Pg Succession at Corral Bluffs, Colorado CHECK IN (Field Trip)	9:30–10 a.m.	Loaf 'n Jug Convenience Store, 1019 Space Center Drive, Colorado Springs, CO 80915
SC2. Core Workshop: Recent Advances in Stratigraphy and Origin of Mid-Carboniferous Strata, Heath and Tyler Formations, Central Montana, USA (Short Course)	8:30 a.m.–3:30 p.m.	USGS Core Research Center in Lakewood, CO
SC1. Practical Python for Earth Scientists (Short Course)	9 a.m.–4 p.m.	CSU Warner College of Natural Resources Geosciences Department Classroom - MSNR 345
SC3. Luminescence (OSL) Dating Short Course: Essential Guide for Sampling and Dark Secrets Behind the Technique (Short Course)	9 a.m.–4 p.m.	CSU Warner College of Natural Resources Geosciences Department Classroom - MSNR 320
Exhibit Set up	noon–5 p.m.	A/B Ballroom
Registration Open	4–8 p.m.	Grand Ballroom Lobby
Speaker Ready Room	4–8:30 p.m.	Room 322
Exhibits Open	5:30–7 p.m.	A/B Ballroom
<b>Welcoming Reception</b>	5:30–7:30 p.m.	A/B Ballroom
<b>TUESDAY, 23 MAY</b>		
Session Chair Orientation	7–7:30 a.m.	Longs Peak 302A
GSA RM Section Management Board Meeting	7–8 a.m.	Room 312
Registration Open	7 a.m.–5 p.m.	Grand Ballroom Lobby
Speaker Ready Room	7 a.m.–6 p.m.	Room 322
Ethnicity and Identity Group Meetup	8–9 a.m.	Room 312
Exhibits Open	8 a.m.–5 p.m.	A/B Ballroom
<b>Morning Oral Technical Sessions</b>		
T3. A Changing Cryosphere: The Past and Present	8 a.m.–noon	Room 304-306
T18. Crust Formation, Deformation, Metamorphism, Plutonism, and Thermal Evolution of the Rocky Mountains: Proterozoic to Present	8 a.m.–noon	Longs Peak 302A
<b>All Day Poster Sessions: authors will be present from 3 to 5 PM</b>		
T1. The Laramide Belt: End to End (Posters)	8 a.m.–6 p.m.	C/D Ballroom
T3. A Changing Cryosphere: The Past and Present (Posters)	8 a.m.–6 p.m.	C/D Ballroom
T5. Drivers of Continental Magmatism (Posters)	8 a.m.–6 p.m.	C/D Ballroom
T7. Geoscience, Hydrology, and Water Management of Our Public Lands (Posters)	8 a.m.–6 p.m.	C/D Ballroom
T15. Geologic Mapping in the Rocky Mountains: Evolving Techniques and Challenges (Posters)	8 a.m.–6 p.m.	C/D Ballroom
T18. Crust Formation, Deformation, Metamorphism, Plutonism, and Thermal Evolution of the Rocky Mountains: Proterozoic to Present (Posters)	8 a.m.–6 p.m.	C/D Ballroom
Geoscience Career Program Workshop Part 1: Career Planning and Informational Interviewing	9–10 a.m.	Room 312

EVENT	TIME	LOCATION
Morning Coffee and Tea	9:30–10:30 a.m.	Grand Ballroom Lobby
Geoscience Career Program Workshop Part 2: Geoscience Career Exploration	10–11 a.m.	Room 312
Roy J. Shlemon Mentors Program in Applied Geoscience	noon–1:30 p.m.	Room 312
<b>Afternoon Oral Technical Sessions</b>		
T19. The Field Fellows: A Network of Diversity and Inclusion Champions within the Earth Sciences	1:30–3 p.m.	Room 308-310
T7. Geoscience, Hydrology, and Water Management of Our Public Lands	1:30–4:05 p.m.	Room 304-306
T5. Drivers of Continental Magmatism	1:30–5 p.m.	Longs Peak 302A
Geology Club Meetup	2–3 p.m.	Room 312
Posters and refreshments	4–5:30 p.m.	C/D Ballroom
Tuesday Evening Informal Downtown Gathering: New Belgium Brewery	6–9 p.m.	New Belgium, 500 Linden Street
FT5. A VIP Behind-The-Scenes Tour at the Denver Museum of Nature & Science CHECK IN (Field Trip)	6–6:30 p.m.	Denver Museum of Nature and Science, 2001 Colorado Boulevard, Denver, CO 80205
<b>WEDNESDAY, 24 MAY</b>		
Session Chair Orientation	7–7:30 a.m.	Longs Peak 302A
Registration Open	7 a.m.–5 p.m.	Grand Ballroom Lobby
Speaker Ready Room	7 a.m.–6 p.m.	Room 322
Exhibits Open	8 a.m.–5 p.m.	A/B Ballroom
<b>Morning Oral Technical Sessions</b>		
T12. Geohydrobiology of the Yellowstone Hydrothermal System	8 a.m.–noon	Longs Peak 302A
T21. Data Preservation for the Geosciences: Recent Advances in Geo-Databases, Repository Practices, and Big Data Applications	8 a.m.–noon	Room 304-306
<b>All Day Poster Sessions: authors will be present from 3 to 5 PM</b>		
T8. The Yellowstone Hotspot Geologic Province: Examining the Effects of Yellowstone Volcanism on the North American West (Posters)	8 a.m.–6 p.m.	C/D Ballroom
T10. Past and Present Stable Isotopes of the Western U.S. and Beyond (Posters)	8 a.m.–6 p.m.	C/D Ballroom
T12. Geohydrobiology of the Yellowstone Hydrothermal System (Posters)	8 a.m.–6 p.m.	C/D Ballroom
T17. Landscape Evolution across Time Scales from the High Plains to the Colorado Plateau (Posters)	8 a.m.–6 p.m.	C/D Ballroom
T20. Quaternary Paleoclimate Records of the Rocky Mountain Region (Posters)	8 a.m.–6 p.m.	C/D Ballroom
T21. Data Preservation for the Geosciences: Recent Advances in Geo-Databases, Repository Practices, and Big Data Applications (Posters)	8 a.m.–6 p.m.	C/D Ballroom
Geoscience Career Program Workshop Part 3: Cover Letters, Résumés, and CVs	9–10 a.m.	Room 312
Morning Tea and Coffee	9:30–10:30 a.m.	Grand Ballroom Lobby
Meeting Luncheon and Plenary Speaker: Dr. James Hurrell, <i>Intervention (Geoengineering) to Cool a Warming Planet: Can Science Fix Climate Change? Is It Ethical</i>	noon–1:30 p.m.	C/D Ballroom
<b>Afternoon Oral Technical Sessions</b>		
T8. The Yellowstone Hotspot Geologic Province: Examining the Effects of Yellowstone Volcanism on the North American West	1:30–4:30 p.m.	Longs Peak 302A
T6. Integrated Science Approaches to Addressing Complex Earth Science Challenges	1:30–5 p.m.	Room 304-306
Posters and Refreshments	4–5:30 p.m.	C/D Ballroom

EVENT	TIME	LOCATION
Town Hall: What's Happening at GSA	5–6 p.m.	Room 312
Wednesday Evening Informal Downtown Gathering: Odell Brewery	6–9 p.m.	Odell Brewery, 800 East Lincoln Avenue
<b>THURSDAY, 25 MAY</b>		
Session Chair Orientation	7–7:30 a.m.	Longs Peak 302A
Registration Open	7–10 a.m.	Grand Ballroom Lobby
Speaker Ready Room	7–11 a.m.	Room 322
Exhibits Open	8 a.m.–noon	A/B Ballroom
<b>Morning Oral Technical Sessions</b>		
T9. Tectonism and Magmatism in the Rio Grande Rift	8 a.m.–noon	Longs Peak 302A
T14. Geologic and Geohazard Mapping: Recent Advances in Mapping and Age-Dating Techniques and Use of Lidar	8 a.m.–noon	Room 304-306
Morning Coffee and Tea	9:30–10:30 a.m.	Grand Ballroom Lobby
John Mann Mentors Program in Applied Hydrogeology	noon–1:30 p.m.	Room 312
Exhibitor Tear Down	noon–5 p.m.	A/B Ballroom
<b>FRIDAY, 26 MAY</b>		
CANCELED FT10. From Mantle to Mountain Top—Palinspastic Restoration of the I-70 Transect across the Basement Uplifts of Central Colorado CHECK IN (Field Trip)	6:45–7:15 a.m.	Hilton Fort Collins, 425 West Prospect Road, Fort Collins, CO 80526
CANCELED FT11. Introduction to the Stratigraphy and Depositional Settings of the Classic Outcrops of the Book Cliffs CHECK IN (Field Trip)	7:30–8 a.m.	Quality Inn, 733 Horizon Drive, Grand Junction, CO 81506
FT6. Proterozoic Tectonics of the Northern Colorado Front Range CHECK IN (Field Trip)	7:30–8 a.m.	Hilton Fort Collins, 425 West Prospect Road, Fort Collins, CO 80526
FT7. Stratigraphy and Structural Geology of the Front Range near Fort Collins, Colorado CHECK IN (Field Trip)	7:30–8 a.m.	Hilton Fort Collins, 425 West Prospect Road, Fort Collins, CO 80526
CANCELED FT8. Geomorphology and Structures in the Epicentral Area of the 1882 M6.6 Earthquake CHECK IN (Field Trip)	7:45–8:15 a.m.	Hilton Fort Collins, 425 West Prospect Road, Fort Collins, CO 80526
FT9. Cenozoic Geology and Geomorphology of the Laramie Mountains, Wyoming CHECK IN (Field Trip)	8–8:30 a.m.	Hilton Fort Collins, 425 West Prospect Road, Fort Collins, CO 80526



GSA BOOKS

## Laurentia: Turning Points in the Evolution of a Continent

*Edited by Steven J. Whitmeyer, Michael L. Williams, Dawn A. Kellett, and Basil Tikoff*

The North American continent has a rich record of the tectonic environments and processes that occur throughout much of Earth history. This Memoir focuses on seven "turning points" that had specific and lasting impacts on the evolution of Laurentia: (1) The Neoproterozoic breakup of Rodinia; (2) the Paleoproterozoic and the initial assembly of Laurentia; (3) the Mesoproterozoic southern margin of Laurentia; (4) the Mid-continent rift and the Grenville orogeny; (5) the Neoproterozoic breakup of Rodinia; (6) the mid-Paleozoic phases of the Appalachian-Caledonian orogeny; and (7) the Jurassic-Paleogene assembly of the North American Cordillera. The chapters in this Memoir provide syntheses of the current understanding of the geologic evolution of Laurentia and North America, as well as new hypotheses for testing.

