



# Colorado Scientific Society

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

**September Meeting, Thursday, Sept. 21, 2017, 5:45 p.m.**

Arbor House, in Maple Grove Park, 14600 W. 32<sup>nd</sup> Ave., Golden (on 32<sup>nd</sup> Ave. between Wheat Ridge and Golden, in the Applewood area).

Social time starts at 5:45; program begins at 6:45; refreshments!

## *Student Paper Night*

*six presentations by graduate (and one undergraduate) students*

*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 <sup>14</sup>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

*Abstracts of all six presentations follow:*

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

**Kelly Kochanski**, Clea Bertholet, Robert S. Anderson, Gregory E. Tucker  
Department of Geological Sciences, University of Colorado, Boulder

**Abstract --** Seasonal snow covers approximately 15% of the surface of the Earth. The majority of this snow is found on tundra, ice sheets, and sea ice. These windswept snow surfaces self-organize into depositional bedforms, such as ripples, barchan dunes, and transverse waves, and erosional bedforms, such as anvil-shaped sastrugi. Previous researchers have shown that these bedforms influence the reflectivity, thermal conductivity, and aerodynamic roughness of the surface.

For the past two winters, we have observed the growth and movement of snow bedforms on Niwot Ridge, Colorado, at an elevation of 3500m. We have observed that (1) when wind speeds are below 3m/s, snow surfaces can be smooth, (2) when winds are higher than 3m/s during and immediately following a storm, the smooth surface is unstable and selforganizes into a field of dunes, (3) as snow begins to harden, it forms erosional bedforms that are characterized by vertical edges facing upwind (4) between 12 and 48 hours after each snowfall, alternating stripes of erosional and depositional bedforms occur, and (5) within 60 hours of each storm, the surface self-organizes into a field of sastrugi, which remains stable until it melts or becomes buried by the next snowfall.

Polar researchers should therefore expect snow-covered surfaces to be characterized by fields of bedforms, which evolve in response to variations in snow delivery, windspeed, and periods of sintering. Smooth drifts may be found in sheltered and forested regions. On most ice sheets and sea ice where snowfall is frequent, the typical surface is likely to consist of an evolving mix of depositional and erosional bedforms. Where snowfall is infrequent, for example in Antarctica, the surface will be dominated by sastrugi fields.

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

**Yalin Li**, PhD candidate, Civil and Environmental Engineering, Colorado School of Mines

**Abstract –** Municipal wastewater is rich in organics and nutrients that typically require energy-intensive processes for removal, yet these substances hold great potential for valorization through proper strategies. This talk presents a scheme where the traditional treatment-focused wastewater management approaches are replaced by resource recovery-focused recycling approaches. In this scheme, municipal wastewater is used as the source water for microalgae cultivation, where the contaminants in wastewater are metabolically utilized by algae, and the algal biomass is harvested as the feedstock for downstream biorefineries. With a combination of biological and thermochemical techniques, organic contaminants and excess nutrients in municipal wastewater can be converted to biofuels and other valuable chemicals, therefore simultaneously achieving the goals of wastewater treatment, energy production, and nutrient recycle. This transformation of wastewater treatment plants into water resource recovery facilities will be a crucial step towards a more sustainable wastewater management system.

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

**J.S. Nakai**<sup>1,2</sup>, M. Weingarten<sup>3</sup>, A.F. Sheehan<sup>1,2</sup>, S.L. Bilek<sup>4</sup>, S. Ge<sup>1</sup>

<sup>1</sup> Department of Geological Sciences, University of Colorado Boulder, 399 UCB, Boulder, CO, 80309

<sup>2</sup> Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder, 216 UCB, Boulder, CO, 80309

<sup>3</sup> Department of Geophysics, Stanford University, Stanford, CA, 94301

<sup>4</sup> Department of Earth and Environmental Science, New Mexico Institute of Mining and Technology, Socorro NM, 87801

