Newsletter of the Society **April 2016**

Colorado Scientific Society

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

Two special program events this month: Thursday, April 14, our annual Past Presidents' dinner meeting with a speaker, 5:30 p.m. (social time begins at 5:00) at White Fence Farm, 6263 West Jewell Ave., Lakewood CO; Program:

Tempest at Teapot Dome, Wyoming: the Greatest Political Scandal in the History of the American Oil Industry

by Matt Silverman, Exploration Manager at Robert L. Bayless, Producer

Dinner cost is $30; please make reservations by Tuesday, April 12

and

The Society's 2016 annual S.F. Emmons Lecture, Tuesday, April 26, 7:00 p.m. at the American Mountaineering Center, 710 10th St., Golden CO,

The Quest for the Only Known Natural Quasi-crystal

by Dr. Lincoln Hollister, Princeton University, Professor Emeritus.

A flier about each event is included in the newsletter

ABSTRACT

Quasicrystals are solids with forbidden symmetry. This new form of matter was first hypothesized to exist some 30 years ago, and was later found in synthetic compounds. In 2008, the first natural quasicrystal was discovered at the Mineralogy Museum in Florence. Later, we found that the sample containing the quasicrystal came to earth on a meteorite (a CV3 carbonaceous chondrite) that landed in far eastern Russia about 8000 years ago. The Russian prospector who found this sample in 1979 took us to the site in 2011 where we found more.

The metal alloys in the meteorite, including the quasicrystal icosahedrite, contain Cu, Al, and Fe. In the new samples we also found a second quasicrystal; it has10-fold symmetry (decagonite).

Except in our sample, metallic Al bearing compounds have not been found on earth or in meteorites, nor do Cu and Al occur together. We are still working to understand how these "impossible" samples formed.

New results indicate that a chunk of Cu-Al-Fe metal had impacted a carbonaceous chondrite in outer space. Oxidation-reduction reactions occurred between impactor and target, and both were quenched together, preserving the reactants and the products of the reactions. The origin of the first Cu, Al, and Fe mix remains a mystery, but it probably involved a highly reducing nebular process.

Colorado Scientific Society

All are invited to attend the Society's 2016 Annual S.F. Emmons Lecture,

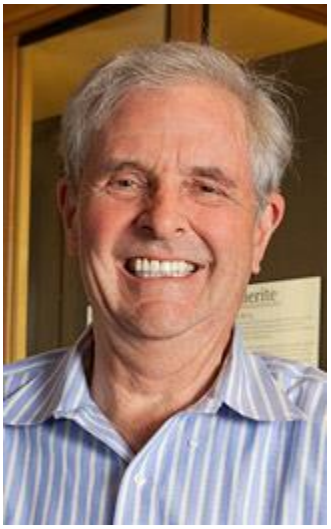
The Quest for and Origin of the Only Known Natural Quasi-Crystal

Lincoln Hollister, Professor Emeritus, Princeton University

Tuesday, April 26, 7:00 p.m.

American Mountaineering Center, auditorium, 710 10th St., Golden, CO

All welcome – no admission charge



"Quasicrystals are solids with forbidden symmetry. This new form of matter was first hypothesized to exist some 30 years ago, and was later found in synthetic compounds. In 2008, the first natural quasicrystal was discovered at the Mineralogy Museum in Florence. Later, we found that the sample containing the quasicrystal came to earth on a meteorite (a CV3 carbonaceous chondrite) that landed in far eastern Russia about 8000 years ago. The Russian prospector who found this sample in 1979 took us to the site in 2011 where we found more.

