



Colorado Scientific Society

The objective of the Society is to promote the knowledge and understanding of Earth science, and its application to human needs

November Meeting, Thursday, Nov. 16, 2017, 7:00 p.m.

Shepherd of the Hills Church, 11500 W. 20th Ave., Lakewood

Social time, 6:30; program at 7:00

Earth's earliest evolution: Fire from above, fire from below

Simone Marchi, Southwest Research Institute, Boulder, Colorado

In the aftermath of the giant collision resulting in the formation of the Moon, about 4.5 billion years ago, the Earth experienced a protracted time of bombardment by leftover planetesimals. In this talk I will present a new bombardment model of the Hadean Earth that has been calibrated using existing lunar and terrestrial geochemical data. We find that the surface of the Hadean Earth was widely reprocessed by impacts through mixing and burial by impact-generated melt. This model may explain the absence of early terrestrial rocks. In addition, by tracking the magnitude and timing of large collisions, we find that existing oceans would have repeatedly boiled away into steam atmospheres as late as about 4 billion years ago. These findings have important implications for the formation and stability of early habitable environments and the onset of life. Finally, I will discuss recent developments in understanding the effects of collisions on the tectonic evolution of the early Earth, as well as the formation of impact-induced geochemical heterogeneities that could still persist in terrestrial mantle rocks.



An artistic conception of the Hadean Earth. Huge, impact-generated lava lakes coexisted with surface liquid water, under a thick greenhouse atmosphere sustained by lava outgassing (credit: SwRI/Simone Marchi, Dan Durda).

Simone Marchi, short biography:

My research interests span from the formation and geology of terrestrial planets the moon and asteroids, to the spectroscopy and dynamics of minor bodies and meteorites. I am associated with several space missions, including: NASA's Dawn, Lucy, Psyche, and ESA's Rosetta, BepiColombo, and JUICE.

I have been a fellow at the NASA Lunar Science Institute, the Observatoire de la Cote d'Azur, the German Aerospace Agency, and Padua University. I hold a PhD in Applied Physics from the Pisa University. More details can be found here: <http://www.boulder.swri.edu/~marchi/index.html> .



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November 2017 President's Message, Marith Reheis, Scientist Emeritus, U.S. Geological Survey

My year of leading the Colorado Scientific Society is drawing to a close.

Because the president is primarily responsible for finding interesting topics and speakers for the monthly meetings, I have chosen to focus several talks on topics in my field of study: earth surface processes and past climate change. I want to use this message this month to raise even more awareness. To be clear, this is my statement and not that of the CSS. Just this week, the World Meteorological Organization reported that CO₂ levels in the atmosphere have reached 403.3 parts per million, due both to anthropogenic causes and their amplification by El Niño. This increase is significantly higher than that occurring in the last major El Niño year of 1998, and the rate of increase exceeds all deglacial rates of increase recorded in ice cores spanning the past 800,000 years. Our speaker last January, Giff Miller, presented data indicating that shrinking ice caps in



Greenland are now exposing land surfaces that have been covered with ice for at least the past 40,000 years and most likely for over 100,000 years. The planet's atmosphere now contains CO₂ concentrations that have not been equaled since the Pliocene, when sea level was 10-20 m higher than now. Julie Brigham-Grette's Emmons lecture on coastal and glacial records in the Pliocene emphasized the importance of planning for "a long-term managed retreat of human infrastructure from our coastlines." To paraphrase published comments on other subjects: If you're not deeply concerned, you're not paying attention! You can read a summary of the report at:

<https://public.wmo.int/en/media/press-release/greenhouse-gas-concentrations-surge-new-record>

Our regular meeting on November 16 will see a return to planetary geology, as Simone Marchi of the Southwest Research Institute talks about the exciting early origins of our planet. I hope you will also be able to attend Family Night on November 19 at the Colorado School of Mines Geology Museum, and bring your kids! Pete Modreski is planning some fun for all ages. In fact, spread the word to your neighbors and friends, we'd love to see some new folks drawn in to the earth sciences in general and CSS in particular.

--- Marith



Colorado Scientific Society

Special Event – CSS Family Night at the Museum

Sunday, Nov. 19, 2017, 4 to 7 p.m.

