



## Colorado Scientific Society

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

***Thursday, January 21 meeting, 7:00 p.m. (social time 6:30)  
Shepherd of the Hills Church, 11500 W. 20<sup>th</sup> Ave., Lakewood CO  
All are Welcome! Program:***

### **Colorado's stratigraphy: eloquent testimony to Earth's history**

Robert G. Raynolds and James W. Hagadorn, Department of Earth Sciences, Denver Museum of Nature & Science, 2001 Colorado Blvd, Denver, CO 80205.

#### ABSTRACT

New tools allow more coherent presentation of Colorado's stratigraphic record. At [Coloradostratigraphy.org](http://Coloradostratigraphy.org) we have worked with the community to assemble a large amount of material on Colorado's stratigraphy, paleogeography and resource distribution patterns.

Our stratigraphic story divides Colorado into four styles of sedimentation: passive margin sequences (Larry Sloss was here), tectonic basins (subsiding basins bounded by active faulting, transpressive, compressional and extensional), a foreland sag basin, and strata accumulated during times of stasis. The few stratal successions that don't fit in these categories are unusual and of particular interest; for example Colorado's earliest sedimentary rocks are clastic dikes in the Front Range crystalline rocks. These dikes are interpreted as Neoproterozoic relicts of strata that are completely eroded today.

Times of stability are marked by healing of landscapes, peneplanation of mountains and filling of basins. Low relief (but not flat) landscapes are loci of sedimentation in absence of accommodation.

Starting in the Miocene the entire region was uplifted. Rivers draining Colorado eroded head-ward into the low relief terrain, sculpting the dramatic landscapes we enjoy today. This erosion continues to the present day.

By plotting the broad scale patterns of stratigraphy across Colorado's varied depositional basins, we have identified a variety of correlation challenges and opportunities. Improved geochronology using new techniques such as single crystal zircon chronology and isotope chemostratigraphy offers a ripe future for recognizing new patterns in old strata.

For example, the Devonian Dyer Formation of west-central Colorado is spectacularly exposed in the Glenwood Canyon area and spans one of the most enigmatic mass extinctions in earth history – the end-Devonian event. Whereas the Dyer is known for its diverse invertebrate and vertebrate assemblages, its geochronology and facies are poorly constrained. Recent chemostratigraphic analyses reveal that a regionally extensive  $\delta^{13}\text{C}_{\text{carb}}$  excursion exists in the upper member of the Dyer. This excursion is interpreted to represent the Hangenberg isotopic excursion, hypothesized to be the signature element of the end-Fammenian extinction. New biostratigraphic work in the Dyer, based largely on conodonts preserved in fish fecal pellets, supports this interpretation, and demonstrates that the upper Dyer, as well as the overlying Gilman Sandstone, were deposited during the Early Carboniferous. The extinction interval in the Dyer is immediately underlain by a firm-ground-like facies which bears abundant rugose corals. Elsewhere in the world, such fossils have been interpreted to represent Lazarus taxa that return after near-decimation at the end-Frasnian extinction. Together, these suggest that the Dyer is younger, and potentially more globally relevant, than previously thought.

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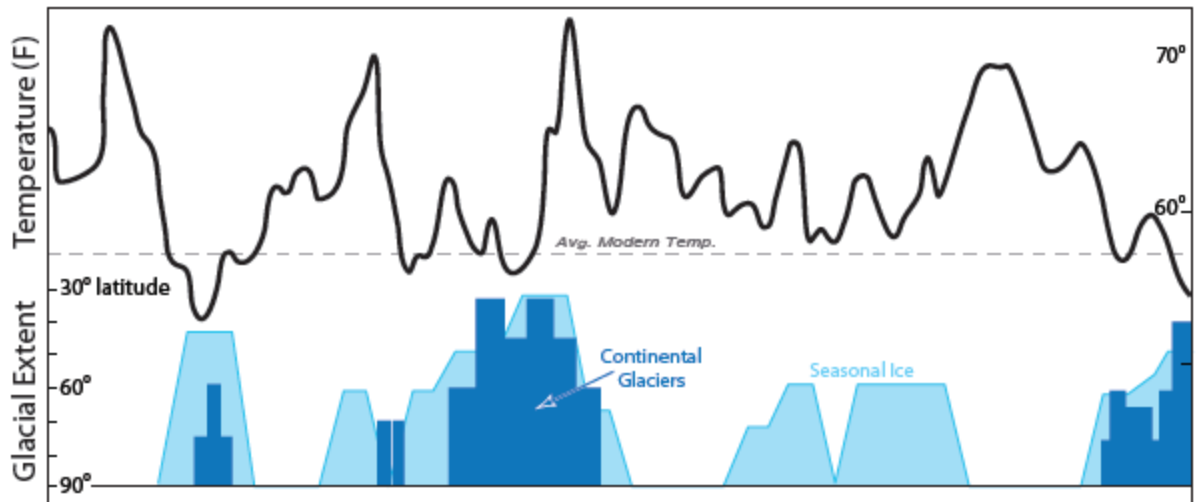
**Bob Reynolds** is a Research Associate at the Denver Museum of Nature & Science. Bob earned his Master's in Applied Earth Sciences from Stanford University and his PhD from Dartmouth College. His dissertation focused on sediments that accumulated at the foot of the Himalayas. This experience led him to study comparable rocks in the Denver Basin that record the uplift of the Laramide Front Range and contain precious groundwater. Bob has worked on the Rift Valley in East Africa and on the eastern plains of the Andes. Bob has taught as a Fulbright professor at the Center for Excellence in Geology at Peshawar University in Pakistan, at Dartmouth College, and at the Colorado School of Mines where he is currently an adjunct faculty member in the geophysics department. His recent lectures focus on the impact of climate change on Colorado's ecology and water resources of the Colorado River system.