## **Abstract**

The Raton Basin has the highest number of earthquakes in Colorado and New Mexico from 2008 to 2010. The rate of wastewater injection and the rate of earthquakes in the Basin increased dramatically starting in 1999 and 2000, respectively. We compare seismicity ( $M_L$  0.0 to 4.3) in the Raton Basin from 2008 to 2010 with the location of modeled pore pressure increases, estimated from cumulative wastewater injection volume beginning at the onset of well injection to present for all 28 injection wells in the Basin. We find that modeled pore pressures in the New Mexico portion of the basin reached that necessary to induce seismicity (0.01-0.1 MPa). We simulate a fault plane, 20 km long, inferred from seismicity in Vermejo Park (1355 of 1800 total earthquakes), into our model. We find that the relatively permeable fault allows pressures to migrate deeper into the basin at the onset of our study in 2008, providing an explanation for the observed seismicity in the basement. The Tercio lineament of earthquakes is similar to Vermejo Park fault in strike, but has fewer earthquakes (129) and is shorter in length (9 km). Seismicity in Vermejo Park occurs continuously, but earthquakes occur episodically in the remainder of the basin. The number of earthquakes we observe in seven seismic clusters increases as the cumulative injected volume from wells within 5 km increases. The modeled pore pressures, earthquake locations, and relationship between cumulative volume and number of earthquakes indicate that seismicity in the Raton Basin is likely induced.

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

Simon L. Pendleton<sup>1</sup>, Gifford H. Miller<sup>1</sup>, Nathaniel Lifton<sup>2</sup>, Robert S. Anderson<sup>1</sup>

<sup>1</sup>INSTAAR and Department of Geological Sciences, University of Colorado Boulder, Boulder, CO 80309-0399

<sup>2</sup>Department of Earth, Atmospheric, and Planetary Sciences and Department of Physics and Astronomy, Purdue University, 550 Stadium Mall Drive, West Lafayette, IN 47907

## Abstract

Significant warming over recent decades at high latitudes is leading to marked ice loss and an overall decline of the Arctic cryosphere. Continued shrinkage of the cryosphere is expected to have far reaching and as yet unknown impacts within and beyond the Arctic, necessitating a better understanding of the consequences of these changes. Investigation and characterization of past glacial fluctuations provide important analogs and context for current and future Arctic cryosphere trends. Here we apply two dating techniques, both utilizing radiocarbon ( $^{14}\text{C}$ ), to investigate preserved landscapes and assess ice coverage since the last interglaciation (LIG) on Baffin Island.

Recent ice margin retreat on Baffin Island is exposing preserved land surfaces from beneath cold-based, non-erosive ice. These land surfaces contain *in situ* dead vegetation preserved in growth position, whose  $^{14}\text{C}$  age most likely represents the timing of most recent ice advance over those locations. Building on the work of Miller et al. (2013), vegetation from the margins of 27 retreating ice caps on Cumberland Peninsula yield  $^{14}\text{C}$  concentrations at or beyond the range of the radiocarbon method, suggesting continuous ice coverage at these locations for more than ~40 ka. Paleoclimate records indicate that prior to ~40 ka, the last warm time similar to present was during the LIG, which ended ~120 ka (Andersen et al., 2004); we have therefore suggested that these surfaces have been buried by ice for ~120 ka.

We test whether these sites were deglaciated and exposed for significant periods during earlier Holocene warm times and subsequently re-covered by ice during Late Holocene cooling, by determining the *in situ* cosmogenic  $^{14}\text{C}$  concentration of boulders and bedrock being exposed alongside the  $^{14}\text{C}$ -depleted vegetation. If these locations had been covered by ice since the LIG, inherited cosmogenic  $^{14}\text{C}$  would have decayed away. Spallation production of  $^{14}\text{C}$  is negligible under six meters or more of ice, but muogenic production would continue even under thicker ice. Modeling of both muogenic and spallogenic  $^{14}\text{C}$  production under varying ice coverage histories suggests that some recently deglaciated surfaces on Baffin Island have most likely been ice covered since the LIG, reinforcing our earlier conclusions that the current century is likely warmer than any century since the LIG. However, modeling also indicates that Holocene exposure is possible at some locations, though not necessary. It is possible that the dynamics and underlying physics of ice bodies on Cumberland Peninsula play a role in the non-uniformity of *in situ*  $^{14}\text{C}$  inventories on preserved landscapes. However, the number of locations with  $^{14}\text{C}$ -depleted vegetation and low *in situ*  $^{14}\text{C}$  inventories reinforces the hypothesis that some ice caps dimensions are the smallest in the past ~120 ka.

Andersen KK, Azuma N, Barnola JM, et al. (2004) High-resolution record of Northern Hemisphere climate extending into the last interglacial period. *Nature* 431(7005): 147–151.