Colorado School of Mines Geology Museum

1310 Maple St. (Maple & 13th Streets), Golden

(free weekend parking on campus & city streets)

Please come join us at this special Open House & Family Night at the CSM Museum!

It will be hosted by Museum Director (and CSS Councilor) Dr. Bruce Geller. We'll have complimentary refreshments (pizza and other food, snacks, treats, non-alcoholic drinks) for everyone. In addition to all the regular features of the museum, there will be some special activities--a mineral & rock scavenger hunt/treasure hunt—one for kids and one for adults. Bring your family, friends, and guests!

Regular Sunday hours of the museum are 1 to 4 p.m. Come early if you like too; our CSS event will begin when the regular museum visitors leave. Some of the special features *always* at the museum include:

Mineral, rock, geology, and fossil displays

New changing mineral displays every year

Displays focusing on Colorado's mining districts

Gold and silver (and platinum!) displays

Miss Colorado crown, and a silver pitcher and platter made of Colorado silver

Colorado State Rock, Mineral, and Gemstone (Marble, Rhodochrosite, Aquamarine)

Amazonite, Smoky Quartz, and Topaz from the Pikes Peak region

Meteorite displays, plus Apollo 15 and 17 Moon Rocks

The Mine Tunnel, including a Fluorescent Mineral Display

Rare-earth and Critical Minerals Display

The 1939 Irwin Hoffman murals depicting mining throughout history

The Museum Gift Shop





CSS Annual Student Paper Night took place on September 21 at the Arbor House, Maple Grove Park, Golden. Our student speakers, all of whom gave excellent presentations, were (in alphabetical order):

The Self-organization of Snow Surfaces and the Growth of Sastrugi

Kelly Kochanski, University of Colorado, Department of Geological Sciences

Transformation of Wastewater Treatment – Energy and Nutrient Recovery from Municipal Wastewater

Yalin Li, Colorado School of Mines, Civil and Environmental Engineering

A Possible Causative Mechanism of Raton Basin, New Mexico and Colorado Earthquakes using Recent Seismicity Patterns and Pore Pressure Modeling

J.S. Nakai, University of Colorado, Department of Geological Sciences

Testing the Ice Cover History of Preserved Landscapes on Baffin Island using ^{14}C

Simon L. Pendleton, University of Colorado, Department of Geological Sciences

The Atmospheres of Two Super-Puffy Exoplanets

Jessica Roberts, University of Colorado, Department of Astrophysical and Planetary Sciences

Feasibility of Fluorescent Placer Diamond Prospecting Using Ultra-Violet Specific Longwave LED Light Sources

John Waida, Metropolitan State University of Denver, Department of Earth and Atmospheric Sciences

Each student received a \$50 honorarium as a thank-you for coming to give their presentation, as well as an engraved CSS pilsner glass. An “audience popular vote” with a \$250 honorarium for best presentation went to Kelly Kochanski for her talk on Self-organization of Snow Surfaces. From left to right in the photo above, Jenny S. Nakai, Jessica Roberts, Yalin Li, John Waida, Simon Pendleton, and Kelly Kochanski.

Corporate Sponsorship of the Colorado Scientific Society (we'll repeat this from last month!)

Corporate sponsorship helps the Society continue to provide earth science-related talks, field trips, and other events to a broad cross-section of Front Range geologists and interested people. Please accept an invitation from the Colorado Scientific Society to become a corporate sponsor, enabling us to continue and expand our programs.

Cost: The annual rate for corporate sponsorship is \$200. Alternatively, sponsors may wish to support a specific event, such as underwrite the cash prizes at our annual Student Night competition, our awards to students at the Colorado State Science Fair, or support a field trip.

Benefits of sponsorship: All sponsors receive public acknowledgment for their support, including your company logo, name, and web address displayed in the CSS monthly newsletter and on our web page.

How to donate: The Colorado Scientific Society is a 501(c)(3) exempt organization, and contributions to it are tax deductible as charitable gifts and contributions. To donate and become a corporate sponsor, contact our Treasurer: Don Sweetkind, CSS Treasurer, email dsweetkind@usgs.gov.

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CSS outreach to non-science groups (repeating this too... please contact us if you would like to be on our list of volunteer speakers!)