**James Hagadorn** is currently the Tim and Kathryn Ryan Curator of Geology at the Denver Museum of Nature & Science. Everything about "deep time" fascinates him, and he has spent the last twenty years studying modern and ancient environments all over the world. Much of his research has focused on the latest part of the Precambrian (700-542 million years ago) and the early parts of the Paleozoic (542-450 million years ago), intervals of time that witnessed some of the most profound changes in environments and biota in all of earth history. Through fieldwork, labwork, and collaboration with academic and citizen scientists, he has studied ancient sedimentary environments, large volcanic deposits, weird minerals, extinct creatures, and a variety of enigmatic 'whatsits'. Although this work contributes to improving our understanding of ancient earth systems, Hagadorn is cognizant of the need to leverage our understanding of ancient earth to better understand future earths.

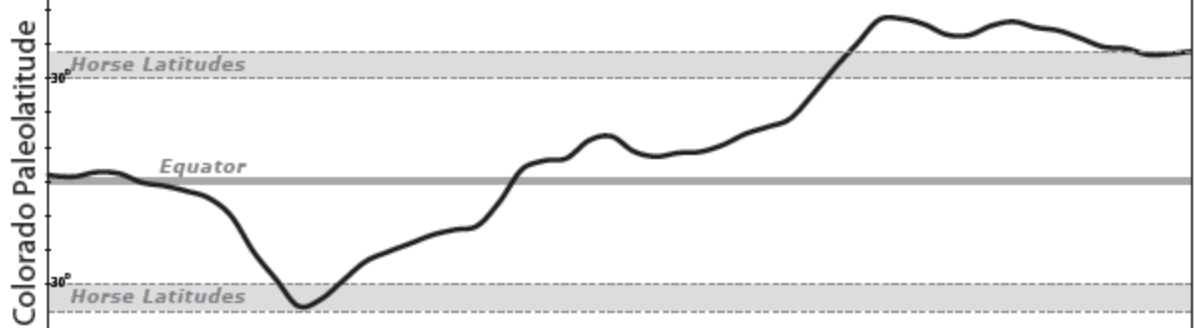
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See everything about the Colorado Stratigraphy project including the current version of their stratigraphic column and correlation diagram for Colorado online at <http://coloradostratigraphy.com/> .

**Climate**



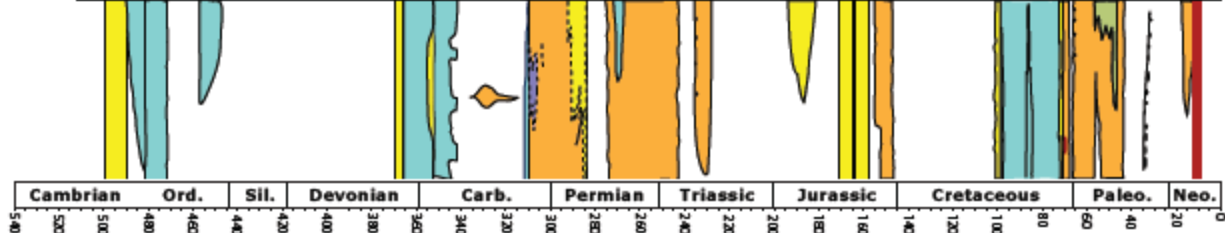
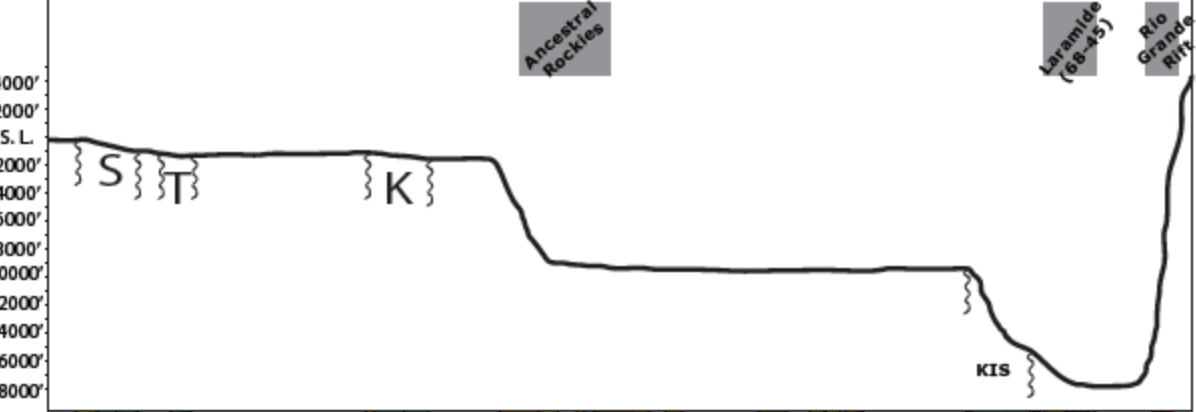
**Geography**



