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Colorado Springs
Mineralogical Society
Founded in 1936

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PICK&PACK

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CSMS General Meeting

Thursday, June 16th 7:00 PM

Guest Speaker: Phil Persson

Topic: Rare Earth Minerals of the Pike's Peak Batholith

Refreshments provided by the Fossil Group

Show Update

Pikes Peak Gem Mineral & Jewelry Show June 3-5 2016

Chairpersons Kim & Bodie Packham - runninboar@hotmail.com

Volunteers: Needed for set up on Thursday June 2nd at 9AM and final tear down Sunday around 4pm. Volunteers for CSMS Hospitality Booth and general backup/relief tasks as needed throughout show. CSMS aprons will be handed out during the show to designate volunteers and then will be available for sale afterwards.

Silent Auction: Please donate specimens! Funds go towards the annual scholarship program! Please contact "Yam" Yamiolkoski with questions : yamofthewest@gmail.com or (719) 351-5548

Vendor & Members potluck dinner: Saturday evening around 5:30. Buns, Roast Beef & Angus provided by **Arby's** (Thank you **Brenda Perkins!!!**) . **Merit Co Inc Real Estate** also donated funds to sponsor any other necessities. All members please bring side dishes or make arrangements with Norma to drop them off. **Norma Rhodes** is coordinating the dinner. Please email csmseditor@hotmail.com or call 719-229-5379 with questions. Thank you **Georgia Woodworth** for volunteering to help with the dinner!! Any other help with clean up and set up will be greatly appreciated.

Club member **Bob Landgraf** rmlwp74@aol.com or 719-685-1364 is coordinating the displays and has made arrangements for others displays, booths and demonstrations!! Thank you Bob for all of your time and efforts!

Pebble Pups: **Steve Veatch, Pebble Pups, and Earth Scholars** will be at the show with presentations and hands on activities for children.

CSMS Calendar

April & May 2016

Tue., **June 7 & July 5**—**Fossil Group**, 7 p.m., Senior Center. Joyce Price (719) 593-8245

Thu., **TBD due to show & July 7**—**Board Meeting**, 7 p.m., Senior Center.

Tue., **No meeting until July 12**—**Micromounts**, 7 p.m., Senior Center. Dave Olsen, 719 495-8720

Thu., **No meetings until Sept.**—**Pebble Pups & Juniors**, Senior Center. Steven Veatch, 719 748-5010

Thu., **June 16 & July 21**—**General Assembly**, 7 p.m., Senior Center

Thu., **No meetings until Sept.**—**Crystal Group**, 7 p.m., Senior Center. Kevin Witte, 719 638-7919

Thu., **No meetings until Sept.**—**Faceting Group**, 7 p.m., Senior Center. Doreen Schmidt, (719) 577-4165

Appointment Only—**Jewelry Group**, Bill Arnson, 719 337-8070

Appointment Only—**Lapidary Group**, Sharon Holte, 719 217-5683

The Senior Center is located at **1514 North Hancock** in Colorado Springs. For more information on any of the sub-groups, meetings, and other CSMS valuable information, go to our website, csms-web.org

Other Events of Interest to CSMS Members Submitted by Pete Madreski

Thurs., June 2, 7:00 p.m., “**Ancient Wyoming with Kirk Johnson**”, special lecture at the Denver Museum of Nature and Science. “Our former chief curator, Kirk Johnson, returns to share his newest book that brings another ancient world to life. Johnson, now Sant Director of the Smithsonian National Museum of Natural History, and Jan Vriesen, world-renowned painter and muralist, joined forces to create Ancient Wyoming. Ever wondered what the ground below you was like millions of years ago? Merging paleontology, geology, and artistry, Ancient Wyoming breathes life into scenes of Wyoming’s changing landscape of vast oceans, lush rainforests, and mountain prairies and provides fascinating details on the flora and fauna of the past 300 million years. Johnson and Vriesen also collaborated on the Ancient Denvers mural project and book. Following the program, join us for a reception and see two of the original Ancient Wyoming murals, pulled especially from our collections for this event. Phipps Theater. For reservations go to <http://www.dmns.org/calendar> ; cost, \$12 member, \$15 nonmember

Fri.-Sun., June 3-5, **53rd annual Pikes Peak Gem, Mineral, and Jewelry Show**, sponsored by the Colorado Springs Mineralogical Society; at a new (indoor!) location, the Mortgage Solutions Financial Expo Center, “a community partnership between the University of Colorado—Colorado Springs (UCCS) and the Housing & Building Association of Colorado Springs (HBA)”, 3650 N. Nevada Ave., Colorado Springs. 10 a.m. – 5 p.m. Fri. & Sat., 10 – 4 Sun. See www.csms-web.org, email runningboard@hotmail.com .