As a follow-up to our participation in the March for Science, we'd like to compile a list of members who would be willing to give an occasional lecture or presentation to non-science audiences. Groups such as neighborhood organizations, churches, social groups (Elks, Rotary, etc.) sometimes ask for speakers and it would be wonderful to have a list of knowledgeable people on whom to call. We'd like to post willing speakers and their topics on our website, so that visitors to the site could see what topics might be easily available. If you'd like to participate, please email your name and topic to Pete Modreski, pmodreski@usgs.gov.

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COLORADO SCIENTIFIC SOCIETY, REMAINING TALKS AND TOPICS FOR 2017

Thur. Nov. 16 Simone Marchi, Southwest Research Institute, Boulder, **The Early Evolution of Earth—Fire from Above, Fire from Below**, 7:00 p.m., Shepherd of the Hills Church

Sun., Nov. 19 **Colo. Sci. Soc. Family Night at the Museum**, open house at the CSM Geology Museum, 4 to 7 p.m., hosted by Museum Director (and CSS Councilor) Dr. Bruce Geller.

Wed. Dec. 13 Marith Reheis, Emeritus USGS: President's address, **"DUST! Why Should You Care? (The answer is blowing in the wind)"** at the CSS Annual Meeting and Holiday Potluck Dinner, starting at 5:30 p.m., Arbor House, Maple Grove Park

Our meetings are normally held at Shepherd of the Hills Church, 11500 W. 20th Ave., Lakewood (May, September, and December will be exceptions this year). All are always welcome. Social time 6:30, meeting begins at 7. See www.coloscisoc.org for more info.

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IT'S NOT TOO EARLY to think about renewing your membership for 2018 in the **Colorado Scientific Society**. Dues are \$25 for regular members, **\$20 if dues renewals are paid before Jan. 31 of each year**, \$10 for corresponding members (outside the Colorado Front Range area) and only \$5 for students. A Lifetime Membership is now available, for \$395.00. Mail a check to the CSS or pay with a credit card using PayPal on the CSS website. Please contact CSS Treasurer Don Sweetkind at 303-236-1828 or dsweetkind@usgs.gov if you are uncertain of your dues or membership status. You'll find a membership form on our website at <http://coloscisoc.org/membership-payment/>. Please remember that when you make your dues payment, you might like to include an extra contribution to support one of our **six Memorial Funds** that go toward student research grants, or the Society's Endowment Fund. You'll find all the categories listed on the membership form.

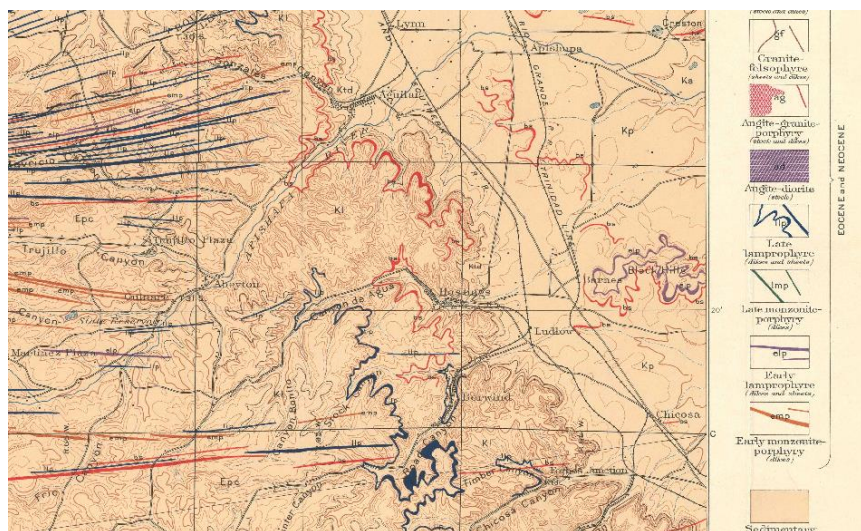
Colorado Scientific Society, P.O. Box 150495, Lakewood CO 80215-0495 <http://www.coloscisoc.org>
Did we mention that there's a \$5 discount if you pay your dues before January 31?

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For more news & information about the Society, always check our website, www.coloscisoc.org, or search for us, Colorado Scientific Society, and "like" us on Facebook. Anyone can view our facebook page, whether you have an account or not, at <https://www.facebook.com/groups/511533159044226/>.