**Eustasy**



**Tect. Subsidence**



## ***January 2016: Incoming President's Message*** ***Peter Barkmann, Colorado Geological Survey***



The start of a new year brings the time for Colorado Scientific Society to break in a new President and several new council members. It is an honor to take on this position and I look forward to a year of rewarding service with my fellow council members, committee chairs, and the many volunteers that make this such a great organization. I welcome new Council members Marith Reheis, Melissa Foster, and Linda Barton Cronoble. I also express appreciation for continuing Council members and officers, Lisa Fisher, Don Sweetkind, Celia Greenman, Chris Morrison, Bruce Geller, and Pete Modreski. And of course, Paul Morgan is a tough act to follow now that he is Past-President! I must mention that the efforts of Cal Ruleman, Thom Fisher, Beth Simmons, Jack Krajewski, Liz Pesce, Chuck Weisenberg and Barb Warden make the Society function. We will all do our best to make this another great year. First, let me tell you a little about myself. I am a native of northern New Mexico, Santa Fe County to be specific- a child of the Rio Grande Rift, you could say. It is no wonder that I fell into geology early on in my academic career, first earning a Bachelor of Science degree from Western Washington University followed by a Master of Science degree from the University of Montana. As you can tell, I did not stray far from the mountainous west! In the years since, I have dabbled in minerals exploration, oil and gas development, geothermal energy development and even archeologic geology. Eventually, I landed in hydrogeology with a stint in the private sector doing consulting on many water resource and environmental projects. This all led me to the Colorado Geological Survey where I currently am the senior hydrogeologist leading water resource mapping projects and helping with the STATEMAP quadrangle mapping program. My first exposure to Colorado Scientific Society was in 1984 soon after moving to the Denver area when I was talked into attending a meeting by Bob Scott of the USGS. I have been a member off and on ever since, but have taken on active role only recently. I see I have really missed out!

As with any New Year, we (are supposed to) make resolutions. My personal resolution this year is to not make any resolutions I don't intend to adhere to. I will do the same as President of CSS. I will, however, resolve to carry through another year as filled with interesting programs and activities as 2015. 2015 brought us many great talks as well as a great field trip lead by Emmet Evanoff. Thom Fisher has offered to help as program committee chair, and I certainly welcome his help. We are in the process of putting together a great line-up of speakers. We have yet to pin down the Emmons lecture as well as to identify a field trip, but both take high priority.

Colorado is a great place to be active in the geosciences and 2016 is shaping up to be a year of opportunity for the Society. We are in the third year of the cycle that brings GSA back to Denver for its annual meeting. As always, this is a good time for the Society to make its presence known. Council will be considering options for our involvement in this important event. What else is in store? We might also want to consider some other activities through this year depending on member interest.

Field Trips, field trips, field trips. We all love being out in the field. CSS historically scheduled two field trips each year. Last year we had one very good one. Knowing how much effort and commitment it takes to prepare for, and organize, a single formal field trip, it may be impractical to pull off more than one organized trip this year, particularly if we commit to GSA events. I might suggest that we "go lite" and schedule some more frequent "field outings". By this, I mean opportunities to get out in a group to observe and ponder. No field logs necessary, no props needed, just time on the rocks together. For example, in a short relaxed day we could go look at the clastic dikes in the Rampart Range, or the Neogene gravel deposits along the Front Range. I am sure we can think of many more. These could be monthly and could even be family oriented. If this sounds enticing, let the Council know, we will make it happen.

In this same vein, I have had conversations with Jim Reed of Rockware and Ron Bell of Aerobic Geophysical Systems about scheduling a field methods day at a local outcrop. This would provide hands on demonstrations of new data gathering technologies. Many of you heard Jim's Field Methods Past and Present presentation in October; a day in the field with Jim would be a treat. If you are interested in helping with this let us know.

Social hours. Our monthly meetings are unparalleled for sharing well formulated scientific topics. I have heard hints that there is interest in less formal gatherings to converse and share ideas in a casual setting. (Not to mention in a place where geologists' favorite barley beverages are available). We can make that happen!

Website. I find our website quite informative and comprehensive, but it needs updating. Barb Warden and Don Sweetkind have been working on a new design in a new platform that will be more mobile accessible. I hope to see that accomplished this year. As always content is always welcome.

There, I don't think I have made a resolution I can't adhere to this year. See you all on the rocks!

---Peter Barkmann

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***Introducing – Marith Reheis, our new CSS President-Elect***

Dr. Marith Reheis is a Scientist Emeritus with the USGS, and a longtime CSS member. Her specialty is Quaternary Geology. From her USGS profession profile: "My career has evolved through bedrock and surficial mapping, soil studies, neotectonics, desert dust sampling and analysis, and paleoclimate research, to a state of mixing them all together. Currently I'm working as an Emeritus scientist on a paleoclimate project focused on the Quaternary paleohydrology of the Mojave Desert, with a combined approach using stratigraphy, dating, core analysis, and outcrop mapping. I also advise in projects examining regional eolian processes and effects on soils, vegetation, and human infrastructure, geochemical composition of eolian dust with respect to source area and activity as well as human health, and regional reconstruction of past climates, such as the Quaternary pluvial-lake history of the Great Basin."



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***Society Reports for the Year 2015 – Don Sweetkind, Treasurer***

**Colorado Scientific Society financial statement 2015**

SUMMARY: The budget table below shows shortfall for 2015 of just over \$200, which is less than that in several previous years. The shortfall will be balanced by withdrawing principal from our Endowment account. Not itemized in the revenue/expense lists below are CSS activities that are approximately revenue-neutral, including field trips and the Past-President's dinner. Also not shown is the pass-through of interest income from our Memorial Funds which is awarded as student grants.