MWR220, 804 p.,  
ISBN 9780813712208

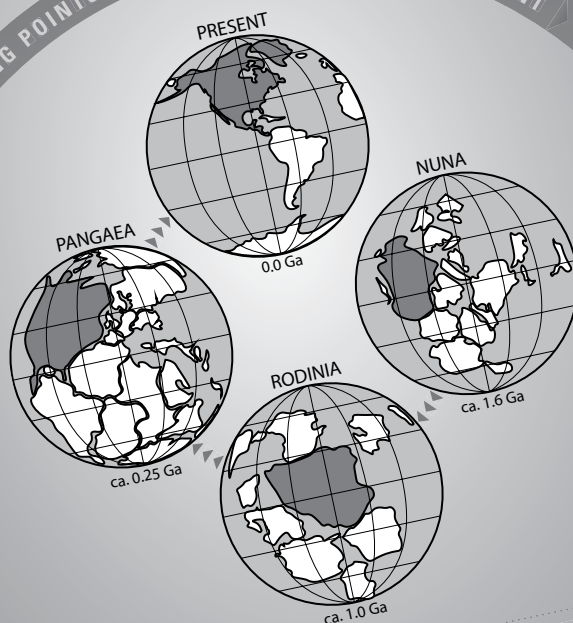
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# LAURENTIA

TURNING POINTS IN THE EVOLUTION OF A CONTINENT



*Edited by Steven J. Whitmeyer, Michael L. Williams, Dawn A. Kellett, and Basil Tikoff*

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# Technical Sessions



A no-smoking policy has been established by the Program Committee and will be followed in all meeting rooms for technical sessions.

## NOTICE

In the interest of public information, the Geological Society of America provides a forum for the presentation of diverse opinions and positions. The opinions (views) expressed by speakers and exhibitors at these sessions are their own and do not necessarily represent the views or policies of the Geological Society of America.



## NOTE INDEX SYSTEM

Numbers (3-3, 15-4) indicate session and order of presentation within that session.

\* denotes speaker

## TUESDAY, 23 MAY 2023

### ORAL TECHNICAL SESSIONS

#### SESSION NO. 1

##### ***T3. A Changing Cryosphere: The Past and Present (GSA Quaternary Geology and Geomorphology Division)***

8:00 AM, Lory Student Center, Room 304-306

Keith Brugger, Jordan Dahle, Eric Leonard, Randall Bonnell, Lucas Zeller, Sierra Melton and Wyatt Reis, Presiding

#### 8:00 AM INTRODUCTORY REMARKS

- 1-1 8:05 AM Zikan, Karina\*; Enderlin, Elyn; Marshall, Hans-Peter; O'Neel, Shad; Gendreau, Madeline: **TERRAIN CONTROLS ON ICESAT-2 SNOW DEPTH ESTIMATES OVER ALPINE WATERSHEDS IN THE WESTERN UNITED STATES**
- 1-2 8:25 AM Mccaslin, James\*; Mikesell, Thomas Dylan; Marshall, Hans-Peter: **CHARACTERIZATION OF SNOW MECHANICAL PROPERTIES USING A LASER ULTRASOUND: ROLE OF THE SNOW CRYSTAL**
- 1-3 8:45 AM Parsekian, Andrew\*; Rangel, Rodrigo Correa; Engram, Melanie; Ohara, Noriaki; Jones, Benjamin; Kanevskiy, Misha; Bergstedt, Helena; Anthony, Katey: **GROUND-PENETRATING RADAR OBSERVATION OF LAKE ICE PROPERTIES**
- 1-4 9:05 AM Munroe, Jeffrey\*; Laabs, Benjamin; Corbett, Lee; Bierman, Paul; Handwerger, Alexander: **MOVEMENT OF AN ICE-CEMENTED ROCK GLACIER OVER ANNUAL TO MULTI-MILLENNIAL TIMESCALES, UINTEA MOUNTAINS, UTAH**
- 1-5 9:25 AM Laabs, Benjamin\*; Anderson, Leif; Licciardi, Joseph; Tulenko, Joseph: **DEVELOPING A GEOSPATIAL DATABASE OF LATE PLEISTOCENE MOUNTAIN GLACIERS IN THE WESTERN UNITED STATES**
- 1-6 9:45 AM Waldock, Madeline\*; Laabs, Benjamin: **IMPACT OF LANDSCAPE DEGRADATION ON COSMOGENIC NUCLIDE EXPOSURE DATING OF DIFFERENT TYPES OF GLACIAL MORAINES**

#### 10:05 AM BREAK

- 1-7 10:20 AM McKean, Adam\*; McDonald, Greg N.: **NEW GLACIAL DEPOSIT MAPPING IN THE WASATCH RANGE, UTAH, YIELDS POTENTIAL SITES FOR ADDITIONAL GLACIAL AGE DATING IN THE EASTERN GREAT BASIN**
- 1-8 10:40 AM Dahle, Jordan\*; Brugger, Keith; Laabs, Benjamin; Swanson, Amelia: **COSMOGENIC EXPOSURE DATING OF LATE PLEISTOCENE MORAINES IN THE TAYLOR RIVER DRAINAGE, SOUTHERN SAWATCH RANGE, COLORADO**
- 1-9 11:00 AM Headley, Rachel M.\*; Megerian, Courtney E.; Morgan, Daniel: **SPATIAL VARIATION IN GLACIAL EROSION AND MORaine DEPOSITION OF THE MULBROW GLACIER THROUGH HOLOCENE WARMING**
- 1-10 11:20 AM Muhs, Daniel R.\*; Skipp, Gary L.; Honke, Jeffrey S.; Rowland, Zachary M.: **A GLACIOGENIC ORIGIN FOR LATE QUATERNARY DUNE FIELDS IN THE UPPER TANANA RIVER VALLEY OF EASTERN ALASKA, USA**
- 1-11 11:40 AM Ganahl, Rolf\*: **1<sup>ST</sup> CONTINENTAL SIZE GLACIATION REACHING MISSISSIPPI DRAINAGE AREA**

#### SESSION NO. 2

##### ***T18. Crust Formation, Deformation, Metamorphism, Plutonism, and Thermal Evolution of the Rocky Mountains: Proterozoic to Present (GSA Structural Geology and Tectonics Division; GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division; GSA Geophysics and Geodynamics Division)***

8:00 AM, Lory Student Center, Longs Peak 302A

Andreas Möller, Graham B. Baird, Timothy Grover and Kate Souders, Presiding

- 2-1 8:00 AM Hillenbrand, Ian\*; Williams, Michael; Karlstrom, Karl; Gilmer, Amy K.; Lowers, Heather; Jercinovic, M.J.; Souders, Kate: **PETROCHRONOLOGIC CONSTRAINTS ON FOUR TECTONO-METAMORPHIC EVENTS IN WESTERN COLORADO**
- 2-2 8:20 AM Baird, Graham\*; Grover, Timothy; Mahan, Kevin H.: **PALEOPROTEROZOIC CRUST GENERATION IN THE NORTHERN COLORADO FRONT RANGE**