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October's "Where is this rock?"

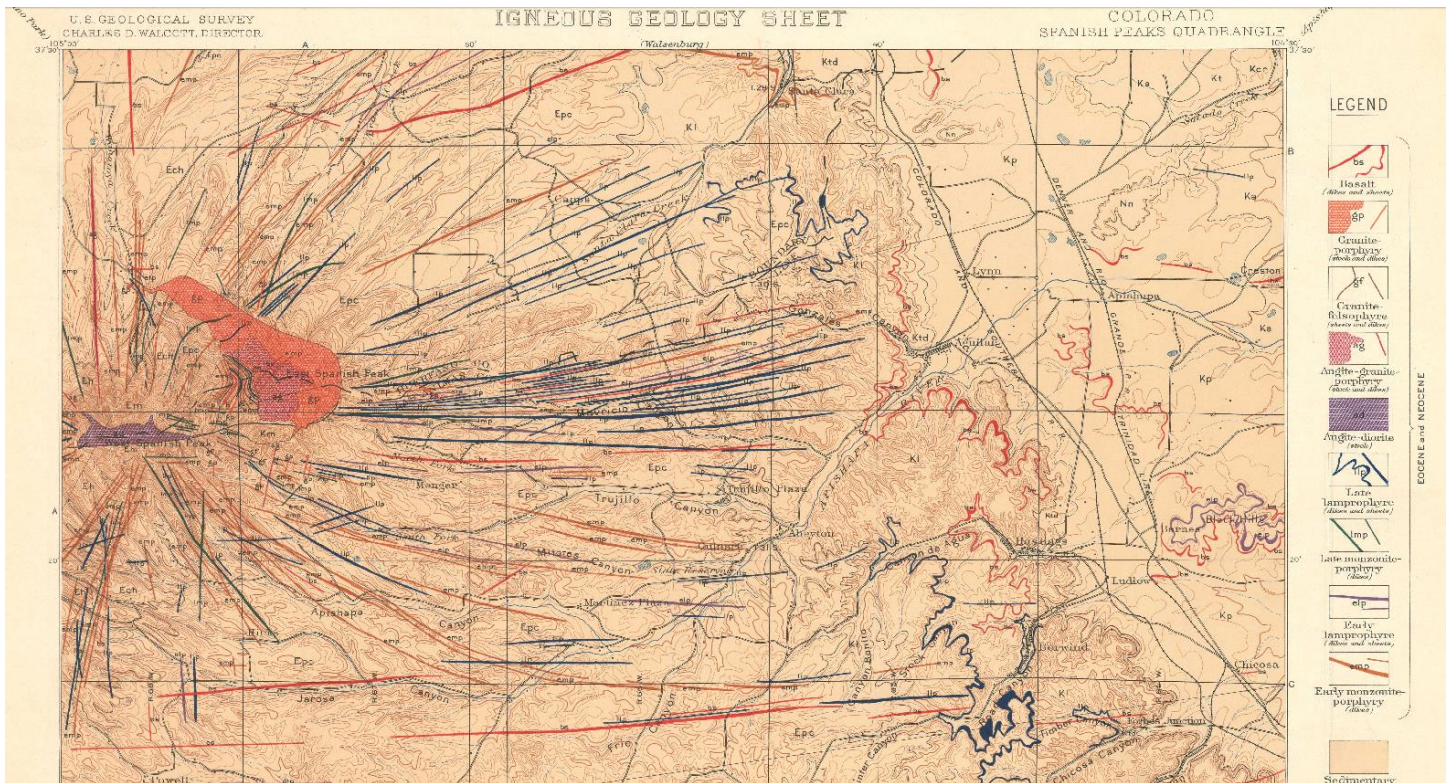


Bob Kirkham once again replied correctly to my October map questions. I had decided to present another geologic map, again from a USGS Atlas Folio; someplace also "classic" and easily recognizable, but I thought I'd at least camouflage it a bit by just using an image showing only one "slightly obscure" corner of the map, that doesn't include its most distinctive key features. Here's the map image that I posted in October, and on the next page, a bigger piece of the map, which does a much better job of giving away where it's from.