The nearly balanced 2015 budget is due in part to the economical rent we pay for meeting space at the church, and the fact that we did not have a student night competition this fall, at which we typically give out \$600 in prize money. There are additional anticipated expenses (\$500?) for our web site redesign, which will be paid for from the Endowment Fund.

*(continued next page)*

## **Revenue**

Dues: \$20 x 122 regular, \$10 x 14 Corresponding, \$5 x 4 Student	\$2,600
2014 accrued interest, Endowment Fund	\$1,425
<b>Total revenue</b>	<b>\$4,025</b>

## **Expenses**

Meeting space (total of 8 meetings church+ \$300 AMC for Emmons)	\$900
Corporate Insurance (covers liability at meetings and on field trips)	\$727
Website costs (Hosting, \$100; monthly page updates, redesign \$570)	\$670
Emmons Honorarium	\$1000
WIPPS symposium donation	\$300
Science Fair awards (\$100, \$75, \$75 and \$50)	\$300
Newsletter expenses (stamps)	\$75
Post office box rental	\$38
State reporting fee	\$25
Treasurer – new checks	\$103
Best Paper award (engraving on plaque and mug)	\$100

**Total Expenses \$4,238**

### Nearly revenue-neutral items

	<u>Income</u>	<u>Expense</u>
Past President's Dinner	\$1,080	\$1,063
Fall field trip	\$680	\$782

## **2015 CSS Memorial Funds investment report**

The Colorado Scientific Society has investment holdings in two accounts: (1) the Memorial Fund, which is supported by the gifts of members and friends and includes the combined holdings of the Ogden Tweto Fund, the Steven Oriel Fund, the Edwin Eckel Fund, the Bill Pierce Fund, the George Snyder Fund, and the Charles Pillmore Fund; and (2) the Endowment Fund. Income generated from the Tweto, Oriel, Eckel, Pierce, and Snyder funds is provided to graduate students to support research in earth sciences through our Memorial Funds Grants program. Income generated from the Pillmore Fund supports student participation on Society field trips. The Endowment Fund is used to cover unanticipated increases in our operating expenses, fund special activities, and to balance shortfalls in our operating budget. Colorado Scientific Society investments are managed by RBC Wealth Management brokerage firm in Denver.

As of December 31, 2015, the investment portfolio of the Colorado Scientific Society totaled \$253,265, with the Memorial Funds holding \$223,532 and the Endowment Fund holding \$29,733. In 2015, Colorado Scientific Society members and friends donated a total of \$5,555 to our funds, as follows: Eckel, \$255; Endowment, \$910; Oriel, \$120; Pierce, \$45; Pillmore, \$1,300; Snyder, \$1,225; Tweto, \$1,290; general donation, \$410. Average return for the total portfolio has been between 5 and 6% over the last several years, which is respectable given our conservative investment goals that emphasize preservation of principal. Our Memorial Funds generate an income of between \$10,000 and \$12,000 per year which is distributed as student research grants.

## **2015 CSS membership report**

The Colorado Scientific Society currently has 201 members, including 132 regular, 17 corresponding, 46 honorary and 6 student members. These numbers represent all members whose memberships were current in 2014, 2015, or 2016 and do not include past members who last paid dues prior to 2014. CSS total membership has gradually declined in the past decade. In the years 2004-2008 total membership was about 300; in 2013,



membership was about 250. Largest declines have been in the regular member category. While some of the member decline may be attributed to clean-up of the member database (removal of errors and duplicate records), the general declining membership trend is real.

### **It's Time to Pay Dues for 2016!**

Membership dues for the year 2016 are now due. Thank you to those who have already paid! You will find a dues payment form in this issue of the newsletter; you will also see a reminder in the mail or email this month. Dues payments are \$20 for regular members; \$10 for corresponding members (outside the Colorado Front Range area), and \$5 for students. You may pay your dues by mailing a check to the CSS, or you can pay with a credit card using PayPal from the CSS web site; go to the "Membership" page on the CSS website, [www.coloscisoc.org](http://www.coloscisoc.org).

If you are uncertain of your member status or whether you owe dues, contact CSS Treasurer Don Sweetkind by phone at 303-236-1828 or by e-mail at [dsweetkind@usgs.gov](mailto:dsweetkind@usgs.gov)

As you renew your membership, we need – in addition to your payment – your current address, phone, and e-mail information so that we can keep our member database current. You can provide this information to us by downloading and printing a mail-in form from the "Membership" page CSS website. You may prefer submitting your information via the web. To do so, go to the "Membership" page and select "Online Membership Application Form" in the upper left part of the page. Members paying via PayPal will be taken first to this electronic form.

As you pay your dues, please consider making an additional contribution to one of our Memorial Funds (which support our student research grants program) or the Endowment Fund (which we use to defray operating costs). Your entire contribution goes towards generating interest for the grants and that your contribution is 100% tax deductible since the Society is a non-profit Section 501 (c)(3) organization. Through interest income generated by our Memorial Funds, we have awarded over \$150,000 in research grant funding to over 200 students.