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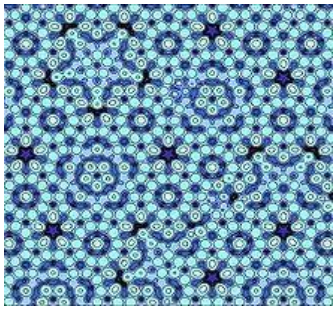
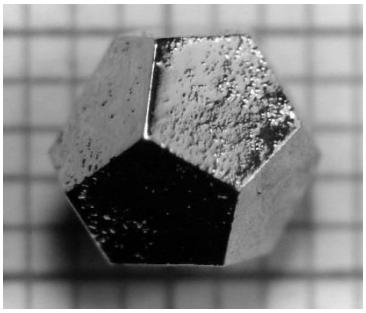
"One January afternoon five years ago, Princeton geologist Lincoln Hollister opened an email from a colleague he'd never met bearing the subject line, "Help! Help! Help!" Paul Steinhardt, a theoretical physicist and the director of Princeton's Center for Theoretical Science, wrote that he had an extraordinary rock on his hands, one that he thought was natural but whose origin and formation he could not identify. …" *(Quanta Magazine, June 2014)*

"A quasiperiodic crystal, or quasicrystal, is a structure that is ordered but not periodic. A quasicrystalline pattern can continuously fill all available space, but it lacks translational symmetry." *(Wikipedia)*





A lab-grown quasicrystal of Ho-Mg-Zn showing normally forbidden 5-fold symmetry (Wikimedia Commons)

President's message, from **Peter Barkmann,** April, 2016:
Quasi-crystals. Now there is a term you don't use often. In fact, up until a few months ago, I had never used it and didn't have a clue what it referred to. But that is all changing, as I hope it does for fellow Colorado Scientific Society members and friends. This month's Emmons Lecture should be very interesting to all. We get to learn first-hand about quasi-crystals and how a specimen of a naturally occurring mineral with quasi-crystalline form was found and how a hypothesis has evolved to how it was formed and preserved. It is a story filled with elements of traditional scientific discovery and human intrigue with a modern day international twist that is not over yet.

We earth scientists all learned early on about crystals and crystal form in mineralogy and crystallography. For some of us with the ability to think visually, this was a high point of our academic careers. To refresh, a crystal is a homogenous solid possessing long-range, three-dimensional internal order of the atoms that that form it. We memorized the seven primary crystal systems and the 32 crystal classes that fall within those primary systems. Here they are in all of their ordered glory: **isometric, hexagonal, rhombohedral*, tetragonal, orthorhombic, monoclinic and triclinic.** Close your eyes and I am sure you will start to see the axes of symmetry pop out for each of these classes (or not, for pedial). It was not hard to imagine how the arrangements of atoms could line up in all directions for ever and ever according to these classes of order and symmetry. It all seemed well-defined and "ordered."

Now I am told there can be other patterns outside of the nice, neat classes that I committed to memory 40 years ago. The science that surrounds the definition of this "new" type of structure has evolved during those years since I learned the seven crystal systems. This is forcing me to visualize something new. These "new" types of form for matter are ordered but not periodic, hence the "quasi" modifier. An example is five-fold symmetry, which works in 2 dimensions, but not in three. With a bit of mathematical wizardry the lattice can be "twisted" to form an icosahedron. The form was hypothetical, and quasi-crystalline patterns were identified in artificially produced metal alloys. Work on quasi-crystal structures won Dan Shechtman a Nobel Prize in Chemistry in 2011. But it wasn't until 2009 that an example of a naturally occurring mineral with this form was found. Icosahedrite is a mineral made up of aluminum, copper and iron found in a very isolated locale in eastern Russia. It probably came from a meteorite with a wild cosmological origin that scattered debris over frozen tundra to be preserved in anoxic muck. This month's Emmons Lecturer is by **Lincoln Hollister**, the geologist from Princeton who master-minded the geologic investigation to determine where the mineral came from and why what should be a very unstable material came to be preserved. The story of how it was found, how it may have originated, and how its occurrence still is not universally accepted is a fascinating one. The story has facets of science, facets of human curiosity and determination, and facets of doubt.