June 09-12, **Fairplay Contin-Tail rock & mineral show**, Fairplay, CO; see www.facebook.com/ContinTail

June 17-19, **Victor, CO Gem and Mineral Show**, Victor, CO; see <http://victorcolorado.com>

Sat., June 18, **GEOdyssey’s annual home rock sale**, 9 a.m. – 3 p.m., 15339 West Ellsworth Drive, Golden, CO 80401 (ph: 303-279-5504). “Help us reduce our inventory at our annual mineral and fossil “garage sale”. Lots of new mineral and fossil specimens from around the world, including some from Namibia, China, Mexico, a selection of vertebrate fossils, and large fossil fish. Bigger price reductions this year, so all specimens are a minimum of 20% off, with larger discounts for volume purchases. We’ll have many new specimens priced at 50% off. Directions: from West 6th Avenue, exit onto Indiana Street and go south on Indiana. Drive into Mesa View Estates. Turn right at the first street (McIntyre Circle) and right at the next street (Ellsworth Drive). We are about midway down the street on the left.”

July 15-17, **WMMI Museum EXPO and Anniversary Celebration**, Colorado Springs, 225 North Gate Blvd ,COS, CO 80921 719/488-0880 www.wmmi.org

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. See full registration information at <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 invited to attend; talks will cover a mixture of scientific research and general descriptive topics. Field Trip information: http://www.colorado.edu/symposium/pegmatite/sites/default/files/attached-files/2016_field_trips.pdf

WANDERING TO WICHITA: REPORT OF THE 2016 RMFMS ANNUAL CONVENTION

Mike Nelson csrockguy@yahoo.com

The annual convention of the Rocky Mountain Federation of Mineralogical Societies (April 22, 23, 24 2016) was hosted by the Wichita Gem and Mineral Society at their 62nd Annual Show. Thursday the 22nd was designated as “student day” and over 600 students “field tripped” to the Show and were treated to a variety of student-orientated activities. I was quite impressed with the sheer numbers of children attending the three-day show and their fascination with the “touch & feel,” “rock pile,” “gem wheel,” and “grab bags.” What a tremendous way to help create future rockhounds. I also noticed that several dealers had colorful specimens priced so that children could afford to purchase their “very own” mineral or fossil.



The gem wheel was busy with lines of children during the entire show.

In wandering to Wichita, I wanted to stay away from the Interstate System, especially I-70 from Limon, Colorado, on east to Hays, Kansas. It seems as though I have traveled that stretch a thousand times; therefore, I often just wander through the countryside. On this trip I traveled south from Colorado Springs to Pueblo on I-25 on the far western reaches of the Colorado

Piedmont Physiographic Province (mostly through the Pierre Shale). At Pueblo I picked up U.S. 50 and the Arkansas River and headed east to Kansas. The entire ride to the boundary of my home state was in the lowlands where the Arkansas River has excavated a major channel through the Cretaceous Rocks of the Colorado Piedmont.

The Arkansas River in Colorado is an amazing and diverse river. Heading near Leadville between the Sawatch and Mosquito ranges the stream flows south in the Rio Grande Rift Zone, an extensional feature (spreading) extending from Mexico through west Texas, central New Mexico, into the San Luis Valley of Colorado and finally north to Leadville and beyond. However, near Salida the River abruptly turns east cutting major canyons, such as the Royal Gorge, before emerging near Pueblo. What happened? As I understand the situation, the Arkansas once continued south flowing into, and through, the San Luis Valley (in the Rift Zone). But, a major extrusive eruption of volcanic rocks blocked the river south of Salida and forced the stream to flow east. Fascinating!

At the state line I continued along U.S 50 and the River in what Kansas calls the Arkansas River Lowlands where the excavation has been in the Tertiary and Cretaceous rocks of the High Plains Physiographic Province. About four miles into Kansas I was greeted by flashing red lights and first thought Wichita Gem and Mineral Society had sent a welcoming committee. Alas, it was just a friendly member of the Kansas Highway Patrol questioning my need for speed in heading to Wichita!