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### ***December's Where is this Rock?***



I don't believe I received any responses to last month's rock quiz, though I know at least one CSS member will surely have recognized it. The rock is "Beulah marble", aka "Beulah Rose Onyx". The photo was taken on a visit to the (now much overgrown) rock quarry located on the outskirts of Beulah, Pueblo County, Colorado. Jane and I were able to visit the Beulah quarry this past October courtesy of permission from the current landowner and thanks to a local teacher who guided us to the site. The rock is famous as the beautiful and distinctive ornamental stone used in wall panels (wainscoting) in

the Colorado State Capitol (photo on the right). For a description of this rock, I will quote excerpts from Vince Matthews' "Leadville Geology" facebook blog, from August 19-29, 2015 (see all Vince's posts at <https://www.facebook.com/LeadvilleGeology>):

"The building was to be constructed entirely of Colorado native materials. NOT! Two featured dimension stones were to be Yule Marble (our State Rock) and Beulah Marble (not a marble at all). Yule Marble was to be used on the floors, in the Grand Staircase, and as wainscoting in the basement. Beulah Marble was to be used as wainscoting on the main and upper floors, and in large panels in the walls of the upper half of the Grand Staircase. Interestingly, Beulah Marble and Yule Marble are both variants of Leadville limestone.

"...the Grand Staircase in the Capitol... is NOT Yule Marble as it was supposed to be. The Capitol was the first big job that the new quarry had received. But, it was having trouble delivering. Finally, the architect went to the legislative committee overseeing the construction (in secret) and said that they could not wait any longer for the Grand Staircase. He gave them two choices: Tennessee Marble (a limestone) or Carrera Marble (from Italy). They chose the Italian marble because it was white and it was the marble Michelangelo sculpted. So, they proceeded to install the large pieces of marble in the Grand Staircase. They also began using Vermont marble for the upper floors - - all of this in secret. They were bringing the marble in by rail on the weekends and unloading it at night to try and avoid detection. But, the Denver Post got wind of this and published an exposé.

"...the Beulah Marble or Rose Onyx is not marble at all. It is from the upper part of the Leadville limestone in a quarry near Beulah, west of Pueblo at the foot of the Wet Mountains. The intricate patterns are from weathering, dissolving, fracturing, re-cementing, and staining of the limestone. The red swirls are from precipitated iron oxide (hematite) in patterns named "liesegang banding". This unit is somewhat similar to the Molas unit of the Leadville limestone in southwestern Colorado.

"They completely quarried all of the Beulah marble and did not have enough to finish the job. When they ran out of Beulah Marble, they began substituting Red Verona marble (a Jurassic limestone) from Italy. You can still purchase Red Verona for your house in Denver. The small staircases in the Capitol have a lot of the non-Colorado stone: black marble, Tennessee Marble (a brown fossiliferous limestone), Vermont marble (white), and Red Verona."

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## *Where is this Rock? – January*



This month's picture should not be too hard, so I think I should get some prompt guesses. And I will say that we are looking at an igneous dike, cutting Cretaceous shale. Write to Pete Modreski, [pmodreski@usgs.gov](mailto:pmodreski@usgs.gov) or 303-202-4766, if you think you have an answer to the "where and what".





## USGS Rocky Mountain Science Seminar Series, January-May 2016

10:30-11:30 a.m. Tuesday mornings, Building 25 Auditorium, Denver Federal Center Lakewood CO

Enter the Fed. Center at Main Gate (Gate 1) off Kipling; turn right on 2<sup>nd</sup> St., bear right on to 1<sup>st</sup> St.; proceed north through 2 stop signs, park on the left beneath the solar panels. Enter Bldg. 25 through door E-14 in the center of the building, where you will check in at a security guard station. Auditorium is just inside, on the right. All visitors are welcome to attend.

1/19/16 Kamini Singha (Colorado School of Mines) **Advances in x-ray vision: New applications of geophysics to hydrogeologic problems**

2/2/16 Katie Snell (CU Boulder) **Hot and High Times in the Western US: Paleoclimate and paleoelevation, 80 Ma to Present**

2/16/16 Seth Burgess (USGS Menlo Park) **Applications of zircon geochronology from the Pleistocene to the Permian**

3/8/16 Ved Lekic (Univ. Maryland) **Constraining Lithospheric Structure and Deformation Beneath the United States**

3/15/16 Elizabeth Miller (Stanford) Alaska tectonics, title TBA

3/22/16 Richard Allen (UC Berkeley) **ShakeAlert and beyond: Prioritizing earthquake and tsunami alerting**

4/5/16 Dave Shelly (USGS Menlo Park) **Fluids and earthquake swarms**

4/19/16 Julio Sepulveda (CU Boulder) **Ecosystem resilience to extreme climates and changing ocean chemistry: lessons from contrasting mass extinction events**

5/3/16 Seth Haines (USGS Denver) **Seismic studies of gas hydrates**

5/24/16 Sarah Brownlee (Wayne State Univ.) **Improving constraints on lower crust composition and structure using seismic anisotropy**

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## Denver Museum of Nature and Science 2016 EARTH SCIENCES COLLOQUIUM

Location: Denver Museum of Nature & Science, VIP Room, except as noted

Time: 3:00 – 4:00pm \* Museum admission not required to attend \*

Thurs., Jan. 14, **Sex in the fossil record**, Walter Joyce (University of Fribourg)

Fri., Feb. 12, **Feathering Utahraptor: The real star of Jurassic Park**, Jim Kirkland (Utah Geological Survey)  
*in RICKETSON AUDITORIUM*

Wed., Mar. 16, **Early Eocene primates and other mammals of western India**, Ken Rose (Johns Hopkins)

Fri., Mar. 25, **The beginning of the age of dinosaurs in the American west**, Randy Irmis (University of Utah)

Fri., Apr. 8, **Piecing together Patagonia's past**, Regan Dunn (University of Wyoming)