This is definitely new stuff for old minds. As scientists, we all can settle into comfortable seats of knowledge and practice. I feel I have the basics, and it works for day-to-day geology and mineral identification, which I don't get to do often enough. This, however, is a story that will push us out of that comfort zones and teach us that science is not static. There is still much to be discovered, much to learn. Join us on April 26 at the American Mountaineering Center

Peter Barkmann, CSS President

or, Trigonal, take your pick, that's a discussion in itself!---ed.

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

Thursday, April 14: our 2016 CSS Past Presidents' Dinner. White Fence Farm, 6263 West Jewell Ave., Lakewood CO. Speaker: Matt Silverman, Tempest at Teapot Dome, Wyoming: the Greatest Political Scandal in the History of the American Oil Industry

Dinner will be at 5:30 p.m. (social time beginning at 5:00). Cost of the dinner will be $30. To make reservations for the dinner, please write to Don Sweetkind, dsweetkind@usgs.gov, 303-236-1828 . You may mail a check to the CSS at P.O. Box 150495, Lakewood, CO 80215-0495 (payment in advance is appreciated) or pay at the door. Due to the restaurant's policy, we must pay for a dinner all who attend the meeting. Please make your reservations by April 12. (A great idea--if you haven't paid dues yet--take care of two things at one time, send in dues + dinner reservations together!)

If you are a member who does not drive and would appreciate a lift to the meeting, please write or call Linda or any of the our other officers and we will do our best to match you up with a ride. Likewise, if you would be willing to pick someone up for a ride to the meeting, please let Linda know. And, if you find yourself to be a member with limited financial means but would enjoy attending this dinner meeting, please contact Linda Barton, 720-338-1237, and we will discretely make some arrangement to help you out. Thank you!

If this meeting announcement reaches you too late to meet our April 12 reservation deadline but you would still like to come—please just call Don, and we are sure we will still be able to accommodate you. We'll hope to see you at the dinner!

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More upcoming CSS meetings:

May19—Stephen Mojzsis, Department of Geological Sciences, University of Colorado, Boulder; title TBA; Dr. Mojzsis' research involves ancient biospheres and the Hadean/Archean Earth

June 25—planned field trip to the Proterozoic Tava Sandstone near Woodland Park, with Christine Siddoway

August 27-28 – field trip with James Hagadorn, DMNS, Devonian strata & extinctions in western Colorado

September 15 (Student Presentation Night) —we may be meeting at a new location for Student Night

October 20— Climate Change, Part I and II: Part I, A Geologist's View (tentative title), by William W. Little, Professor of Geology, Brigham Young University-Idaho, Rexburg, Idaho; and Part II, Climate Models, Data, Predictions, and Model Uncertainty (tentative title), Thomas R. Fisher, CEO, Escalante Mines Inc. Evergreen, Colorado.

November 17— Joe Sertich, Curator of Vertebrate Paleontology, Denver Museum of Nature & Science; Title TBA; Dr. Sertich's research involves global changes and the evolution of terrestrial ecosystems during the Mesozoic

December 15—Potluck dinner, Annual Meeting, and President's Address

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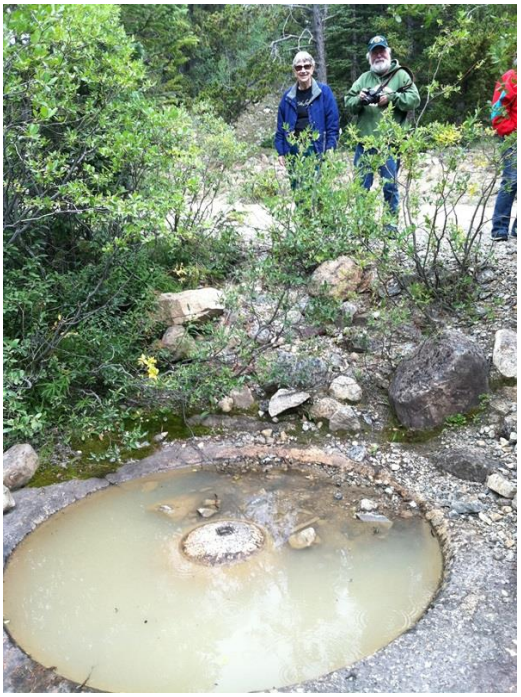
Colorado Scientific Society dues

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.