The River flows east through Garden City and Dodge City and then does a “strange” thing---it makes a large turn to the northeast, the “Great Bend” of the Arkansas River.” This feature was noted by Europeans as early as 1541 when that Spanish treasure hunter, Francisco Vázquez de Coronado y Luján, tromped through the area. After traveling about 70 miles to the northeast, the River does a “strange” thing and turns back to the southeast and heads 70 miles to Wichita. There it flows south into Oklahoma and ultimately east to its final destination, the Mississippi River in southeastern Arkansas. At 1469 miles, the River is the 6th longest in the U.S. As for the “Great Bend,” I was unable to find a concrete answer as to “why.” In my graduate school days, many years ago, we speculated that some sort of feature in the basement Precambrian rocks was responsible for the Bend. I suppose that may be as good an answer as any!

Welcome to the Show



(Continued on page 4)

In cutting across the “Great Bend” of the River I traveled on U.S 54 across some nondescript parts of the High Plains including loess deposits, lowlands of the Ninnescah River, sand dunes, and a few Permian redbeds before reaching the lowlands of the Arkansas. And finally, growing up in Kansas we knew the river as the ar-KAN-zes. Later in life I learned the rest of the world called it the AR-kan-saw!



A couple of nice cases.



Most official activities of the Federation were held on Saturday and started with the Editors/Webmasters Breakfast at 8:00 am. **Under the leadership of *Pick & Pack* 2015 Editor Lisa Kinder, members of the CSMS garnered a number of awards led by Jack Shimon and his First Place in Junior Articles Under 12 for *Radio Waves Powered Radio*. Other awardees were: Steven Marquez, 3rd Place Junior Articles 12-17 *Guide to Amazonite*; Kevin Witte, 2nd Place Adult Articles- *Summer's Swan Song Pocket and the Big Kahuna*; Mike Nelson, 3rd Place Written Features -*Field Trip Report: Trout Creek Pegmatite*; Mike Nelson, 2nd Place Special Publications- *Paleontological Resources Preservation***

Late Saturday morning I presented a talk to a variety of show attendees entitled: *Geology and Physiography of Kansas; Collecting Minerals and Fossils*. On Sunday afternoon Ron Wooley, an opal miner, talked about his experiences collecting opals in Australia.

The House of Delegates Meeting occupied much of Saturday afternoon and was fairly routine. A large number of Federation clubs sent delegates, something like 35. President Matt Charsky represented the American Federation of Mineralogical Societies and offered greetings from the Federation office. President Jaeger (RMFMS) noted that a large number of members (many committee chairs) are serving the Federation for the first time. Secretary Thomas received reports from 40 committee chairs and officers, possibly a record! Treasurer Maggard reported the Federation ended FY 2014-15 with 78 member clubs and a total membership of 9,014 members—an increase of 623 members over FY 2013-14. The Federation added one new club, the Daisy Mountain Rock and Mineral Club of Anthem, Arizona (northern suburb of Phoenix). In FY 2015-16 the Federation also added the Apache Junction Rock and Gem Club (eastern Phoenix suburb), and its 230 members. The Federation has lost the Arizona Leaverites Club (Phoenix) and the Chanute Gem and Mineral Society (Kansas). However, for this FY the Federation has gained over 700 new members! In addition, the RMFMS donated \$1,764 to the American Federation scholarship fund.

The Long Range Planning Committee submitted “tens of pages” of revisions and updates to the Federation’s Operating Procedures. This project started three years ago when I chaired a small committee (with Betty Cain) to offer suggestions and we turned in our report two years ago at the Tulsa meeting. The Committee’s report was accepted by the Delegates.

New Federation officers elected by the Delegates included: President: Beth Simmons (Denver). Vice President: Liz Thomas (Tulsa), Secretary: Wayne Cox (northwest Arkansas), Treasurer: Gene Maggard (Wichita)

The Delegates offered a round of applause to Alice LaBonte for her editorial leadership of the Federation Newsletter. And, after a number of other rather ordinary reports, President Jaeger noted the upcoming banquet and the Sunday morning PLAC meeting and then adjourned the convocation.

(Continued on page 5)

The Saturday night banquet had some fairly tasty food, compared to most other hotel food events that I have attended! However, the highlight of the evening was the introduction of Dr. Forest Sawyer, the winner of the AFMS-sponsored scholarship for 2016. Dr. Sawyer teaches at the South Dakota School of Mines and Technology in Rapid City and will use his award to fund two, \$4000 scholarships for Tech graduate students. I found it sort of serendipitous that Dr. Sawyer's dissertation advisor is a very good friend of mine, and a member of his graduate committee was my graduate school roommate. Sometimes it seems like a small world!