Miller GH, Lehman SJ, Refsnider KA, et al. (2013) Unprecedented recent summer warmth in Arctic Canada. *Geophysical Research Letters* 40(21): 5745–5751.

## The Atmospheres of Two Super-Puffy Exoplanets

**Jessica Roberts**, Zach Berta-Thompson, Jean-Michel Desert, Katherine Deck, Daniel Fabrycky, Jonathan Fortney, Michael Line, Eric Lopez, Caroline Morley, Roberto Sanchis-Ojeda, and Joshua Winn  
Department of Astrophysical and Planetary Sciences, University of Colorado, Boulder

**Abstract** -- Thanks to the NASA Kepler Mission, astronomers now know that most stars in our galaxy are orbited by at least one planet. These exoplanets span an incredible range of temperatures, sizes, and atmospheric compositions. Many of these exoplanets are unlike anything seen in our own Solar System including extremely hot Jupiter-sized planets and rocky super-Earths. This is certainly the case for the “super-puffs,” rare planets that have only a few Earth masses and yet are the size of Jupiter. With such low mass these planets have little gravitational pull, only 1/10th that of Earth, leading us to wonder how these planets both accrete and then retain such a large atmosphere. We use the Hubble Space Telescope to observe several transits of two super-puffs, Kepler 51b and Kepler 51d. Using these data, we measure transmission spectra of the planets’ atmospheres, which allows us to probe their composition and structure. I will present the results of our study and discuss how our findings aid us in understanding the formation and evolution of these unusual exoplanets.

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

**John Waida**<sup>1</sup>, Undergraduate Researcher Geoscience<sup>1</sup>, and Uwe Richard Kackstaetter, Ph.D.<sup>1</sup>, Associate Professor of Geology

<sup>1</sup>Department of Earth and Atmospheric Sciences, Metropolitan State University of Denver

Placer diamond prospecting methods usually focus on the specific gravity of kimberlite indicator minerals (KIM’s) or actual diamonds. Although tried and true, these techniques are often tedious and time consuming. Visual reconnaissance surveys are non-existent. The idea of using long wave or short wave UV excitation as an alternate prospecting tool are usually disbanded because of the absence of fluorescent responses to KIM’s and most naturally occurring diamonds. However, using UV wavelengths outside the commonly accepted 365 nm (Long Wave) and 254 nm (Short Wave) bands by employing commercially available UV LED lamps, fluorescent excitation of detrital diamonds is indeed possible and visible, showing promising results. Dark room testing of rough, un-cut 1 - 2 mm sized diamonds using an OceanView Optics Red Tide 650 usb spectrometer and associated Sparkvue software, a < 400 nm UV blocking filter, and UV LEDs with 365 nm, 388 nm, and 395 nm emissions showed visible light fluorescence in 95% of the diamond samples tested. Light excitement levels varied based on natural color of diamonds and wavelength of UV light. Best results were obtained with the 365 nm and 388 nm UV LEDs, thus showing promise for the feasibility of a visual diamond prospecting method. Based on results from 25 detrital diamonds investigated, all but 2 emitted visible light photons under intense UV radiation at the respective wavelengths. The experimental set-up verified that strong blue intensity peaks are indicative of visible fluorescence masking through the UV source light. However, adding an optical UV/blue wavelength filter will eliminate this “blue-out” effect, thus increasing the potential of an economical and visual prospecting method for placer diamonds. Further study will focus on the fluorescent response of KIM’s using the same approach.

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

Happy fall to all! The summer has flown by but luckily the aspen leaves haven't yet followed suit so hopefully we will have a long mellow fall to enjoy.

The CSS sponsored two great field trips this summer. The June field trip was led by Peter Barkmann exploring new findings within South Park and their implications on the Proterozoic to Tertiary evolution of the region. These accommodations will provide a nice place for future South Park field trips. We began by exploring the Pennsylvanian-Permian structural and stratigraphic relationships with the Ancestral Rockies and migrated through the Cretaceous seaway record, Laramide reverse faulting, Cenozoic volcanism and late Tertiary-Pleistocene? extensional faulting. In late August, we met on the White River Plateau to examine new findings by the Denver Museum of Nature and Science folks on the paleontology of the Devonian section and the several stratigraphic/geomorphic complexities in the region (e.g., unusual bedforms in section created by Devonian critters, or unusual erosional features created by surficial processes). The weather was perfect and meadows of wildflowers still in bloom!