2-3	8:40 AM	Workman, Jeremiah*: <b>THE GREEN MOUNTAIN ARC–RAWAH BATHOLITH BOUNDARY IN THE SOUTHERN LARAMIE MOUNTAINS OF COLORADO—CORNELIUS CREEK SHEAR ZONE</b>
2-4	9:00 AM	Kuiper, Yvette D.*; Daniel, Christopher G.: <b>THE ENIGMA OF THE PICURIS OROGENY IN COLORADO</b>
2-5	9:20 AM	Grover, Timothy*; Williams, Michael L.; Baird, Graham B.: <b>CONSTRAINTS ON THE NATURE AND TIMING OF METAMORPHISM AND DEFORMATION OF STAUROLITE + ANDALUSITE ZONE METAPELITIC ROCKS IN BIG THOMPSON CANYON, NORTHERN COLORADO FRONT RANGE</b>
	9:40 AM	<b>BREAK</b>
2-6	9:55 AM	Ettson, Matthew*; Grover, Timothy; Baird, Graham B.; Williams, Michael L.: <b>CONSTRAINTS ON THE TIMING OF METAMORPHISM, DEFORMATION, AND ANATEXIS OF BIG THOMPSON AND POUDRE CANYON MIGMATITES USING EPMA MONAZITE PETROCHRONOLOGY</b>
2-7	10:15 AM	Balgord, Liz*; Yonkee, Adolph; Wilcock, Laura: <b>UNRAVELING THE PALEOPROTEROZOIC PETROTECTONIC EVOLUTION OF THE FARMINGTON CANYON COMPLEX, NORTHERN UTAH, IMPLICATIONS FOR THE BREAKUP OF SUPERIA AND CONSTRUCTION OF WESTERN LAURENTIA</b>
2-8	10:35 AM	Nowaczewski, Vincent S.*; Sturmer, Daniel; Vaughan, Benjamin L.: <b>EVALUATING THE RELATIVE IMPORTANCE OF BOUNDARY DISPLACEMENTS AND CONTINENT SHAPE IN GOVERNING INTERIOR STRESS AND STRAIN DURING THE ANCESTRAL ROCKY MOUNTAIN OROGENY WITH A 3-DIMENSIONAL FINITE ELEMENT METHOD</b>
2-9	10:55 AM	Hobbs, Noah*; van Wijk, Jolante: <b>THE ROLE OF PRE-EXISTING WEAKNESSES IN THE LARAMIDE OROGENY</b>
2-10	11:15 AM	Kittleson, Ken*: <b>A REINTERPRETATION OF THE STRUCTURAL DEVELOPMENT OF THE OUTCROPPING GEOLOGICAL SECTION EAST OF BOULDER, COLORADO</b>

## POSTER TECHNICAL SESSIONS

### SESSION NO. 3

**T1. The Laramide Belt: End to End (Posters) (GSA Structural Geology and Tectonics Division; GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division)**

8:00 AM, Lory Student Center, C/D Ballroom

Authors will be present from 3 to 5 PM

Booth #		
3-1	1	Eichler, Carla*; Saylor, Joel E.: <b>EARLY LARAMIDE DEFORMATION AND DEVELOPMENT OF DYNAMIC SUBSIDENCE IN MONTANA AND WYOMING: PRODUCTS OF LATE CRETACEOUS MULTI-MICROPLATE SUBDUCTION UNDER THE WESTERN UNITED STATES</b>
3-2	2	Brailer, Nicholas A.*; Thacker, Jacob O.; Michelfelder, Gary: <b>ANALYSIS OF ENIGMATIC PORPHYRY COBBLES IN THE CA. 90 MA FRONTIER FORMATION, EASTERN BIGHORN BASIN, WYOMING</b>
3-3	3	Ricketts, Jason*; West, David; Conley, Aaron T.; Langford, Richard P.: <b>INVESTIGATING STYLES OF CONTRACTION AND OVERPRINTING BY RIO GRANDE RIFT EXTENSION IN THE SOUTHERN INDIO MOUNTAINS, WESTERN TEXAS</b>

### SESSION NO. 4

**T3. A Changing Cryosphere: The Past and Present (Posters) (GSA Quaternary Geology and Geomorphology Division)**

8:00 AM, Lory Student Center, C/D Ballroom

Authors will be present from 3 to 5 PM

Booth #		
4-1	4	Reis, Wyatt*; McGrath, Daniel: <b>QUANTIFYING TOPOGRAPHIC CONTROLS OF SNOWPACK MASS AND ENERGY BALANCES FOLLOWING HIGH-ELEVATION WILDFIRE IN THE SOUTHERN ROCKY MOUNTAINS</b>
4-2	5	Megerian, Courtney E.; Breitzmann, Payton E.; Chen, Ming; McGlynn, Nadia R.; Morgan, Daniel*: <b>THE FLOW OF THE FERRAR GLACIER CONSTRAINED BY THE PROVENANCE OF GLACIAL TILL IN VERNIER VALLEY, ANTARCTICA</b>
4-3	6	McGrath, Daniel*; Reis, Wyatt; Wright, Patrick; Caskey, Simeon; Scambos, Theodore: <b>GOING, GOING, GONE? DECIPHERING THE MASS BALANCE OF VERY SMALL GLACIERS IN THE AMERICAN WEST</b>
4-4	7	Bonnell, Randall*; McGrath, Daniel; Zeller, Lucas; Bump, Ella; Olsen-Mikitowicz, Alex; Duncan, Caroline: <b>ESTIMATING SEASONAL SNOW ACCUMULATION FROM NASA UAVSAR AT CAMERON PASS, CO</b>

### SESSION NO. 5

**T5. Drivers of Continental Magmatism (Posters) (GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division; GSA Geophysics and Geodynamics Division)**

8:00 AM, Lory Student Center, C/D Ballroom

Authors will be present from 3 to 5 PM

Booth #		
5-1	8	Rubin, Gene*; Murray, Kendra; Karlstrom, Leif; Goughnour, Rebecca: <b>USING (U-TH)/HE THERMOCHRONOLOGY TO QUANTIFY THE VARIABILITY OF DIKE EMPLACEMENT ALONG STRIKE DURING THE MAIN PHASE OF THE COLUMBIA RIVER FLOOD BASALTS</b>
5-2	9	Litton, Shelby Dianne*; Newell, Dennis; Mahan, Kevin; Goncalves, Philippe; Grasner, Benoit: <b>HYDROGEN STABLE ISOTOPE CONSTRAINTS ON HYDRATION OF COLORADO PLATEAU LOWER CRUST FROM OLIGOCENE-MIOCENE NAVAJO VOLCANIC FIELD XENOLITHS</b>
5-3	10	Parker, Douglas*: <b>THE HYPOTHESIS OF LARGE-SCALE TEPHRA FALL PRESENTS A COMPLEX EARTH SCIENCE CHALLENGE THAT DEMANDS AN INTEGRATED SCIENTIFIC EVALUATION</b>

### SESSION NO. 6

**T7. Geoscience, Hydrology, and Water Management of Our Public Lands (Posters) (GSA Hydrogeology Division)**

8:00 AM, Lory Student Center, C/D Ballroom

Authors will be present from 3 to 5 PM

Booth #		
6-1	11	Landolt, Benjamin*: <b>A SPATIAL INVENTORY &amp; GIS ANALYSIS OF INFORMAL TRAIL NETWORKS IN COLORADO NATIONAL MONUMENT: IMPLICATIONS FOR RECREATION AND RESOURCE MANAGEMENT</b>
6-2	12	Mroczek, Caelum*; Springer, Abe E.; Sankey, Temuulen: <b>ENHANCING AQUIFER RECHARGE ON PUBLIC LANDS OF THE COLORADO PLATEAU TO ADAPT WATER SUPPLIES FOR CLIMATE AND LANDSCAPE CHANGE</b>
6-3	13	Ulate, Isabella*; Rugenstein, Jeremy: <b>WEATHERING IN ROCKY MOUNTAIN ALLUVIAL VALLEYS</b>
6-4	14	Olivares-Mejia, Samantha*: <b>BIG RIVERS LEAD TO BIGGER DATA PACKAGES: STREAMLINING DATA PUBLICATION VIA REPRODUCIBLE PROGRAMMING</b>

- 6-5 15 Custado, Manuel Justin\*; Miller, Shaw; Chang, Natalie; Prausnitz-Weinbaum, Mia; Gagnon, Catherine; Belanger, Bryce; de Wet, Cameron; Kinsley, Christopher W.; Sharp, Warren D.; Oster, Jessica; Ibarra, Daniel: **HYDROLOGICAL BALANCE IN THE BEAR LAKE WATERSHED, UTAH AND IDAHO USING MAJOR-ION AND STABLE ISOTOPE ANALYSIS**
- 6-6 16 Elkins, Joe\*: **CA, MG, AND FE CONCENTRATIONS IN SURFACE WATERS NEAR EARLY INDUSTRIAL DISTILLERY LOCATIONS IN TENNESSEE AND KENTUCKY**