Please renew your membership for 2016 if you've not already done so!

March's Where is this Rock?

Several CSS members responded correctly to this one, including Steve Veatch and (first responder) Beth Simmons, who wrote "The arastra in the stream is along Buckskin Joe Creek just before the Paris Mill". So, it's an arrastra, an old Spanish-style pit for grinding ore, carved into the granitic bedrock along Buckskin Gulch. Park County Road 8 follows the creek from Alma to Kite Lake, passing the afore-mentioned Paris Mill and the site of the Sweet Home mine. Flat boulders would be connected to the center point with a chain and pulled around in a circle to grind the ore by horse, mule, human, or water power (I do not know what was employed at this arrastra). Often mercury would be added to recover the gold when it was gold ore that was being ground.



Here's another view of the arrastra, and one of the nearby Paris Mill.

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Where is this Rock? – April

We are going to go with another artificially-made rock structure again this month. What is it, what's it made of, and where is it? Write to Pete Modreski, pmodreski@usgs.gov , if you think you know the answer.

Calendar of Coming Events

Wed., Apr. 13, 4:00 p.m., CU Geological Sciences Seminar, Boulder, "**Geomagnetic induction hazards**", by Jeff Love, USGS, Golden, CO. Benson Earth Sciences Building Auditorium (room 180). All welcome; refreshments are served at 3:30 on the 3rd floor.

Thurs., Apr. 14, 4:00 p.m., **"Along-strike variations in the (northern) Appalachians: a model of mid-Paleozoic oceanic ridge subduction",** by Dr. Yvette Kuiper, Colorado School of Mines. Van Tuyl Lecture at Colorado School of Mines, Berthoud Hall Room 241. All are welcome to attend. See http://inside.mines.edu/GE_Lecture-Series for the full schedule.

Thurs., Apr. 14, the **Colorado Scientific Society annual Past Presidents Dinner** (to honor & introduce past presidents of the society; anyone is welcome to attend) will be held at White Fence Farm, Lakewood, CO. The speaker will be Matt Silverman, Exploration Manager at Robert L. Bayless, Producer, on **"Tempest at Teapot Dome, Wyoming: the Greatest Political Scandal in the History of the American Oil Industry".** See http://www.coloscisoc.org/ for more info.

Fri.-Sun. April 15-17, Rocky Mountain Gem and Mineral Show, to be held at Crowne Plaza DIA Convention Center Hotel, 15500 E 40th Ave., Denver, CO. 9 a.m. – 6 p.m. Fri. & Sat., 9 – 5 Sun. See http://www.rockygems.com/april-mineral-show.html for more info. Over 50 dealers. This new show is being sponsored by the Rocky Mountain Gem and Mineral Co-op, c/o Sandra Gonzales, http://www.rockygems.com/ . Saturday evening after close of the show there will be a fundraiser silent/verbal auction to benefit the CSM Geology Museum, 6 p.m. – 9 p.m. "Food and drinks—come dressed as a miner!"

Saturday, April 16, 5:00 p.m., at the monthly meeting of the Park County Historical Society, **"The Geology of South Park"**, by Pete Modreski, USGS. At Shepherd of the Rockies Lutheran Church, 106 Rosalie Road, Bailey, CO. Dinner ($8.00 charge at the door) at 5:00 p.m., presentation at about 5:30. For more information see https://www.facebook.com/ParkCountyHistorical/?fref=ts .

Sun., Apr. 17, 1:00 p.m., monthly meeting of the Florissant Scientific Society, Sunday, Jay Temple, **Changes in solar radiation and global warming**, by Jay Temple. University of Colorado at Colorado Springs (UCCS) Osborne Center, Room B215. Lunch 12:00-1:00 (BYO Potluch), presentation, 1:00-2:30. For more information or directions contact Beth Simmons, cloverknoll@comcast.net, or see http://www.fss-co.org/ .