We anticipate lots of great activities this fall, starting with excellent and varied presentations by students at our upcoming meeting on September 21 at the Arbor House. Stimulating talks, friends, and good beer—who could want for more?! In October our speaker will be Suzette Morman (USGS) on geology and health, and in November will be Simone Marchi of the Southwest Research Institute on the early evolution of Earth—fire from above, fire from below. In addition, in November we are planning to host a family afternoon-evening event as a private group to tour the Geology Museum at the Colorado School of Mines. We'll wind up with our traditional potluck gathering at the Arbor House in December. Keep an eye on the website for dates and times. The Council has been busy cooking up ideas for rehabilitating the geologic signage in the Morrison I-70 roadcut, which was placed there by the CSS back in the 1980's. It is sadly worn and vandalized. We plan to replace the signs with numbers keyed to a website with expanded descriptions of the stratigraphy exposed in the outcrops. We invite anyone interested in becoming involved with the planning for this effort to contact Marith Reheis (marith16@gmail.com) or Lisa Fisher (lisa.fisher@alumni.mines.edu).

--- Marith

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***Corporate Sponsorship of the Colorado Scientific Society***

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***

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. Sept. 21 **Student Paper Night**, 5:45 p.m., Arbor House, Maple Grove Park

Thur. Oct. 19 Suzette Morman, Crustal Imaging and Characterization, USGS: **Using Geoscience to Augment Environmental Public Health Studies**, 7:00 p.m., Shepherd of the Hills Church

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

Wed. Dec. 13 Marith Reheis, Emeritus USGS: **President's address**, 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](http://www.coloscisoc.org) for more info.

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**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. Extra payments to contribute to our Memorial Funds or Endowment Fund are always most welcome; you'll see a list of them on the membership form attached to this newsletter, or see our website at <http://www.coloscisoc.org/membership/dues.html>.

**Colorado Scientific Society, P.O. Box 150495, Lakewood CO 80215-0495 <http://www.coloscisoc.org>**

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**For more news & information about the Society**, always check our website, [www.coloscisoc.org](http://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/> .

## Calendar of Coming Events

**Thurs., Sept. 21, 5:45 p.m., Student Paper Night at the Colorado Scientific Society**, at the Arbor House, in Maple Grove Park, 14600 W. 32nd Ave., Golden (on 32nd Ave. between Wheat Ridge and Golden, in the Applewood area). Oral presentations on earth science topics by graduate students; all are welcome to attend. Complimentary refreshments!

**Fri., Sept. 22, DATE CHANGED TO NOVEMBER 10**, the talk, **Twenty Years of Paleontological Adventure & Discovery on the Great Red Island, Madagascar**, by Raymond Rogers in the Denver Museum of Nature & Science Earth Science Colloquium Series, originally scheduled for this date has been **rescheduled to Friday Nov. 10** (3:00 p.m.).

**Fri., Sept. 29, 6:30 p.m., Space: The Next Frontier in Mining!** by Dr. Joe Sercel, founder & CEO of TransAstra Corporation. A free public lecture sponsored by the National Mining Hall of Fame and Museum, Leadville CO. At the Lake County High School Auditorium, 1000 W. 4<sup>th</sup> St., Leadville.

**Sun., Oct. 1, 6-9 p.m., Dinosaur Ridge Scientific Spelling Stomp, at Denver Museum of Nature & Science; An All-Ages Competitive Spelling Bee**

- Event Profile: A fun-filled event for students, families, teachers, and science lovers from all walks of life to promote scientific literacy in our community.
- All words related to paleontology, geology, or science
- Teams of 2-4 people, all ages, will enter to compete for prizes and the glory of the Dinosaur Ridge Scientific Spelling Champion title.
- Sponsored by Colorado Chemistry Teachers Association (Additional sponsorships are available. Contact Sara Miller at 303-697-3466 x107 or [development@dinoridge.org](mailto:development@dinoridge.org))
- Date and Time: Sunday, October 1, 6-9 p.m.
- Location: Denver Museum of Nature and Science (Ricketson Theatre and Schlessman Lobby)
- Beneficiaries: Friends of Dinosaur Ridge educational and transportation programs
- Team registrants: \$40 per adult, \$25 per student (food and drink and official t-shirt included) Register at: <http://www.dinoridge.org/spelling-bee.html>
- \$15 for attendees (non-teams) (food and drink included) Tickets available at: <http://www.dinoridge.org/spelling-bee.html>
- Special guests: Steve Spangler (local science personality, owner Steve Spangler Science); Sylvie Lamontagne (spelling coach, 2-time Colorado spelling bee Champ, 4th place 2016 Scripps National Bee); Scott Isaacs (spelling coach, Champion, 1989 Scripps National Bee)