**SESSION NO. 7****T15. Geologic Mapping in the Rocky Mountains: Evolving Techniques and Challenges (Posters)**

8:00 AM, Lory Student Center, C/D Ballroom

Authors will be present from 3 to 5 PM

## Booth #

- 7-1 17 Smout, Brooklyn\*: **CATALOGING DIGITAL DATA FROM PUBLISHED SUBSURFACE MAPPING BY THE U.S. GEOLOGICAL SURVEY**
- 7-2 18 Barrette, Nolan\*; Johnstone, Sam: **ASSESSING THE EFFICACY OF CLUSTERING TECHNIQUES FOR AIDING REGIONAL SYNTHESIS OF QUATERNARY GEOLOGY**
- 7-3 19 Omeara, Stephanie\*; Karpilo, Ronald D.; Chappell, James R.; Winter, James R.H.: **MAKING DIGITAL GEOLOGIC GIS DATA ACCESSIBLE TO DIVERSE USER GROUPS BY PRODUCING MULTIPLE DATA FORMATS**
- 7-4 20 Hopkins, Nathan\*; Tedrow, Linda; Lewis, Reed S.: **A NEW DATABASE INITIATIVE FOR REGIONAL SEAMLESS 1:24,000 SCALE GEOLOGIC MAP COMPILATIONS IN IDAHO**
- 7-5 21 Funk, Jonathan A.\*; Lund, Karen; Larkin, Edward M.; Horton, John D.; San Juan, Carma A.: **TO LUMP OR TO SPLIT: CHALLENGES IN THE COMPILATION OF THE HAILEY 1°X2° QUADRANGLE IN THE SOUTHWEST CORNER OF THE USGS NORTHERN ROCKY MOUNTAINS TRANSECT PROJECT, SOUTH-CENTRAL IDAHO**
- 7-6 22 Johnstone, Sam\*; Campos, Juan-Marcel; Barrette, Nolan; Roe, Warren; Colgan, Joseph: **A NATIONAL-RESOLUTION COMPILATION OF QUATERNARY GEOLOGY FOR THE CONTERMINOUS UNITED STATES**
- 7-7 23 Mauch, James\*; Wittke, Seth J.; Barrette, Nolan: **NEW MAPPING OF INCONSPICUOUS QUATERNARY FAULTS IN EASTERNMOST JACKSON HOLE, WYOMING**
- 7-8 24 Parker, Don\*: **GEOLOGIC MAP OF THE NORTHEASTERN DAVIS MOUNTAINS, TRANS-PECOS TEXAS**
- 7-9 25 Bora, Erick\*; Borsook, Ariel J.; Sisco, Spencer S.; Kuiper, Yvette D.; Ruleman, Cal: **GEOLOGY OF THE MONTEZUMA 7.5 MINUTE QUADRANGLE, CENTRAL COLORADO FRONT RANGE**
- 7-10 26 Di Fiori, Russell\*: **DETAILED STRIP MAP OF ROADCUT GEOLOGY OF IDAHO STATE HIGHWAY 14: A WINDOW INTO MIGMATITE AND LEUCOSOME VARIETIES OF THE ELK CITY REGION, NORTH-CENTRAL IDAHO**
- 7-11 27 Raynolds, Robert G.\*; Scott, Larry M.; Hagadorn, James W.: **CHARTING COLORADO'S STRATIGRAPHY**
- 7-12 28 Morgan, Daniel\*; Megerian, Courtney E.; Scarpitti, Erica A.; McGlynn, Nadia R.; Chen, Ming; Breitzmann, Payton E.: **DESIGNING A GLACIAL GEOLOGY FIELD AND LAB COURSE-BASED UNDERGRADUATE RESEARCH EXPERIENCE IN THE SAWATCH RANGE, CO**
- 7-13 29 Bebo, Chase\*; Tibbits, David; Chang, Clara; Danyi, Chase; Pinnella, Michael; Prabhakar, Lakshman; Witkowski, Robert; Slibeck, Bennett; RoyChowdhury, Abhishek; Olsen, Paul E.; Kinney, Sean: **MAPPING THE DISTRIBUTION OF GEOGENIC CONTAMINATES IN BEDROCK FROM COLORADO PLATEAU CORES USING CONTINUOUS X-RAY FLUORESCENCE SPECTROSCOPY**

**SESSION NO. 8****T18. Crust Formation, Deformation, Metamorphism, Plutonism, and Thermal Evolution of the Rocky Mountains: Proterozoic to Present (Posters) (GSA Structural Geology and Tectonics Division; GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division; GSA Geophysics and Geodynamics Division)**

8:00 AM, Lory Student Center, C/D Ballroom

Authors will be present from 3 to 5 PM

## Booth #

- 8-1 30 Brumbaugh, David\*: **THE LAKE MARY FAULT AND FLAGSTAFF, ARIZONA**
- 8-2 31 Chaudoir, Kayla M.\*; Newell, Dennis; Ault, Alexis K.; Grambling, Tyler A.; Shaw, Colin A.; Jessup, Micah J.: **MULTI-SCALE TEXTURAL OBSERVATIONS OF SILICA FAULT MIRRORS AND THEIR POTENTIAL CONNECTION TO SEISMICITY ALONG THE CORDILLERA BLANCA DETACHMENT FAULT, PERU**
- 8-3 32 Benoit, Haley\*; Duprat, Tom; Gottardi, Raphael; Ferre, Eric: **TOWARDS NEW PHOSPHATE GEOTHERMOMETER USING DAHLITE CONCRETIONS OF THE THERMOPOLIS SHALE, WYOMING USING MULTI-CHANNEL SPECTROSCOPY**
- 8-4 33 Genta, Katelyn\*; Murray, Kendra; Pearson, David M.: **CHARACTERIZATION OF ZIRCONS FROM BASEMENT COBBLES COLLECTED FROM THE NEOPROTEROZOIC POCATELLO FORMATION TO ASSESS A POTENTIAL ARCHIVE OF BASEMENT-ROCK THERMAL HISTORIES**
- 8-5 34 Bora, Erick\*; Shirey, J. Mitchell; Magnin, Benjamin; Kuiper, Yvette D.: **DETAILED STRUCTURAL MAPPING OF THE SIERRA ESTRELLA WILDERNESS AREA, SIERRA ESTRELLA MOUNTAINS, ARIZONA**
- 8-6 35 Nowaczewski, Vincent S.\*; Sturmer, Daniel; Vaughan, Benjamin L.: **A 3-DIMENSIONAL GEOMECHANICAL FINITE ELEMENT METHOD COMPARISON BETWEEN MODELS OF CONTINENTAL BOUNDARY TECTONISM EXPLAINING THE ANCESTRAL ROCKY MOUNTAIN OROGENY**
- 8-7 36 Goldenberg Araujo, Breno\*; Lipper, Christina Hope; Mahan, Kevin H.; Goncalves, Philippe; Newell, Dennis; Litton, Shelby; Abbott, Lon D.; Farmer, G. Lang; Frothingham, Michael: **EXPLORING POSSIBLE CRUSTAL XENOLITH LOCALITIES IN THE SOUTHERN ROCKY MOUNTAIN REGION: HENRY MOUNTAINS, UTAH AND ELK RANGE, COLORADO**
- 8-8 37 Rasmussen, Donald\*: **LITHOSPHERIC FLEXURE MAPS FOR THE PARADOX BASIN USING GRAPHIC CORRELATION**

**ORAL TECHNICAL SESSIONS****SESSION NO. 9****T19. The Field Fellows: A Network of Diversity and Inclusion Champions within the Earth Sciences**

1:30 PM, Lory Student Center, Room 308-310

Gillian Bowser, Lisa White and Philip Halliwell, Presiding

- 9-1 1:30 PM White, Lisa\*: **VOICES OF INTEGRATING CULTURE IN THE EARTH SCIENCES**
- 9-2 1:50 PM Alwan, Akilah\*; Ajayi, John; Patacsil-Hardin, Ashlee; Moss, Stefan; Thompson, Alexandria: **DIVERSITY, EQUITY, AND INCLUSION IN THE FIELD: EXPERIENCES AND LESSONS LEARNED FROM THE STUDENT PERSPECTIVE**
- 9-3 2:10 PM Celestin, Modeline; Cooper, Tyrik Jordan; Gordon, Dylan; Peng, Amanda Wu\*; Thompson, Carmi Milagros: **REFINING THE NARRATIVE FOR DIVERSITY IN FIELD SCIENCES**

9-4 2:30 PM Briggs, Daniel\*; Halliwell, Philip; Bowser, Gillian; White, Lisa: **2023 FIELD FELLOWS TRIP TO CSU MOUNTAIN CAMPUS**

## SESSION NO. 10

### ***T7. Geoscience, Hydrology, and Water Management of Our Public Lands (GSA Hydrogeology Division)***

1:30 PM, Lory Student Center, Room 304-306

F. Edwin Harvey, Steven Rice, Tyler Gilkerson, Nicole O'Shea, Erin White and Matthew Dawson, Presiding

1:30 PM **INTRODUCTORY REMARKS**

10-1 1:40 PM Skaggs, Elizabeth\*; Friedman, Jonathan M.; Holmquist-Johnson, Christopher; Enns, Kyle D.; Perkins, Dusty W.: **EFFECTS OF WATER MANAGEMENT ON CHANNEL AND VEGETATION CHANGES ALONG THE GREEN AND YAMPA RIVERS, UTAH**

10-2 2:00 PM Alexander, Jason\*; Miller, Cheryl E.; Stout, Jacob: **GRAZING PRACTICES CONTROL CHANNEL STABILITY IN AN ARROYO**

10-3 2:20 PM Means-brous, Mickey\*; Wohl, Ellen; Kanno, Yoichiro: **BEAVERS, FIRE, FISH: GEOMORPHIC INFLUENCES ON SALMONID RECOLONIZATION IN A COLORADO POST-FIRE ENVIRONMENT**

2:40 PM **BREAK**

10-4 2:55 PM English, Alan\*: **THE YELLOWSTONE CONTROLLED GROUNDWATER AREA-HISTORY, PURPOSE, AND LONG-TERM MONITORING**

10-5 3:15 PM Crosby, Jacob; Boczek, Laura; Ware, Michael; Murphy, Jason; Hutchinson, Marcella; Dugan, Nicholas; White, Erin\*: **MICROBIAL PATHOGEN AND SURROGATE IDENTIFICATION IN SHALLOW GROUNDWATER AND SPRING COLLECTION SYSTEMS IN YELLOWSTONE NATIONAL PARK FOR IMPROVED GWUDI CLASSIFICATIONS**

10-6 3:35 PM Holloway, JoAnn M.\*; McGee, Ben N.; Choate, LaDonna M.; Lund, Karen; Granitto, Matthew: **ARSENIC AS A MINING REMEDIATION AND RESTORATION CHALLENGE IN THE SALMON RIVER MOUNTAINS, IDAHO, USA**

3:55 PM **CONCLUDING REMARKS**

## SESSION NO. 11

### ***T5. Drivers of Continental Magmatism (GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division; GSA Geophysics and Geodynamics Division)***