Mon., Apr. 18, 11:30 a.m.-1:00 p.m., **Denver Mining Club** weekly luncheon meeting, "**Pegmatites, Nature's Mineral Treasure Storehouses"** by Pete Modreski, Geochemist, U. S. Geological Survey. At Golden Corral Buffet & Grill, 3677 South Santa Fe Dr., Sheridan, CO (southwest side of Santa Fe Dr. south of Hampden Ave.); all are welcome; purchase of buffet lunch is required. See www.denverminingclub.org .

Tues., Apr. 19, 10:30 a.m. USGS Rocky Mountain Science Seminar, **"Ecosystem resilience to extreme climates and changing ocean chemistry: lessons from contrasting mass extinction events"**, by Julio Sepulveda, CU Boulder. Building 25 auditorium (use entrance E-14), Denver Federal Center, Lakewood CO; visitors are welcome.

Wed., Apr. 20, 4:00 p.m., CU Geological Sciences Seminar, Boulder, "**Was the Cambrian Explosion an Artifact of True Polar Wander**?", by Joseph Kirschvink, Caltech. Benson Earth Sciences Building Auditorium (room 180). All welcome; refreshments are served at 3:30 on the 3rd floor.

Sat., Apr. 23, 9:00 a.m., an **Earth Day Field Trip** led by USGS Geologist Pete Modreski will, this time, be a **Bicycle Ride** instead of a geology hike. We will meet at Prospect Park, Wheat Ridge, CO (off W. 44th Ave.,

about ¾ mile west of Kipling St.) and ride along the Clear Creek bike path all the way east to the Creek's confluence with the South Platte River, about 12.5 miles one way. This easy-paced ride will take about 90 minutes each way. Along the route, we'll stop to see some outcrops of the Denver Formation in the bed of Clear Creek, nicely water-eroded into chutes and potholes, and we'll check out birds, flowers, rocks, and do some quick water quality tests too. Meet in Prospect Park at the parking area closest to Clear Creek (arrive there by car or bike, as you like). Bring water, a snack, and a sack to help pick up any notable trash that we see; and of course, a bicycle. For questions or if there is weather uncertainty, Pete's cell is 720-205-2553. Actual Earth Day, of course, is always April 22.

Tues., Apr. 26, 7:00 p.m., Colorado Scientific Society annual Emmons Lecture, "**The Quest for and Origin of the Only Known Natural Quasi-Crystal."**, by Lincoln Hollister, Princeton University, Professor of Geosciences, Emeritus. To be held at the American Mountaineering Center, auditorium, 710 10th St., Golden, CO. No charge and all are welcome. See http://www.coloscisoc.org/ for more info.

Sat.-Sun., Apr. 30-May 1, Colorado School of Mines Geology Museum, Rock, Mineral, Book, and Map "Garage Sale", 9 a.m. – 4 p.m. each day, at the CSM Geology Museum, 13th and Maple Streets, Golden CO.

Sat., May 7, 11:00 a.m. – 2:45 p.m., **Colorado Mineral Society Silent Auction**, Holy Shepherd Lutheran Church, 920 Kipling St., Lakewood CO. For more information see http://www.coloradomineralsociety.org/ .

Thurs., May 12, 7:30 p.m., **Friends of Mineralogy, Colorado Chapter**, bimonthly meeting, "**Geology and Mineral Deposits of the Upper Peninsula, Michigan"**, by James Cappa, Conifer, CO, retired from the Colorado Geological Survey. At the Denver Museum of Nature & Science, VIP Room.

Sat., May 14, Friends of Mineralogy, Colorado Chapter, Silent Auction. Clements Community Center, 1580 Yarrow St., Lakewood CO, 12:00-3:00 (setup begins at 10:30 a.m., auction begins at 12:00, verbal auction 1:00, checkout begins at 3:00 p.m.).