**Oct. 4**, and following weeks: **21st Century Maps—Smart Mapping**, a course for the general public to get people excited about mapping and spatial thinking! Taught by Dr. Joseph Kerski, ESRI, through the Academy for Lifelong Learning.

See <http://academyll.org/course/21st-century-maps-smart-mapping-new/>.

Course Leader: Joseph Kerski [jkerski@esri.com](mailto:jkerski@esri.com)

MEETS: 5 WEDNESDAYS TIME: 11:30AM - 1:00PM

DATES COURSE MEETS: 10/4, 10/11, 10/18, 10/25, 11/1

Price - \$55 - goes to Academy for Lifelong Learning to support their wonderful programs.

Location: Calvary Baptist Church, 6500 E. Girard Ave., Denver, CO 80225.

Type: Lecture, discussion, demonstration, hands on; bring your own device (optional).

“For thousands of years, maps have been used to explore the unknown, and to communicate a great amount of detail in a small amount of space. Today, digital maps are still used to explore the unknown, conveying information in 2D and in 3D, and are used in city planning, sustainable energy development, to assess natural hazards, to plan for future water needs, and much more. Learn why maps are even more relevant and exciting today than in the past, how maps tell rich stories, and how you can create your own maps of something you are interested in.

This course will enable participants to understand why stories can be effectively told with today’s interactive, web based (such as <http://storymaps.arcgis.com> and [www.arcgis.com](http://www.arcgis.com)) maps, and learn how to create story maps that incorporate sounds, video, photographs, narrative, and other multimedia. Through readings, videos, quizzes, lively discussions, and hands-on activities, learn how and why to create maps and be confident that you can use these tools to investigate our world and tell your own stories.



**Mon., Oct. 9,** Graham Young (Manitoba Museum), **Tropical fossils from the edge of the Arctic.** Denver Museum of Nature & Science Earth Science Colloquium Series; VIP Room, DMNS.

**Oct. 8-14** is **Earth Science Week**, sponsored by the American Geoscience Institute and many cooperators (including the USGS). See more about it at <http://www.earthsciweek.org/>, including about public activities taking place in many towns throughout the U.S. One of these will be a **Geology Hike** to be held in the Golden-Morrison-Lakewood area, led by USGS Geologist Pete Modreski, probably to take place on Sunday afternoon, October 8; details will be available later.

USGS also has available free copies of the **2017 Earth Science Week Teachers Packet**, containing classroom material (posters, calendars, activity ideas, etc.) for school or other educational use. The theme of the 2017 packet is “**Earth and Human Activity**”. Educators can pick up a copy at the USGS Library, Building 41, Denver Federal Center, Lakewood, CO, at the Reference Desk. The library is open 8 to 4 p.m. weekdays (closed on Federal holidays); see <https://library.usgs.gov/denlib.html> for directions. Most of the material in the packet is aimed at middle to high school level students.

**Sat., Oct. 14, Dinosaur Discovery Day**, public tour day at Dinosaur Ridge, featuring **Girl Scout Day/National Fossil Day**, 10 a.m. – 2 p.m. “Girl Scouts of all levels can earn badge requirements. Girl Scout registration information will be posted as soon as the event is finalized. We’ll also be celebrating National Fossil Day with the National Park Service and many other special guests! Hands-on activities at the Visitor Center for all ages, and scientists will be along the Ridge interpreting fossils and geology for all attendees. Public welcome!” **Contact: Erin LaCount – tours@dinoridge.org**

**Sat., Oct. 14,** 8 a.m. – 5 p.m., **Bighorn Sheep Canyon Geology Bus Tour , Arkansas River between Salida & Cañon City.** Arkansas Headwaters Recreation Area (AHRA) Volunteer Geologist Bob Hickey will narrate an all-day bus tour on the geology of Bighorn Sheep Canyon between Salida and Cañon City on Saturday, October 14, 2017. The bus will depart Cañon City at 8:00 AM on US-50 and travel up the Arkansas River to the Salida East Recreation Site, then begin a slow return trip that will include a narrative description of the canyon’s unique geologic features as well as several stops where tour participants may get off the bus to view the geology up-close. A Public-Address system will be used and a printed tour-guide provided to aid in understanding.