1:30 PM, Lory Student Center, Longs Peak 302A

Pamela Kempton, Claudia Adam and Matthew Brueseke, Presiding

1:30 PM **INTRODUCTION - DRIVERS OF CONTINENTAL MAGMATISM**

11-1 1:35 PM Sims, Kenneth\*; Stark, Gregory J.; Phillips, Erin; Blichert-Toft, Janne; Reagan, Mark K.; Scott, Sean R.; Tedesco, Dario; Wallace, Paul; Connors, Lissie: **LITHOSPHERIC CONTROLS ON ALKALINE VOLCANISM: EVIDENCE FROM NYIRAGONGO AND NYAMULAGIRA VOLCANOES, VIRUNGA VOLCANIC PROVINCE, DR CONGO**

11-2 1:55 PM Adam, Claudia\*; Lee, Esther; Kempton, Pamela: **BACKTRACKING THE KIMBERLITES EMPLACED OVER THE NORTH AMERICAN CONTINENT**

11-3 2:15 PM Lupini, Isabella\*; Kempton, Pamela D.; Möller, Andreas; Adam, Claudia: **U-PB EMPLACEMENT AGES OF KANSAS LAMPROITES AND KIMBERLITES**

11-4 2:35 PM Pell, Dalton\*; Möller, Andreas: **IN SITU U-PB GEOCHRONOLOGY OF PEROVSKITE, TITANITE AND SCHORLOMITE, KIMZEYITE GARNETS FROM MAGNET COVE, AR: NEW AGE CONSTRAINTS ON ALKALINE MAGMATISM AND SUITABILITY AS REFERENCE MATERIALS**

2:55 PM **BREAK**

11-5 3:10 PM Kant, Lisa B; Sims, Kenneth\*; Yogodzinski, Gene; Garrison, Jennifer; Blichert-Toft, Janne; Scott, Sean R.; Reagan, Mark K.; Mothes, Patricia: **EFFECTS OF CRUSTAL ASSIMILATION ON 238U-230TH DISEQUILIBRIA IN CONTINENTAL ARC SETTINGS: EVIDENCE FROM REVENTADOR VOLCANO, ECUADOR**

11-6 3:30 PM Ascencio, Porfirio\*; Kang, Patricia; Zieman, Lisa; Ibanez-Mejia, Mauricio: **EQUILIBRIUM THERMODYNAMIC MODELLING OF ARCLOGITES: ARE WE THERE YET? AN EXAMPLE FROM THE ANDEAN NORTHERN VOLCANIC ZONE (NVZ)**

11-7 3:50 PM Brooks, Carrie; Kempton, Pamela\*: **MELT INCLUSIONS IN GRANULITE XENOLITHS FROM THE GERONIMO VOLCANIC FIELD: EVIDENCE FOR THE CRUSTAL MELTING EVENT GIVING RISE TO MID-TERTIARY RHYOLITES OF THE SOUTHERN BASIN AND RANGE?**

4:10 PM **DISCUSSION**

## WEDNESDAY, 24 MAY 2023

## ORAL TECHNICAL SESSIONS

## SESSION NO. 12

### ***T12. Geohydrobiology of the Yellowstone Hydrothermal System (GSA Hydrogeology Division; GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division)***

8:00 AM, Lory Student Center, Longs Peak 302A

Andrew Miller, Kenneth Sims, Dan Colman and Eric Boyd, Presiding

12-1 8:00 AM Shock, Everett L.\*; Robare, Jordyn; Weeks, Katelyn; Barnes, Tanner; Debes, Randall; Prapaipong, Panjai; Fecteau, Kristopher: **SEVERAL ORDERS OF MAGNITUDE: GEOCHEMICAL VARIABILITY OF YELLOWSTONE HYDROTHERMAL ECOSYSTEMS**

12-2 8:20 AM Sims, Kenneth\*; Messa, Cole; Scott, Sean R.; Parsekian, Andrew; Carr, Brad; Miller, Andrew; Shock, Everett L.; McCleskey, R. Blaine; Colman, Dan; Boyd, Eric S.: **THE DYNAMIC IMPACTS OF REACTIVE TRANSPORT, PHASE SEPARATION AND SHALLOW MIXING ON THE GEOMICROBIOLOGY OF YELLOWSTONE HOT SPRINGS**

12-3 8:40 AM Holloway, JoAnn M.\*; McCleskey, R. Blaine; Roth, David A.; Janssen, Sarah E.; Tate, Michael T.; Krabbenhoft, David P.; Nordstrom, D. Kirk: **BIOTIC AND ABIOTIC MERCURY METHYLATION IN YELLOWSTONE THERMAL WATERS**

12-4 9:00 AM St Clair, Brian E.\*; Arteaga, Maria E.; Andrade-Barahona, Eva; Colman, Dan; Keller, Lisa M.; Stefánsson, Andri; Boyd, Eric S.; Cox, Alysia: **TECTONIC SETTING DRIVES GEOCHEMICAL COMPOSITION IN TERRESTRIAL HOT SPRINGS**

12-5 9:20 AM Alexander, Erin R.\*; Shock, Everett L.; Whipple, Kelin X.: **HIDDEN STRUCTURES IN THE SUBSURFACE: UNDERSTANDING THE GEOLOGY, GEOMORPHOLOGY, AND HOT SPRING GEOCHEMISTRIES OF A COMPLEX THERMAL AREA**

9:40 AM **BREAK**

12-6 9:55 AM Miller, Andrew\*; Sims, Kenneth; Carr, Brad; Elliot, Mathew G.; Parsekian, Andrew: **GEOPHYSICAL AND GEOCHEMICAL CONSTRAINTS ON SUBSURFACE FLUID MOVEMENT BENEATH RABBIT CREEK THERMAL AREA, YSNP**

12-7 10:15 AM Parsekian, Andrew\*; Smeltz, Natalie; Sims, Kenneth; Carr, Brad: **GEOPHYSICAL EVIDENCE OF HYDROTHERMAL**



# GROUNDWATER MIXING IN SENTINEL MEADOWS, YELLOWSTONE NATIONAL PARK

- 12-8 10:35 AM Harrison, Lauren\*; Hurwitz, Shaul; Paces, James B.; Whitlock, Cathy; Peek, Sara; Licciardi, Joseph: **TRAVERTINE RECORDS CLIMATE-INDUCED TRANSFORMATIONS OF THE YELLOWSTONE CALDERA HYDROTHERMAL SYSTEM FROM THE LATE PLEISTOCENE TO THE PRESENT**
- 12-9 10:55 AM Kelley, Shari\*: **PRELIMINARY RESULTS OF JOINT ANALYSIS IN PROTEROZOIC TERRAINS IN NEW MEXICO**

## SESSION NO. 13

### T21. Data Preservation for the Geosciences: Recent Advances in Geo-Databases, Repository Practices, and Big Data Applications

8:00 AM, Lory Student Center, Room 304-306

Amy Atwater, Kelly Thomson and Victoria Crystal, Presiding

#### 8:00 AM INTRODUCTORY REMARKS

- 13-1 8:10 AM Thomson, Kelly\*; Morgan, Leah; Hillenbrand, Ian; Engle, Zachary T.; Gilmer, Amy K.; Dombrowski, Allison; Warrell, Kathleen; Thompson, Ren: **USGS GEOCHRON: QUALITY ASSURANCE AND QUALITY CONTROL OF COMPILING LEGACY GEOCHRONOLOGY DATA**
- 13-2 8:30 AM Szymanski, Eugene\*; Kirby, Stefan; Bowman, Steve D.; Payne, Nathan: **THE UTAH GEOCHRONOLOGY DATABASE**
- 13-3 8:50 AM Arthur, Dan\*; Johnson, Michaela; Habermann, Ted: **RESCICOLL: MAKING SCIENTIFIC COLLECTIONS FAIR**
- 13-4 9:10 AM Arthur, Dan\*; Johnson, Michaela: **NATIONAL INDEX OF BOREHOLE INFORMATION (NIBI): INCREASING DISCOVERY AND ACCESS TO SUBSURFACE RESOURCES**
- 13-5 9:30 AM Goldman, Margaret\*; Graham, Garth; Lederer, Graham; Rosera, Joshua M.: **PROGRESS TOWARD AUTOMATING GEOREFERENCING AND FEATURE EXTRACTION OF GEOLOGIC MAPS**
- 9:50 AM **BREAK**
- 13-6 10:05 AM Shuler, Sophia\*; Scheland, Cullen; Kenworthy, Jason P.: **TALK DATA TO ME: IMPROVING DATA COMMUNICATIONS IN THE NATIONAL PARKS SERVICE**
- 13-7 10:25 AM Scheland, Cullen\*; Shuler, Sophia; Kenworthy, Jason P.: **BUILDING A FAIR DATA LAYER FOR NATIONAL PARKS THROUGH A NATIONAL NATURAL LABS PROGRAM**
- 13-8 10:45 AM Hillenbrand, Ian\*; Gilmer, Amy K.; Souders, Kate: **LAURENTIAN ISOTOPIC ATLAS CONSTRAINS PRECAMBRIAN CRUSTAL GROWTH, STABILIZATION, AND FOUNDERING**
- 13-9 11:05 AM Tate, Christopher\*: **DIGITIZATION AND DISSEMINATION OF ANALOG VIDEO INVENTORIES OF ABANDONED MINE SITES IN IDAHO**
- 13-10 11:25 AM Stright, Lisa\*; Hubbard, Stephen M.; Romans, Brian W.: **CREATING QUANTITATIVE PATHWAYS TO CONNECT OUTCROP ANALOGS TO RESERVOIR PREDICTION THROUGH DIGITIZED STRATIGRAPHIC MEASURED SECTIONS**
- 11:45 AM **CONCLUDING REMARKS**