Bob wrote: "Another relatively easy one. This map shows dikes and sills associated with the Spanish Peak intrusions that crop out along the east flank of the Laramide Raton Basin in the foothills west of Aguilar and Ludlow. Some of the basaltic sills may be rift-related and possibly correlative to the basaltic flows that cap Fishers Mesa." The map is from the Spanish Peaks Folio, #71, of the Geologic Atlas of the U.S., by R.C. Hills, 1901. This is the Igneous Geology sheet. I knew about the dikes here of course, but I'm not sure I realized that there were also sheets (sills) of several matching magma compositions that crop out along the mesa escarpments east of the Peaks. (Hills referred to these as "sheets", he seems never to have used the term "sill" in his report. Penn and Lindsey (1996—see below) also refer to these as "sole injections")

The Spanish Peaks Folio can be downloaded online at <https://pubs.er.usgs.gov/publication/gf71>. If you'd like to read more about the intrusions, dikes, and ages of magma types in and around the Spanish Peaks, I suggest the field guide by Penn & Lindsey from the 1996 GSA Annual Meeting:

Penn, Brian S., and Lindsey, David A., 1996, Tertiary igneous rocks and Laramide structure and stratigraphy of the Spanish Peaks region, south-central Colorado; road log and descriptions from Walsenburg to La Veta (first day) and La Veta to Aguilar (second day), *in* Geologic Excursions to the Rocky Mountains and Beyond, Thompson, Ren A, Hudson, Mark R., and Pillmore, Charles L. editors, Colorado Geological Survey, Report: 44, 21 pp., 1996. <http://coloradogeologicalsurvey.org/wp-content/uploads/2013/08/34.pdf>



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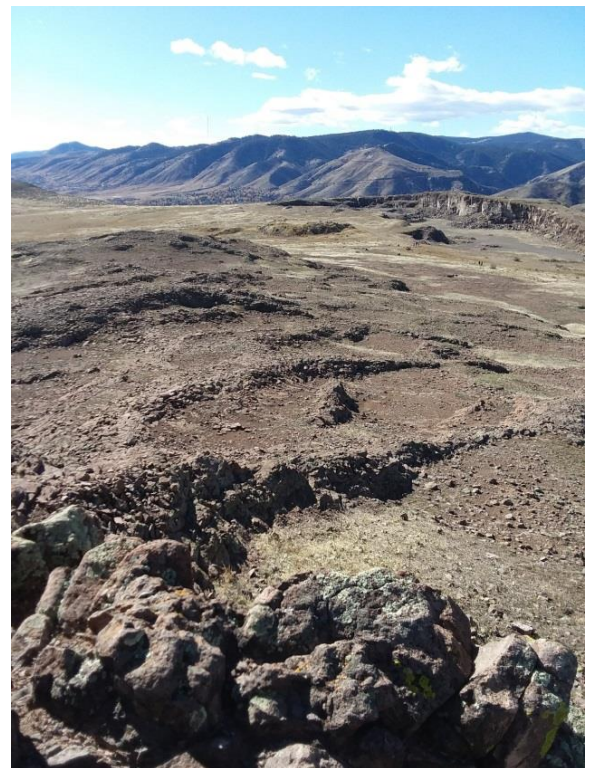
November "Where is This Rock?"

I'll switch off from geologic maps now, and go back to "real rocks" for this month. What have we here, and where?

One of these that I wanted to use seemed too easy, so here's a bonus for this month, two pictures for one. Where is the nice cross-bedding from, and, what's the other?



Send your answers to Pete, the newsletter editor, pmodreski@usgs.gov.



Calendar of Coming Events

Tues., Nov. 7, 5:30 p.m., Rocky Mountain Map Society, Annual Scholar Lecture, Imre Demhardt: "The Rio Colorado of the West: 19th Century Exploration and Cartography". Denver Public Library, 5th Floor, Gates Room, free and open to the public:

"President Teddy Roosevelt in May 1903, standing on the southern rim of the Grand Canyon, exclaimed that this is "one of the great sights which every American, if he can travel at all, should see". But why did he come out to this remote chasm at all? This presentation introduces the explorers from the Spanish Entradas to Anglo pioneers like John Wesley Powell and their influence on nineteenth century (carto)graphic imaginations of the Rio Colorado of the West. Milestone representations of the river and its region do range from Alexander von Humboldt's first 'cleansed' depiction of the area in 1811 to Friedrich Wilhelm von Egloffstein's pioneering relief shaded map of the Grand Canyon in 1861 and Clarence Dutton's geological atlas in 1882. They all contributed to shape our mental map of the Rio Colorado as one of America's iconic riverscapes."