Sun., May 22, monthly meeting of the Florissant Scientific Society, meeting this day at the **Pueblo Weisbrod Aircraft Museum** (east of Pueblo at I-25 exit 101). Cort Hayden speaking
The May meeting will be at the Pueblo Weisbrod Aircraft Museum. "Museum hours are 10:00 to 4:00. At noon, we will converge on the meeting room behind the front desk for the talk and lunch. Lunch will be provided. Presentation will by Howard "Cork" Hayden, author of "A Primer on CO2 and Climate, and Bass Ackwards: How Climate Alarmists Confuse Cause with Effect". For more information or directions contact Beth Simmons, cloverknoll@comcast.net, or see http://www.fss-co.org/ .

Coming up during the summer:
Sun., June 26, "Vince Matthews will lead a field trip to the Laramide fold structures along the northeastern flank of the Front Range uplift". This geology field trip will take place through the informal geology group, the Florissant Scientific Society; see http://www.fss-co.org/page3.html for details about this and the group's other planned meetings and field trips. This trip will leave at 7:30 a.m. from a Park-and-Ride along I-25 at the north end of Denver, and return at 6:30 p.m.

July 15-19, the "**2nd Eugene E. Foord Symposium on Pegmatites, Golden Colorado**" will take place on the CSM campus. There will be a welcoming reception, two days of oral and poster presentations, and two days of field trips to Colorado pegmatite localities. For further information and registration forms see http://www.colorado.edu/symposium/pegmatite/ . Pegmatite researchers from around the country and internationally are expected to attend, as well as local presenters. All interested persons are welcome.

July 28-31, **Petroleum History Institute, Annual Symposium, "Casper, Wyoming, the Oil City".** For more information see www.petroleumhistory.org .

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.

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 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: a new temporary exhibit opened in February, **"Cheyenne Mountain at 50: Military Icon, Engineering Marvel".** See http://www.wmmi.org ./

For more lecture series during the year see:
CU Geological Science Colloquium (Wednesdays, 4 p.m.) see http://www.colorado.edu/geolsci/colloquium.htm
CSU Dept. of Geoscience Seminars (Fridays, 4 p.m.), see http://warnercnr.colostate.edu/geo-news-and-events/department-seminars
Van Tuyl Lecture Series, Colorado School of Mines, (Tuesdays, 4 p.m.): http://inside.mines.edu/GE_Lecture-Series
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/ .

2016 CSS Elected Officers

President…….Peter Barkmann, 303-384-2642, barkmann@mines.edu
President Elect……Marith Reheis, 303-277-1843, marith16@gmail.com
Past President……. Paul Morgan, 303-384-2648, morgan@mines.edu
Secretary…….Lisa Fisher, 303-215-0480, lisa.fisher@alumni.mines.edu
Treasurer…….Don Sweetkind, 303-236-1828, dsweetkind@usgs.gov

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

Database Manager: Don Sweetkind, 303-236-1828, dsweetkind@usgs.gov
Field Trip Chair: Cal Ruleman, 303-236-7804, cruleman@usgs.gov
GSA Meeting Co-chairs, Lisa Fisher & Libby Prueher
History Chair: Beth Simmons, cloverknoll@comcast.net
Hospitality Chair: Linda Barton Cronoble, 720-338-1237, lbarton1611@gmail.com
Membership Chair: open
Newsletter Editor: Pete Modreski, 303-202-4766, pmodreski@aol.com or pmodreski@usgs.gov
Outreach Chair: open
Past Presidents' Best Paper Award, Marith Reheis, 303-277-1843, marith16@gmail.com
Program Chair: Thom Fisher, thom.fisher@esclantemines.com, 303-674-1233
Publicity Chair: open
State Science Fair: Chuck Weisenberg, 303-238-8806, cweisnbrg@msn.com
Student Programs Chair: Melissa Foster, Melissa Foster, melissa.ann.foster@gmail.com, 707-498-2484
Student Research Grants Chair: Paul Morgan, 303-384-2648, morgan@mines.edu
Webmaster: Barb Warden, 303-278-2701, bwarden@tablemtn.com

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http://www.coloscisoc.org