# POSTER TECHNICAL SESSIONS

## SESSION NO. 14

### T8. The Yellowstone Hotspot Geologic Province: Examining the Effects of Yellowstone Volcanism on the North American West (Posters) (GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division)

8:00 AM, Lory Student Center, C/D Ballroom

Authors will be present from 3 to 5 PM

#### Booth #

- 14-1 38 White, Drew\*; Potter, Katie; Shervais, John; Science Party, Expedition 391: **INTERNAL CHEMICAL VARIATION OF MASSIVE BASALT LAVA FLOWS, WALVIS RIDGE HOTSPOT**
- 14-2 39 Hart, Rachelle\*; Wolff, John; Steiner, Arron; Ramos, Frank C.: **A NEW LOOK AT THE GENESIS OF THE WANAPUM BASALT, COLUMBIA RIVER BASALT GROUP**
- 14-3 40 Murray, Kendra\*; Pu, Xiaofei; Sutherland, Rebecca; Dietz, Haley M.: **APPLICATION OF OLIVINE HYGROMETRY TO EASTERN SNAKE RIVER PLAIN BASALTS: IMPLICATIONS FOR THE VOLATILE BUDGET DURING MAGMATIC DIFFERENTIATION**

## SESSION NO. 15

### T10. Past and Present Stable Isotopes of the Western U.S. and Beyond (Posters) (GSA Quaternary Geology and Geomorphology Division)

8:00 AM, Lory Student Center, C/D Ballroom

Authors will be present from 3 to 5 PM

#### Booth #

- 15-1 41 Sanchez Ortiz, Gabriela\*; Löberbauer, Marlene; Andrić Tomašević, Nevena; Mandić, Oleg; Pavelić, Davor; Demir, Vedad; Meijers, Maud; Rugenstein, Jeremy: **ESTIMATING MIOCENE TOPOGRAPHY OF THE DINARIC ALPS USING STABLE-ISOTOPE PALEOALTIMETRY**
- 15-2 42 Manser, Livia; Kukla, Tyler; Rugenstein, Jeremy\*: **GREAT PLAINS OGALLALA FORMATION STABLE ISOTOPE EVIDENCE FOR THE POSITION OF THE 100<sup>TH</sup> MERIDIAN ARIDITY GRADIENT IN THE LATE NEOGENE**
- 15-3 43 Littleton, Shelby\*; Cotton, Jennifer M.; Hyland, Ethan; Azmi, Iffat; Raigemborn, Maria Sol; Tineo, David; Insel, Nadja: **USING CARBON ISOTOPES TO CONSTRAIN C4 EXPANSION FROM BAHIA BLANCA TO MENDOZA IN RESPONSE TO CHANGES IN PRECIPITATION DURING THE LATE MIOCENE**
- 15-4 44 Macarewich, Sophia\*; Herrington, Adam; Zhu, Jiang; Nusbaumer, Jesse; Otto-Bliesner, Bette; Brady, Esther: **EVALUATING A VARIABLE-RESOLUTION APPROACH FOR SIMULATING WATER ISOTOPES IN THE CONTINENTAL UNITED STATES USING VR-ICESM**
- 15-5 45 Ekart, Douglas D.\*: **300 MILLION YEARS OF PEDOGENIC CARBONATES FROM WESTERN NORTH AMERICA: EVALUATING OXYGEN ISOTOPE RATIOS AS PROXIES FOR PALEOCLIMATE RECONSTRUCTIONS**
- 15-6 46 Bui, Thu\*; Spaur, Siânin; Rugenstein, Jeremy; Koning, Daniel: **SOUTHWEST CLIMATE AND ECOSYSTEM PRODUCTIVITY IN THE MIOCENE**
- 15-7 47 Cotton, Jennifer\*; Ghosh, Adit; Hyland, Ethan G.; Hauswirth, Scott; Littleton, Shelby; Azmi, Iffat; Insel, Nadja; Raigemborn, Maria Sol; Tineo, David: **THE RISE OF C<sub>4</sub> GRASSES IN SOUTH AMERICA: LINKING GRASSLAND TRANSITION TO THE SOUTH AMERICAN SUMMER MONSOON**

AM

WEDNESDAY

POSTERS

## SESSION NO. 16

### ***T12. Geohydrobiology of the Yellowstone Hydrothermal System (Posters) (GSA Hydrogeology Division; GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division)***

8:00 AM, Lory Student Center, C/D Ballroom

Authors will be present from 3 to 5 PM

Booth #	
16-1	48 Loya, Michael J.*; Sims, Kenneth; Miller, Andrew; Scott, Sean R.; Colman, Dan; Boyd, Eric S.: <b>QUANTIFYING THE IMPACT OF AEOLIAN DUST ON THE COMPOSITION OF YELLOWSTONE WATERS AND THEIR PRECIPITATES</b>
16-2	49 Andrade-Barahona, Eva*; Cox, Alysia: <b>ZN MICROBIAL UPTAKE IN YELLOWSTONE NATIONAL PARK HYDROTHERMAL SPRINGS</b>
16-3	50 Barnes, Tanner*; Shock, Everett L.; Meyer-dombard, D'arcy; Debes, Randall; Boyer, Grayson: <b>EXPLORATION OF DISSOLVED INORGANIC CARBON AND DISSOLVED ORGANIC CARBON IN HOT SPRINGS WITHIN YELLOWSTONE NATIONAL PARK</b>
16-4	51 Debes, Randall*; Fecteau, Kristopher; Robare, Jordyn; Santana, Michelle; Boyer, Grayson; Shock, Everett L.: <b>SEASONAL GEOCHEMICAL CYCLING OF YELLOWSTONE HOT SPRING FLUID DRIVES CHEMOSYNTHETIC ENERGY SUPPLY FLUX</b>
16-5	52 Soto Lopez, Israel E.*; St Clair, Brian: <b>KINETICS AND ENERGETICS OF MICROBIAL SULFATE REDUCTION IN ACIDIC HOT SPRINGS AT YELLOWSTONE NATIONAL PARK</b>

## SESSION NO. 17

### ***T17. Landscape Evolution across Time Scales from the High Plains to the Colorado Plateau (Posters) (GSA Quaternary Geology and Geomorphology Division)***

8:00 AM, Lory Student Center, C/D Ballroom

Authors will be present from 3 to 5 PM

Booth #	
17-1	53 Bobik, Theodore R.*; Terry, Dennis O.; Ibarra, Daniel: <b>MAGNETIC SUSCEPTIBILITY OF PALEOSOLS IN THE WHITE RIVER GROUP (NORTHWEST NEBRASKA) REFLECTS REGIONAL EOCENE-OLIGOCENE PALEOCLIMATE</b>
17-2	54 Montejo, Carlos*; Stanley, Jessica; Miller, D.E.: <b>STRATIGRAPHY OF THE NEOGENE SIXMILE CREEK FORMATION FROM THE GALLATIN BASIN – IMPLICATIONS FOR MIDDLE MIOCENE TO PLIOCENE LANDSCAPE EVOLUTION IN THE YELLOWSTONE REGION</b>
17-3	55 Abbott, Lon*; Flowers, Rebecca; Metcalf, James: <b>WHAT MECHANISM CREATED THE MIOCENE-AGED GOTHIC EXHUMATION DOME IN COLORADO'S ELK MOUNTAINS?</b>
17-4	56 Marder, Eyal*; Gallen, Sean: <b>UNRAVELING THE DRIVER FOR RECENT TOPOGRAPHIC REJUVENATION OF THE COLORADO ROCKY MOUNTAINS</b>
17-5	57 Price, Curtis*; Stetler, Larry: <b>COMPARING DEM-DERIVED STREAM CHANNEL LONGITUDINAL PROFILES ACROSS DATA RESOLUTIONS AND DIFFERENT LARAMIDE TERRANES</b>
17-6	58 Gallen, Sean*; Hill, Daniel: <b>CLIMATE CONTROLS ON HILLSLOPE MORPHOLOGY IN THE POUDRE DRAINAGE BASIN, NORTHERN COLORADO</b>

## SESSION NO. 18

### ***T20. Quaternary Paleoclimate Records of the Rocky Mountain Region (Posters) (GSA Quaternary Geology and Geomorphology Division)***