Wed., Nov. 8, 6 p.m., "Unveiling Reception of the Oreodont Skeleton" at the Sherman Dugan Museum, San Juan College, School of Energy, Farmington, NM. This newly established and refurbished museum has very fine and up-to-date mineral and fossil displays. All are welcome at this reception.

Fri., Nov. 10, 3:00 p.m., Raymond Rogers (Macalester College), Twenty Years of Paleontological Adventure & Discovery on the Great Red Island, Madagascar. Denver Museum of Nature & Science Earth Science Colloquium Series; VIP Room, DMNS; all are welcome, and museum admission is not required to attend.

Sat., Nov. 11, Silent Auction, held by the Littleton Gem and Mineral Club; Columbine Hills Church, 9700 Old Coal Mine Ave, Littleton CO. Seller setup at 11, auction begins at 12 noon, verbal auction at 1 p.m., auction is completed and checkout of purchases begins at 3:30 p.m. All are welcome; complimentary refreshments.

Sat.-Sun., Nov. 11-12, 38th annual New Mexico Mineral Symposium, at New Mexico Institute of Mining & Technology, Socorro, NM; see <https://geoinfo.nmt.edu/museum/minsymp/home.cfm> .

Thurs., Nov. 16, 7:00 p.m., Colorado Scientific Society November meeting, Simone Marchi, Southwest Research Institute, **The Early Evolution of Earth—Fire from Above, Fire from Below,** at Shepherd of the Hills Church, 11500 W. 20th Ave., Lakewood.

Thurs., Nov. 16, 7:30 p.m., Friends of Mineralogy-Colorado Chapter bimonthly meeting, in VIP Room, DMNS. Program, **"Phosphate Minerals of Arkansas and Where We Found Some"**, by Ed Pederesen.

Fri., Nov. 17, Colorado Science Teachers' Conference (full name: Colorado Science Conference for Professional Development). Held at the Denver Mart, 451 E. 58th Ave., and sponsored by the Colorado Association of Science Teachers (CAST) and other science educators organizations. For info see <http://www.coloradoscienceconference.org/> .

Fri.-Sun., Nov. 17-19, Denver Area Mineral Dealers Show, Jefferson County Fairgrounds, Golden CO. 10 a.m. – 5 p.m. Friday, 10-6 Sat., 11-4 Sun. All welcome; free admission and parking.

Sun., Nov. 19, 12 noon, monthly meeting of the Florissant Scientific Society, at Dinosaur Ridge, in the Chevron Classroom (upstairs in the "barn" at the Visitor's Center). Potluck lunch at noon (bring something to share), talk follows at about 1 p.m. Speaker: Cal Ruleman, USGS. Cal will be giving a version of the talk he presented back in February for the Colorado Scientific Society, **Cenozoic drainage integration of the southern Rocky Mountains**". If you'd like to read the abstract from Cal's February talk, find it on the CSS website at http://coloscisoc.org/wp-content/uploads/2017/02/2017-02_CSS_February_newsletter.pdf .

Beth Simmons (FSS Program Coordinator) adds: "Cal and his cronies (including me) have been investigating the extent of early glaciations in Colorado. My [Beth's] belief is that the "wind gap" directly west of the barn, high on the hogback is truly a U-shaped valley. It has glacial boulders in it. I believe that the extensive scree slopes on the north-facing canyon walls are ancient peri-glacial features that formed when the glacial front sat nearby. I believe that the canyons were cut by rivers flowing under the glacier that sat overtop. Cal has traced glacially modified surfaces high

above the present landscape along the Front Range from New Mexico into Wyoming and is working to identify the time that boulders on those landscapes were exposed. Come hear him discuss these features and how these observations change our interpretation of the glacial epoch here along the Front Range.”

Next summer, the FSS plans to have a field trip to observe some of these features, including the Central City "Gravels" along the Casino (Central City) Parkway.