Wed., Apr. 27, **How fast do terrestrial ecosystems recover from mass devastation?**, Antoine Bercovici (Smithsonian)

Fri., May 6, **Mass extinction events using organic/isotopic geochemical tools to reconstruct changes in marine ecology**, Julio Sepulveda (CU Boulder)

Fri., Aug. 26, **Hot and high times in the western US, 80 Ma to Present**, Katie Snell (CU Boulder)

Fri., Sep. 23, **Jurassic-Cretaceous paleogeographic evolution of the Western Interior Seaway**, Ron Blakey (Colorado Plateau Geosystems), *in RICKETSON AUDITORIUM*

Thurs., Sep. 29, **Deciphering the Rocky Mountains**, Beth McMillan (University of Arkansas-Little Rock)

Tues., Nov. 8, **Exploring the Eocene forests of Colorado**, Steve Manchester (Florida Museum of Natural History)

Tues., Dec. 6, **Pterosaur paleobiology: Insights from photogrammetric ichnology**, Brent Breithaupt & Neffra Matthews (BLM)

## *Calendar of Coming Events*

**Tues., Jan. 19**, 10:30-11:30 a.m., first talk of the year in the USGS Rocky Mountain Science Seminar Series, **Advances in x-ray vision: New applications of geophysics to hydrogeologic problems**, by Kamini Singha, Colorado School of Mines. Building 25 Lecture Hall, Denver Federal Center, Lakewood. Dr. Singha's work has focused on hydrogeology and environmental geophysics in mining-impacted watersheds. Enter Main Gate on the Federal Center, off Kipling. Park in the large lot east of Building 25 (with overhead solar panels) and enter the building through door E-14, where there is a security guard's station.

**Tues., Jan. 19**, 7:00-8:30 p.m., Steps in Stone Lecture Series at the CU Museum, Boulder: **The Cretaceous West: Dinosaur Distribution and Movement on the Lost Landmass of Laramidia**, by Dr. Joseph Sertich, Curator of Vertebrate Paleontology at the Denver Museum of Nature & Science. In the Paleontology Hall at the CU Museum of Natural History, Henderson Building, 15<sup>th</sup> & Broadway, CU campus, Boulder. All are welcome, no charge; see <http://cumuseum.colorado.edu/events/64825> for more info.

**Thurs., Jan. 21**, 7:00 p.m., **Colorado Scientific Society** bimonthly meeting, "**Colorado's stratigraphy: eloquent testimony to Earth's history**", by Bob Raynolds and James Hagadorn. No charge, all are welcome; Shepherd of the Hills Presbyterian Church, 11500 W. 20<sup>th</sup> Ave., Lakewood CO.

**Sat., Jan. 23**, 10:00 a.m. – 4:00 p.m., **Family Day - Tromping Through Time with Dinosaurs, Ice Age Mammals, and More**, at the CU Museum, Boulder; "Help us say goodbye to our Steps in Stone: Walking Through Time exhibition." For kids & family, free admission; see <http://cumuseum.colorado.edu/events/64823>.

**Tues., Jan. 26**, 6:30-8:30 p.m. "**The World's Greatest Geological Wonders**" course of 36 videos has resumed Tuesday evenings (through March 1) at Mount Vernon Country Club, Aspen Room, in 2-hour sessions; the next (no meeting on Jan. 19) will be:

Session 8 – January 26

Lecture 22 Rock of Gibraltar – Catastrophic Floods

Lecture 23 Bay of Fundy – Inexorable Cycles of Tides

Lecture 24 Hawaii - Volcanic Island Beauty

The price for adults is \$5 each session, to go towards the Club's audio/visual setup charge, but children are free." For more information please contact Jim Keller, [kellerjb10@aol.com](mailto:kellerjb10@aol.com).

**Wed., Jan. 27**, 4:00 p.m., CU Geological Sciences Seminar, Boulder, "**Volcanism and Bonanza Gold of the Miocene Yellowstone Hotspot**", by Bill Hames, Auburn Univ. Benson Earth Sciences Building Auditorium (room 180). All welcome; "refreshments are served at 3:30 on the 3rd floor"

**Thurs., Feb. 4, 7**, 7:00 p.m., monthly "First Thursday" lecture sponsored by the **Friends of the Colorado School of Mines Geology Museum**. Topic and speaker(s) are still TBA, but the program *may* be about the Gold King mine wastewater spill. In Berthoud Hall, Room 240 on the CSM campus; free admission is free and all are welcome. Socializing at 6:00 p.m., program at 7:00. Check <https://www.facebook.com/LikeCSMGeoMuseum/> for updated info.

**Fri., Feb. 12**, 3:00 p.m., Earth Sciences Colloquium at the Denver Museum of Nature & Science, "**Feathering Utahraptor: The real star of Jurassic Park**", by Jim Kirkland (Utah Geological Survey). In the Ricketson Auditorium for this lecture; all are welcome, museum admission is not required.

**Sun., Feb. 21**, noon, monthly meeting of the Florissant Scientific Society, **Rock Glaciers**, by Alex Paul, at the Woodland Park Library, Woodland Park, CO. See <http://www.fss-co.org/index.html> or contact Beth Simmons for more info.

**Feb. 26-28, Denver Gem and Mineral Guild, Gem, Mineral, and Jewelry Show**, at the Jefferson County Fairgrounds, Exhibit Building. No admission charge.