The event, part of Fremont Fall Heritage Days, is sponsored by the Fremont County Historical Society (FCHS) with cooperation from the Arkansas Headwaters Recreation Area (AHRA) and the support of Raft Masters, who is providing the bus. Registration fee for the tour is \$40, which may be paid by check to FCHS, PO Box 965, Cañon City, CO 81215. Lunch will be available but it is priced separately. The tour is limited to 43 participants. This is a Hold the Date announcement while final arrangements are being made.

Registration information, itinerary, tour details and additional information will be available soon at <https://www.fremontheritage.com/>. Look for the Bighorn Sheep Canyon Geology Bus Tour under Events. Further information is available from FCHS and (719) 285-8284.

**Thurs., Oct. 19,** 7:00 p.m., **Colorado Scientific Society October meeting, Suzette Morman, USGS, Using Geoscience to Augment Environmental Public Health Studies,** at Shepherd of the Hills Church, 11500 W. 20<sup>th</sup> Ave., Lakewood.

**Thurs., Nov. 2,** Jaelyn Eberle (University of Colorado, Boulder), **Life at the Top of the Eocene Greenhouse World.** Denver Museum of Nature & Science Earth Science Colloquium Series; VIP Room, DMNS

**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. *[this talk had originally been scheduled for Sept. 22; data was changed]*

**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. 20<sup>th</sup> Ave., Lakewood.

**Fri., Nov. 17, Colorado Science Teachers’ Conference** (full name: Colorado Science Conference for Professional Development). Held at the Denver Mart, 451 E. 58<sup>th</sup> Ave., and sponsored by the Colorado Association of Science

Teachers (CAST) and other science educators organizations. For full info see <http://www.coloradoscienceconference.org/>

**Wed., Dec. 13, 5:30 p.m., Colorado Scientific Society Annual Meeting**, Potluck Dinner, and President's Address, by Marith Reheis. 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.

and one more item:

**Solar Eclipse Survey**

From: Joseph Kerski <jkerski@esri.com>

Date: Fri, Sep 1, 2017 at 3:41 AM

Subject: Citizen Science eclipse survey

Science Colorado Community:

A few researchers and I are working on a project about the solar eclipse on 21 August. We are looking for stories of those who witnessed the event. Feel free to fill it out and circulate it to friends who celebrated the event and to colleagues and students.

Here is the survey:

<https://survey123.arcgis.com/share/ba8c72d4b5b8496788a82a751d623eb8>

Questions? Direct them to:

Stanley D. Brunn, Ph.D., Emeritus

Department of Geography, 841 Patterson Tower, University of Kentucky. Lexington, KY 40506-0027

email: Brunn@uky.edu

Office Phone: (859) 257-6947 or 2931; Home 266-9737

Fax: (859) 257-6277

[www.uky.edu/AS/Geography/dept/brunn.htm](http://www.uky.edu/AS/Geography/dept/brunn.htm)

<http://www.uky.edu/AS/GeographyDept/brunn.htm>

Joseph Kerski

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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. \*

**Mon., Oct. 9**, Graham Young (Manitoba Museum), **Tropical fossils from the edge of the Arctic**

**Thurs., Nov. 2**, Jaelyn Eberle (University of Colorado, Boulder), **Life at the Top of the Eocene Greenhouse World**

**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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## CSS Officers for 2017

President..... Marith Reheis, 303-277-1843, marith16@gmail.com  
President Elect..... Bob Raynolds, bob.raynolds@dmns.org  
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**This is a slightly abbreviated September newsletter** to make room for the abstracts for the Student Paper talks. Some other features and reports—about our August field trip to the White River Plateau, and our “Where’s This Rock” feature, will be reported on in the next, October, newsletter.

---Pete Modreski, CSS Newsletter Editor