Sun., Nov. 19, Colorado Scientific Society Family Night at the Museum, open house at the CSM Geology Museum, 4 to 7 p.m., hosted by Museum Director (and CSS Councilor) Dr. Bruce Geller.

Fri.-Sun., Dec. 8-10, Flatirons Mineral Club annual Gem and Mineral Show, “Rocks and Rails”. Boulder County Fairgrounds, Main Exhibit Building, 9595 Nelson Rd., Longmont, CO. Combined Gem and Mineral Show + Boulder Model Railroad Club Exposition; 10 a.m. – 5 p.m. each day. See <https://flatironsmineralclub.org/about/annual-fmc-gem-and-mineral-show/>.

Wed., Nov. 29, 4:00 p.m., “In dry climates with weak rocks, micro-climates reshape drainage networks”, by Sam Johnstone, USGS. . CU Geological Sciences Colloquium, Benson Earth Sciences 180; refreshments follow lecture. See <http://www.colorado.edu/geologicalsciences/colloquium> for the full fall schedule.

Wed., Dec. 13, 5:30 p.m., Colorado Scientific Society Annual Meeting, Potluck Dinner, and President's Address, by Marith Reheis: **DUST! Why Should You Care? (The answer is blowing in the wind)**. At the Arbor House, in Maple Grove Park, 14600 W. 32nd Ave., Golden. Social time begins at 5:30, dinner at 6:00, program begins at 7:00 p.m.

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2017 DMNS EARTH SCIENCES COLLOQUIUM SERIES

Location: Denver Museum of Nature & Science, VIP Room (Enter the museum and make a hard left, pass the gift shop on your right, bathrooms on the left, and then the TRex Café on the right; the VIP room is at the far NE corner of the museum, just past the set of 3 TRex Café cash registers). Time: 3:00 - 4:00pm. * Museum admission not required to attend; all are welcome. *

Fri., Nov. 10, Raymond Rogers (Macalester College), Twenty Years of Paleontological Adventure & Discovery on the Great Red Island, Madagascar. *[this talk had originally been scheduled for Sept. 22; data was changed]*

Tues., Dec. 5, Ellen Currano (University of Wyoming), Seeing the forest through the leaves - from Ethiopia to the Rocky Mountains

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For more lecture series during the year see:

Colorado Café Scientifique in Denver, monthly lectures on science topics held either at Blake Street Station or Brooklyn’s, Denver; open to the public, no charge other than refreshments you may choose to purchase; see <http://cafescicolorado.org/>.

CU Geological Science Colloquium (Wednesdays, 4 p.m.) see <http://www.colorado.edu/geologicalsciences/colloquium>
CSU Dept. of Geoscience Seminars (Fridays, 4 p.m.), see <https://warnercnr.colostate.edu/geosciences/geosciences-seminar-series/>

Van Tuyl Lecture Series, Colorado School of Mines, (Thursdays, 4 p.m.): <https://geology.mines.edu/events-calendar/lectures/>

Denver Mining Club (Mondays, 11:30), see <http://www.denverminingclub.org/>

Denver Region Exploration Geologists Society (DREGS); 1st Monday, 7 p.m.), <http://www.dregs.org/index.html>

Florissant Scientific Society (FSS); meets monthly in various Front Range locations for a lecture or field trip; meeting locations vary, normally on Sundays at noon; all interested persons are welcome to attend the meetings and trips; see <http://www.fss-co.org/> for details and schedules.

Rocky Mountain Map Society (RMMS); Denver Public Library, Gates Room, 3rd Tuesday, 5:30 p.m.), <http://rmmaps.org/>

Western Interior Paleontology Society (WIPS); Denver Museum of Nature & Science, 1st Monday, 7 p.m.), <http://westernpaleo.org/>.

CSS Officers for 2017

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Past President..... Peter Barkmann, 303-384-2642, barkmann@mines.edu
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Treasurer..... Don Sweetkind, 303-236-1828, dsweetkind@usgs.gov

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2015-2017 Pete Modreski, pmodreski@usgs.gov, 303-202-4766
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2016-2018: Melissa Foster, melissa.ann.foster@gmail.com, 707-498-2484
2017-2019: Jim Reed, jim@rockware.com
2017-2019: Chris Morrison, chris-morrison@comcast.net

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