8:00 AM, Lory Student Center, C/D Ballroom

Authors will be present from 3 to 5 PM

Booth #

18-1	59 Manzanares, Amanda*: <b>UNDERGRADUATE STUDENTS' KNOWLEDGE ABOUT THE RELATIONSHIPS BETWEEN CLIMATE CHANGE AND THE FOOD-ENERGY-WATER NEXUS</b>
18-2	60 Alt, Mio*; Puseman, Kathryn; Lee, Craig; Pederson, Gregory T.; McConnell, Joseph R.; Chellman, Nathan; McWethy, David: <b>SEDIMENT LAYERS PRESERVED IN ICE PATCHES: A NEW RECORD OF HOLOCENE ENVIRONMENTAL CHANGE ON THE BEARTOOTH PLATEAU</b>
18-3	61 Staley, Spencer*; Fawcett, Peter; Anderson, R. Scott; Jimenez-Moreno, Gonzalo; Markgraf, Vera: <b>DENUDATION, DEPOSITION, AND DUST: HOW LONG-TERM CLIMATE CHANGE DRIVES SEDIMENT TRANSPORT ON THE MARGIN OF THE COLORADO PLATEAU</b>
18-4	62 Fawcett, Peter*; Anderson, R. Scott; Brown, Erik; Werne, Josef P.; Cutler, Savannah; Bixby, Rebecca J.; Contreras, Sergio: <b>CENTENNIAL TO MILLENNIAL-SCALE CLIMATE CHANGE AND ECOSYSTEM RESPONSE DURING THE MIDDLE PLEISTOCENE FROM THE VALLES CALDERA, NEW MEXICO</b>
18-5	63 Harris, Branson R.*; Dulin, Shannon A.; Jimenez-Moreno, Gonzalo; Valles, Karen S.; Sanger, David B.; Soreghan, Gerilyn: <b>PRELIMINARY RESULTS FROM A SEDIMENTOLOGICAL STUDY OF AN EARLY PLEISTOCENE UPLAND LAKE (UNAWEEP CANYON, CO)</b>
18-6	64 Cutler, Savannah*; Fawcett, Peter; Bixby, Rebecca J.: <b>EVIDENCE OF SUB-STAGE CLIMATIC SHIFTS DURING MIS 11 REFINED FROM DIATOM ASSEMBLAGE RECONSTRUCTION IN THE VALLES CALDERA, NEW MEXICO</b>
18-7	65 Dunda, Mairaed E.L.*; Bywater-Reyes, Sharon; Baird, Graham B.: <b>INVESTIGATING GEOCHEMICAL CONTROLS ON VEGETATION COVER IN THE NORTHERN COLORADO FRONT RANGE</b>

## SESSION NO. 19

### ***T21. Data Preservation for the Geosciences: Recent Advances in Geo-Databases, Repository Practices, and Big Data Applications (Posters)***

8:00 AM, Lory Student Center, C/D Ballroom

Authors will be present from 3 to 5 PM

Booth #	
19-1	66 Morgan, Leah*; VanSistine, Paco; Engle, Zachary T.; Hillenbrand, Ian; Thomson, Kelly; Gilmer, Amy K.; Warrell, Kathleen: <b>USGS GEOCHRON: SERVING USGS GEOCHRONOLOGIC DATA WITH THE DATABASE EXPLORER</b>
19-2	67 Ivis, Dawn*; Honey, Jeannine: <b>AN IN-DEPTH LOOK AT THE IMPORTANCE OF WELL MATERIALS AND THEIR PRESERVATION IN REPOSITORIES</b>
19-3	68 Crystal, Victoria*; Atwater, Amy: <b>REDUCE, REUSE, RESCICOLL: HOW TO CREATE A SCIENTIFIC LEGACY THROUGH PLANNING AND MANAGEMENT OF SCIENTIFIC WORKING COLLECTIONS</b>
19-4	69 Arthur, Dan*; Langseth, Madison: <b>USGS &amp; IGSNS: BENEFITS &amp; BEST PRACTICES</b>

# ORAL TECHNICAL SESSIONS

## SESSION NO. 20

### ***T8. The Yellowstone Hotspot Geologic Province: Examining the Effects of Yellowstone Volcanism on the North American West (GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division)***

1:30 PM, Lory Student Center, Longs Peak 302A

Cole Messa, Mark Stelten and Kenneth Sims, Presiding

1:30 PM **INTRODUCTORY REMARKS**

20-1	1:35 PM	Soderberg, Evan*; Wolff, John; Ramos, Frank C.: <b>GEOCHEMICAL CONNECTIONS BETWEEN THE IMNAHA AND GRANDE RONDE FORMATIONS OF THE COLUMBIA RIVER BASALT GROUP: THE DEVELOPMENT OF A LARGE MAGMA SYSTEM FOR A FLOOD BASALT PROVINCE</b>
20-2	1:55 PM	Potter, Katie*; Shervais, John: <b>TIMESCALES OF MAGMATIC FRACTIONATION IN THE SNAKE RIVER PLAIN VOLCANIC PROVINCE RECORDED IN DRILL CORE</b>
20-3	2:15 PM	Shervais, John*; Glen, Jonathan: <b>AGE AND DISTRIBUTION OF VOLCANIC VENTS THROUGHOUT THE SNAKE RIVER PLAIN VOLCANIC PROVINCE, IDAHO</b>
	2:35 PM	<b>BREAK</b>
20-4	2:50 PM	Stelten, Mark*; Thomas, Nicole; Pivarunas, Anthony F.: <b>SPATIO-TEMPORAL CLUSTERING OF POST-CALDERA ERUPTIONS AT YELLOWSTONE: IMPLICATIONS FOR VOLCANIC HAZARDS AND PRE-ERUPTIVE MAGMA RESERVOIR CONFIGURATION</b>
20-5	3:10 PM	Messa, Cole*; Sims, Kenneth; Stelten, Mark; Lawler, Brandi L.; Kuntz, Mel A.: <b>DECOUPLED ASSIMILATION-FRACTIONAL CRYSTALLIZATION IN THE HENRY'S FORK CALDERA OF THE YELLOWSTONE-SNAKE RIVER PLAIN AS REVEALED BY SR-ND-HF-PB ISOTOPES AND <sup>40</sup>AR/<sup>39</sup>AR ERUPTION AGES</b>
20-6	3:30 PM	Turner, Jamey*; Winston, Molly; Hornsby, Kristofer; Vessely, Mark; Williams, Karen; George, Orion; Cole, Ryan; Lim, Eric; Hungerford, Jefferson; Bilderback, Eric L.: <b>IMPACTS OF ABSAROKA VOLCANICS, LARAMIDE TECTONICS, GLACIATION, LANDSLIDES, AND RAIN-ON-SNOW 2022 FLOODING SEVERELY DAMAGING YELLOWSTONE NATIONAL PARK'S NORTH ENTRANCE ROAD AND PLANS FOR RESILIENT REBUILDING WITH THE MAMMOTH TO GARDINER PERMANENT REPAIRS PROJECT</b>
	3:50 PM	<b>DISCUSSION</b>
	4:05 PM	<b>CONCLUDING REMARKS</b>

**SESSION NO. 21**

**T6. Integrated Science Approaches to Addressing Complex Earth Science Challenges (GSA Geology and Society Division; GSA Hydrogeology Division; GSA Environmental and Engineering Geology Division; GSA Soils and Soil Processes Division; GSA Geoscience Education Division; GSA Geoinformatics and Data Science Division; GSA Geophysics and Geodynamics Division)**

1:30 PM, Lory Student Center, Room 304-306

Jason Alexander, Rebecca Frus, Patrick Anderson, Joseph Hevesi, Adrian Monroe, Sharon Qi and Katharine Dahm, Presiding

	1:30 PM	<b>INTRODUCTORY REMARKS</b>
21-1	1:35 PM	Miller, Mathew*; Day, Natalie; Dickinson, Jesse; Engott, John A.; Jones, Casey J.R.; Knight, Jacob; Longley, Patrick C.; Lopez, Samuel; Masbruch, Melissa D.; McDonnell, Morgan; Miller, Olivia; Rumsey, Christine; Schmadel, Noah; Tillman, Fred D.; Wise, Daniel: <b>REGIONAL SCALE WATER AVAILABILITY ASSESSMENT IN THE UPPER COLORADO RIVER BASIN</b>
21-2	1:55 PM	McShane, Ryan*; Goodling, Phillip; Sando, Roy; Hamshaw, Scott; Watkins, David; White, Ellie; Simeone, Caelan; Hammond, John: <b>FORECASTING STREAMFLOW DROUGHT IN THE COLORADO RIVER BASIN USING MACHINE LEARNING MODELS</b>
21-3	2:15 PM	Schaar, Melissa*: <b>COLLABORATIVE SCIENCE OPPORTUNITIES IN THE MINING-AFFECTED TRANSBOUNDARY KOOTENAI RIVER WATERSHED, UNITED STATES AND CANADA</b>
21-4	2:35 PM	Atkins, Rachel*; Jones, Daniel; Williams, Brianna; Gordon, Stephanie; Seawolf, Serena; Morriss, Matthew; Whipple, Ashley; Aldridge, Cameron L.; Monroe, Adrian P.; Hannon,

Mark; Enns, Kyle D.: **DEVELOPING A GEOSPATIAL DECISION TOOL FOR DATA-BASED PRIORITIZATION AND TRACKING OF REMEDIATION AND ASSESSMENTS OF HAZARDS POSED BY MINED LANDS IN THE CONTINENTAL UNITED STATES**

2:55 PM **BREAK**

21-5	3:10 PM	O'Donnell, Michael*; Manier, Daniel: <b>A WESTERN UNITED STATES ASSESSMENT OF SOIL-CLIMATE FOR INFORMING CONSERVATION OF SAGEBRUSH ECOSYSTEMS</b>
21-6	3:30 PM	Monroe, Adrian P.*; Tarbox, Bryan C.; Shyvers, Jessica E.; Aldridge, Cameron L.; Dahm, Katharine G.; Anderson, Patrick: <b>LEVERAGING A STAKEHOLDER ENGAGEMENT PROCESS TO ADVANCE SAGEBRUSH ECOSYSTEM CONSERVATION AND RESTORATION PLANNING IN THE COLORADO RIVER BASIN</b>
21-7	3:50 PM	Godaire, Jeanne*; Dahm, Katharine; Anderson, Patrick; Andrews, William; Driscoll, Jessica; Frus, Rebecca; Hevesi, Joseph; Jones, Daniel; Monroe, Adrian; Thomas, Kathryn; Tillery, Anne C.; Torregrosa, Alicia: <b>AN INTEGRATED APPROACH TO ACTIONABLE SCIENCE FOR DROUGHT MANAGEMENT IN THE COLORADO RIVER BASIN</b>
	4:10 PM	<b>DISCUSSION</b>