**Thurs., Mar. 10**, 7:30 p.m., Friends of Mineralogy, Colorado Chapter, bimonthly meeting, at Denver Museum of Nature and Science, VIP Room. Special invited speaker, Jeff Scovil, internationally famous mineral photographer; “**The Best of Colorado Minerals**”.

**Apr. 1-3, Fort Collins Rockhounds Gem and Mineral Show**, at the McKee 4-H Building, Larimer County Fairgrounds, I-25 exit 259.

**April 7-11, California pegmatites field trip**, sponsored by the Friends of the Colorado School of Mines Geology Museum. This trip will include attendance at the annual one-day Sinkankas Gemstone Symposium sponsored by GIA; a guided tour of the Los Angeles County Natural History Museum; a tour of the GIA (Gemological Institute of America) headquarters in Carlsbad, CA; and underground visits to two or three gem pegmatite mines in San Diego County. For more information, see the Friends page at <https://www.facebook.com/LikeCSMGeoMuseum/>. You must be a Friends of the CSM Museum member to take part in the trip, but, anyone may join! There is no fee for the trip, other than your own payment of costs for the symposium registration, museum entry, and your own airfare, lodging, and meals.

**May** – Lew Kleinhans (CSS member) mentions that he has room for one more person on a **Grand Canyon geology raft trip**—similar to one held last year for CSM alumni; open to anyone who would like to fill this vacant place. Please contact Lew at [lewis.oysterclub@gmail.com](mailto:lewis.oysterclub@gmail.com) or 720-273-9233 for details about date, cost, etc.

The “**2<sup>nd</sup> Eugene E. Foord Symposium on Pegmatites**” will take place on the CSM campus, Golden, CO, July 15-19, 2016. There will be a welcoming reception, two days of oral and poster presentations, and two days of field trips to Colorado pegmatite localities. Look for further information on the Friends of the Colorado School of Mines Geology Museum page, <https://www.facebook.com/LikeCSMGeoMuseum/>. Pegmatite researchers from around the country are expected to attend, as well as local presenters. All will be welcome to attend. If you would like to receive future updates about the symposium or would like to offer to present a paper, please contact Mark Jacobson, [markivanjacobson@gmail.com](mailto:markivanjacobson@gmail.com), or Pete Modreski, [pmodreski@usgs.gov](mailto:pmodreski@usgs.gov).

#### ***Special exhibits in 2016:***

A new “**Critical Materials**” Exhibit in The Colorado School of Mines Geology Museum is now open. The exhibit highlights critical materials and rare-earth elements - including the minerals the elements can be derived from - essential to the development of advanced technology and energy. The exhibit is a joint project of the Critical Materials Institute at the School of Mines and the Colorado School of Mines Geology Museum. Mandi Hutchinson, graduate student at CSM, played a major role in planning and design of the exhibit. The exhibit focuses on the elements Li, Y, Te, Nd, Eu, Tb, Dy, their minerals, and their uses in technology. You’ll find the exhibit downstairs in the museum, near the Gift Shop.

**Steps in Stone: Walking Through Time**, at the University of Colorado Museum of Natural History, CU campus, Boulder, was open throughout 2015 and closes this month; Sun., Jan. 24 (10 a.m. – 4 p.m.) will be the **LAST** day to see this exhibit. The CU Museum, always free admission, is open 9-5 weekdays, 9-4 Saturdays, 10-4 Sunday; see <http://cumuseum.colorado.edu/>. In February, this exhibit of fossil trackways will be moving to the CU-South Denver Campus Museum\*.

\*The CU South Denver Campus Museum, Liniger Building, is now part of The Wildlife Experience, at 10035 S. Peoria St., Parker, CO. [*This all was new news to me—ed.*] “The Wildlife Experience—now part of CU South Denver—is an art and natural history museum that is home to an impressive wildlife art collection and interactive, educational displays including Globeology, Science on a Sphere and special exhibits.” Open 9:30 a.m. – 5:00 p.m. daily; there is an admission charge. See <http://southdenver.cu.edu/visit-the-museum/visitor-info/>.

**Unearthed: Ancient Life in the Boulder Valley**, at the at the University of Colorado Museum of Natural History (Henderson Building; in the Anthropology Hall), CU campus, Boulder, “This new exhibit features a collection of 80+ stone tools known as The Mahaffy Cache that was found in a Boulder backyard in 2007. The artifacts were studied by CU Boulder Professor of Archaeology Doug Bamforth, Ph.D. He dates the tools to 13,000 years ago at the end of the last ice age. The discovery of stone tools from the late Pleistocene within the city limits of Boulder is a rare event in archaeology. This is the first time the tools will be on display for the public. The exhibit includes interactive elements and video, as well as replicas of the tools that visitors can pick up and hold.” Open daily, no admission charge.

**Western Museum of Mining & Industry, Colorado Springs:** Heritage Lecture and Exhibit Opening, Thursday, February 11, 6:00 p.m. – “**Cheyenne Mountain at 50: Military Icon, Engineering Marvel**”. “Join WMMI and officials from NORAD on Thursday February 11th for a new exhibit opening and lecture series about the construction of the North American Aerospace Defense Command center in Cheyenne Mountain. Lecture details will be announced soon. Heritage Lectures at WMMI are always free. The exhibit opens at 6pm and the lecture begins at 7 pm. Free, but RSVP is required at [rsvp@wmmi.org](mailto:rsvp@wmmi.org) or 719-488-0880.