## THURSDAY, 25 MAY 2023

### ORAL TECHNICAL SESSIONS

**SESSION NO. 22**

**T9. Tectonism and Magmatism in the Rio Grande Rift (GSA Structural Geology and Tectonics Division; GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division; GSA Geophysics and Geodynamics Division)**

8:00 AM, Lory Student Center, Longs Peak 302A

Gregory Stark, John Singleton, W. Scott Baldrige and Kenneth Sims, Presiding

22-1	8:00 AM	Harry, Dennis*; Mayle, Micah; Crocker, Eli: <b>LITHOSPHERE AND ASTHENOSPHERE MAGMA SOURCES IN THE RIO GRANDE RIFT - INSIGHTS FROM GEODYNAMIC MODELS</b>
22-2	8:20 AM	Stark, Gregory J.*; Sims, Kenneth: <b>DECONSTRUCTING THE EVOLUTIONARY HISTORY OF SUMMER COON VOLCANO, COLORADO: EVIDENCE FROM GEOCHEMISTRY AND RADIOGENIC ISOTOPES</b>
22-3	8:40 AM	Gilmer, Amy*; Thompson, Ren; Turner, Kenzie; Morgan, Leah: <b>MAGMA MIXING IN THE HINSDALE MAGMATIC SYSTEM, NORTHERN RIO GRANDE RIFT IN SOUTHERN COLORADO AND NORTHERN NEW MEXICO, USA</b>
22-4	9:00 AM	Wolff, John*; Ramos, Frank C.; Rowe, Michael C.; Wu, Jie; Boro, Joseph R.; Self, Stephen: <b>THE JEMEZ MOUNTAINS VOLCANIC FIELD (JMVf): A PETROLOGIC HISTORY</b>
22-5	9:20 AM	Farmer, G. Lang*; Ellison, Eric T.; Bell, Aaron: <b>EVIDENCE FROM VOLCANIC ROCK XENOCRYSTS FOR ONSET OF EXTENSIONAL TECTONISM IN NORTHERNMOST RIO GRANDE RIFT SYSTEM, COLORADO</b>
22-6	9:40 AM	Malavarca, Samantha*; Singleton, John; Sitar, Michael; Rahl, Jeffrey; Magloughlin, J.F.: <b>CENOZOIC METAMORPHISM AND ALONG-STRIKE PEAK TEMPERATURES IN THE PENNSYLVANIAN MINTURN FORMATION IN THE SANGRE DE CRISTO RANGE: UNRAVELING THE COMPLEX THERMAL HISTORY OF THE RIO GRANDE RIFT IN SOUTHERN COLORADO</b>

AM

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<b>22-7</b>	10:00 AM	Lindsey, David A.*; Caine, Jonathan: <b>TECTONIC EVOLUTION OF THE NORTHERN SANGRE DE CRISTO MOUNTAINS, COLORADO, USA</b>
<b>22-8</b>	10:20 AM	Sitar, Michael*; Singleton, John; Rahl, Jeffrey; Caine, Jonathan Saul; King, Jacob: <b>LATE OLIGOCENE TO EARLY MIOCENE EXTENSIONAL REACTIVATION OF THE INDEPENDENCE MINE SHEAR ZONE IN THE SANGRE DE CRISTO RANGE, SOUTHERN COLORADO</b>
<b>22-9</b>	10:40 AM	Ghamed, Omar*; Singleton, John; Sitar, Michael; Rahl, Jeffrey; Wong, Martin; O'Sullivan, Paul; Hurtado, Cece; Malavarca, Samantha: <b>REFINING THE PRE- AND SYN-RIO GRANDE RIFT COOLING HISTORY ACROSS THE SANGRE DE CRISTO RANGE AND ALVARADO FAULT THROUGH APPLICATION OF MID- TO LOW-TEMPERATURE THERMOCHRONOMETRY</b>
<b>22-10</b>	11:00 AM	Schneider, Ethan*; Hampton, Brian A.; Ridl, Shay: <b>CONSTRAINING THE OLIGOCENE-MIOCENE TRANSITION FROM CLOSED BASIN RIFT SEDIMENTATION DURING THE EARLIEST STAGES OF THE ANCESTRAL RIO GRANDE FLUVIAL SYSTEM, SOUTH-CENTRAL NEW MEXICO</b>
<b>22-11</b>	11:20 AM	Drenth, Benjamin*; Grauch, V.J.S.; Turner, Kenzie; Rodriguez, Brian D.; Thompson, Ren A.; Bauer, Paul W.: <b>A SHALLOW RIFT BASIN SEGMENTED IN SPACE AND TIME: THE SOUTHERN SAN LUIS BASIN, RIO GRANDE RIFT, NORTHERN NEW MEXICO</b>
<b>22-12</b>	11:40 AM	Hurtado, Cece*; Gallen, Sean: <b>INFLUENCE OF GLACIAL EROSION AND MELT ON THE SANGRE DE CRISTO NORMAL FAULT SYSTEM, SOUTHERN COLORADO</b>

## SESSION NO. 23

### ***T14. Geologic and Geohazard Mapping: Recent Advances in Mapping and Age-Dating Techniques and Use of Lidar (GSA Environmental and Engineering Geology Division)***

8:00 AM, Lory Student Center, Room 304-306

Kassandra Lindsey, Stephen M. Keller, Amy Crandall, Jonathan Lovekin, Stephen Slaughter and Jonathan W. Godt, Presiding

	8:00 AM	<b>INTRODUCTORY REMARKS</b>
<b>23-1</b>	8:05 AM	Ryherd, Julia*: <b>GEOHAZARD ASSESSMENT AND MAPPING OF A BEAVER DAM OUTBURST FLOOD AND PIPELINE EXPOSURE</b>
<b>23-2</b>	8:25 AM	Baum, Rex*; Coe, Jeffrey; Jensen, Erin K.: <b>FRICTION-REDUCTION MECHANISMS THAT AFFECTED THE</b>

		<b>MOBILITY OF THE MAY 2014 WEST SALT CREEK ROCK AVALANCHE, MESA COUNTY, COLORADO</b>
<b>23-3</b>	8:45 AM	Allstadt, Kate; Coe, Jeffrey*; Collins, Elaine; Rengers, Francis; Mangeney, Anne; Esser, Scott; Pursley, Jana; Yeck, William; Bellini, John; Brady, Lance: <b>THE 2022 CHAOS CANYON LANDSLIDE IN ROCKY MOUNTAIN NATIONAL PARK: INSIGHTS REVEALED BY SEISMIC ANALYSIS, FIELD AND REMOTE-SENSING INVESTIGATIONS, AND RUNOUT MODELING</b>
<b>23-4</b>	9:05 AM	Rengers, Francis*; Bower, Sam; Knapp, Andrew; Kean, Jason; Vonlembke, Danielle; Thomas, Matthew; Kostelnik, Jaime; Vessely, Mark; Barnhart, Katherine; Bethel, Matthew; Anderson, Justin K.; Roberts, Elizabeth; Lane, Belize; Ridgeway, Paxton; Murphy, Brendan P.; Staley, Dennis: <b>POST-FIRE DEBRIS FLOW MODEL TESTING IN THE GRIZZLY CREEK FIRE, GLENWOOD CANYON, COLORADO, USA</b>
<b>23-5</b>	9:25 AM	Keller, Stephen M.*: <b>EOLIAN FINE-GRAINED SEDIMENT IN THE NORTHERN COLORADO PIEDMONT</b>
<b>23-6</b>	9:45 AM	Morgan, Matthew L.*; O'Keeffe, Michael K.; Mahatma, Asha A.; Keller, Stephen M.: <b>DETRITAL ZIRCON AGE ESTIMATES OF SELECT UPPER CRETACEOUS AND NEOGENE SEDIMENTARY ROCKS, DENVER BASIN AND NORTHEASTERN, COLORADO</b>
	10:05 AM	<b>BREAK</b>
<b>23-7</b>	10:20 AM	Lydic, Carol*: <b>USGS 3D ELEVATION PROGRAM IN THE ROCKY MOUNTAIN REGION</b>
<b>23-8</b>	10:40 AM	Kean, Jason*; Barnhart, Katherine; Graber, Andrew; King, Jonathan; Kostelnik, Jaime; Rengers, Francis; Selander, Brittany; Thomas, Matthew: <b>FIRE, FLOOD, AND MUD: ASSESSING POSTFIRE DEBRIS-FLOW HAZARDS THROUGHOUT THE ROCKY MOUNTAIN REGION</b>
<b>23-9</b>	11:00 AM	Bailey, Mary*; Rittenour, Tammy; Roos, Christopher I.: <b>LUMINESCENCE RECORD OF ENHANCED WILDFIRE INTENSITY: ANALYSIS OF ARCHEOLOGICAL POTTERY AND SOILS IN NEW MEXICO</b>
<b>23-10</b>	11:20 AM	Wasklewicz, Thad*; Guthrie, R.H.; Knibbs, Graham: <b>CHARACTERIZING RISK FROM POST-FIRE DEBRIS-FLOW HAZARDS</b>
<b>23-11</b>	11:40 AM	Belair, Gina*: <b>UPDATED LANDSLIDE SUSCEPTIBILITY MAP OF THE UNITED STATES</b>



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## How to use the indexing system:

The first number (preceding the dash) represents the session number in which the paper will be presented.

The second number (following the dash) indicates the presentation order of the paper within its session.

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