*For more lecture series during the year see:*

Colorado School of Mines, Van Tuyl Lecture Series (Tuesdays, 4 p.m.) see [http://inside.mines.edu/GE\\_Lecture-Series](http://inside.mines.edu/GE_Lecture-Series)  
CSU Dept. of Geoscience Seminars (Fridays, 4 p.m.), see <http://warnercnr.colostate.edu/geo-news-and-events/departments-seminars>

CU Geological Science Colloquium (Wednesdays, 4 p.m.) see <http://www.colorado.edu/geolsci/colloquium.htm>

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

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

Florissant Scientific Society (monthly, various Front Range locations), <http://www.fss-co.org/index.html>

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

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



**CSS Meeting Dates for 2016** (normally the 3<sup>rd</sup> Thursday of the month; subject to change if need arises)

January 21  
February 18  
March 17  
April 21  
May 19  
September 15  
October 20  
November 17  
December 15

**2015 CSS Elected Officers**

President.....Peter Barkmann, 303-384-2642, barkmann@mines.edu  
President Elect.....Marith Reheis, 3032771843, marith16@gmail.com  
Treasurer.....Don Sweetkind, 303-236-1828, dsweetkind@usgs.gov  
Secretary.....Lisa Fisher, 303-215-0480, lisa.fisher@escalantemines.com  
Past President..... Paul Morgan, 303-384-2648, morgan@mines.edu

**Councilors**

2014-2016: Celia Greenman, celia.greenman@earthlink.net  
2014-2016: Chris Morrison, chris-morrison@comcast.net  
2015-2017: Bruce Geller, bgeller@mines.edu, 303-273-3823  
2015-2017 Pete Modreski, pmodreski@usgs.com, 303-202-4766  
2016-2018: Linda Barton Cronoble, lbarton1611@gmail.com, 720-338-1237  
2016-2018: Melissa Foster, melissa.ann.foster@gmail.com, 707-498-2484

**Committee Chairpersons**

Best Student Paper Competition: Paul Morgan, 303-384-2648, morgan@mines.edu  
Database Manager: Don Sweetkind, 303-236-1828, dsweetkind@usgs.gov  
Field Trips: Cal Ruleman, 303-236-7804, cruleman@usgs.gov  
History: Beth Simmons, cloverknoll@comcast.net  
Hospitality: Jack Krajewski, gijack08@gmail.com  
Membership/Mentor: Liz Pesce, pesce.e@gmail.com  
Student Research Grants: Paul Morgan, 303-384-2648, morgan@mines.edu  
Newsletter Editor: Pete Modreski, 303-202-4766, pmodreski@aol.com or pmodreski@usgs.gov  
Outreach: Linda Barton Cronoble, 720-338-1237, lbarton1611@gmail.com  
Program: Thom Fisher, thom.fisher@esclantemines.com, 303-674-1233  
Publicity: Open  
State Science Fair: Chuck Weisenberg, 303-238-8806, cweisnbrg@msn.com  
Webmaster: Barb Warden, 303-278-2701, bwarden@tablemtn.com

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

**Colorado Scientific Society dues** are \$20 for regular members, \$10 for corresponding members (outside the Colorado Front Range area) and only \$5 for students. Mail a check to the CSS or pay with a credit card using PayPal on the CSS website. Contact CSS Treasurer Don Sweetkind at 303-236-1828 or dsweetkind@usgs.gov if you are uncertain of your dues and 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, or see our website at <http://www.coloscisoc.org/membership/dues.html>.

***Now is the time to renew your membership for 2016! Thank you!***



# Colorado Scientific Society

## Application and Membership Update Date \_\_\_\_\_ Dues and Funds Contributions

New Member \_\_\_\_\_

Renewing Member \_\_\_\_\_

\_\_\_\_\_  
(email address)

\_\_\_\_\_  
(Telephone)

\_\_\_\_\_  
(Last Name)

\_\_\_\_\_  
(First Name)

\_\_\_\_\_  
(Initial)

\_\_\_\_\_  
(Address)

The success of most Society activities depends on volunteer help. Please circle any activities for which you can provide assistance. We will pass your name on to the appropriate Committee Chairperson.

Field Trips  
Fund Raising

History  
Newsletter

Outreach  
Program/Talks

### Annual Dues (January – December)

Regular Members \$20 \_\_\_\_\_

Corresponding Members \$10 \_\_\_\_\_

Student Members \$5 \_\_\_\_\_

**Memorial Funds:** These funds support research grants to graduate students in the Earth Sciences throughout the nation. *Please note if contribution is made in the memory of an individual.*

Ogden Tweto Memorial Fund \_\_\_\_\_

Steven Oriel Memorial Fund \_\_\_\_\_

Edwin Eckel Memorial Fund \_\_\_\_\_

Bill Pierce-Heart Mountain Fund \_\_\_\_\_

George Snyder Memorial Fund \_\_\_\_\_

Chuck Pillmore Memorial Fund \_\_\_\_\_

### Endowment Fund:

This fund is used to support the Society's monthly meetings and newsletter, field trips, family night, annual Emmons Lecture, invited speaker honorarium, and special activities. \_\_\_\_\_

**TOTAL CONTRIBUTIONS (DUES AND FUNDS):** \_\_\_\_\_

Please make your checks payable to the:

Colorado Scientific Society

Send this form & your check to:

Colorado Scientific Society

P.O. Box 150495

Lakewood, CO 80215-0495

Or register and pay on-line using PayPal at:

<http://www.coloscisoc.org/membership/duespaypal.htm>