On Sunday morning I convened a meeting of the Public Lands Access Committee (PLAC) chairs and interested visitors. Major discussions centered on: 1) USFS and BLM rules on collecting invertebrate fossils; 2) the creation of many new Wilderness Study Areas (WSA) and Wilderness Areas (WA); and 3) the road closures on large tracts of USFS land.

As the PLAC Chair for the last year, my major interest has been the implementation of new USFS collecting regulations for invertebrate fossils. Although I disagree with many of the individual regulations, it behooves Federation members to try and work with their local USFS leaders. Keep in contact with the local offices, and "know" the regulations.

The future, maybe within the next year, will bring draft collecting rules and regulations from the Bureau of Land Management (BLM). PLAC state directors will need to muster club members to take action (individual letters and comments) if BLM draft regulations are as strict as the USFS rules. The drafts will be published in the Federal Register and I will try and monitor such in order to notify state directors.

Other states, especially New Mexico and Wyoming, also have a variety of problems associated with road closures and proposed WSA/WA. Their directors are working hard to try and ameliorate the situations.

In summary, the Wichita club had a great show and thousands of people attended. Show Chair Gene Maggard (and I am certain assisted by spouse Peggy) rounded up an amazing number of Show workers and is to be congratulated. Pat and Mary Clough constructed Delegate gift bags and table favors that were quite unique and impressive and will be remembered by recipients for many years. President Jaeger and his officers have pulled the Federation out of the doldrums and a major slump and we now have a bright future.



I was curious about a gold prospecting club in Kansas so stopped in for a visit. Where do you collect gold in Kansas? Why right in downtown Wichita! See photo below.



Update on the 2nd Eugene E. Foord Pegmatite Symposium, July 15-19, 2016



The full registration information for the Symposium is now online at the symposium website, <http://www.colorado.edu/symposium/pegmatite/>.

Our current schedule of presentations at the symposium includes 27 oral talks and 13 poster presentations. There will be a wide variety of talks, ranging from description of pegmatite mineral occurrences to state-of-the-art research on the nature of pegmatites. Shortly, we'll be posting a full list of all the speakers & their presentations.

Conference registration is \$100, and half-price \$50 for full-time students. A Saturday evening banquet at the Table Mountain Inn, in Golden will cost

\$40. If you choose to attend the banquet, please note that there is now an option to select your choice of dinners: (1) Southwest Pasta Primavera; (2) Southwest Pasta Primavera with Grilled Chicken; (3) Pan-seared Salmon; (4) Buffalo Pot Roast. The banquet will be a social event; there will not be any formal speaker. All attendees and spouses are invited to attend the welcoming reception Friday evening at the CSM Museum. Other options that you can select on our registration page include low-cost dormitory housing (\$37 or \$43) on the CSM campus available for up to 5 nights (through all the field trips if desired); breakfast at the Mines Market cafeteria (\$8.50) for those staying on-campus; lunch at Mines Market (\$10; we recommend this for all participants unless they plan to bring their own lunch, to save time vs. walking to a restaurant in town); and box lunches (\$10) for the field trips. When registering be sure to select your preferred choices for the two days of field trips—mark your preferences from 1st to 5th choice, and we will do our best to assign everyone their top choices (it has not yet been determined which trips will take place on which days, and a few trips of the 13 offered may have to be dropped if there are not enough sign-ups for them or for other logistic reasons). Please notice that there is a page giving full detailed descriptions of each field trip on the Field Trips website page, via a clickable link to http://www.colorado.edu/symposium/pegmatite/sites/default/files/attached-files/2016_field_trips.pdf

If you have any questions about registration or symposium events please feel free to contact Mark Jacobson, markivanjacobson@gmail.com, or Pete Modreski, pmodreski@aol.com.

Just for a little "who's who", here are two photos from the PEG2015 symposium in Książ, Poland, with a few of the pegmatite scientists who will be speaking at our symposium in Colorado, shown relaxing here and, of course, doing what they all do best when not examining pegmatites and their minerals, enjoying some local beer! Those pictured include Al Falster (Maine Mineral and Gem Museum), Mona Sirbescu (Central Michigan University), William B. "Skip" Simmons (Univ. of New Orleans & Maine Mineral and Gem Museum), Dave London (Univ. of Oklahoma), Bob Martin (McGill University, Québec), and Luis Sánchez-Muñoz (Madrid, Spain). Other presenters will be coming from Brazil, Czech Republic, Ireland, Norway, and Sweden. Skip Simmons and Dave London will be two of the keynote speakers at the symposium; another will be Mike Wise of the Smithsonian Institution/U.S. National Museum.



PEBBLE PUPS CORNER



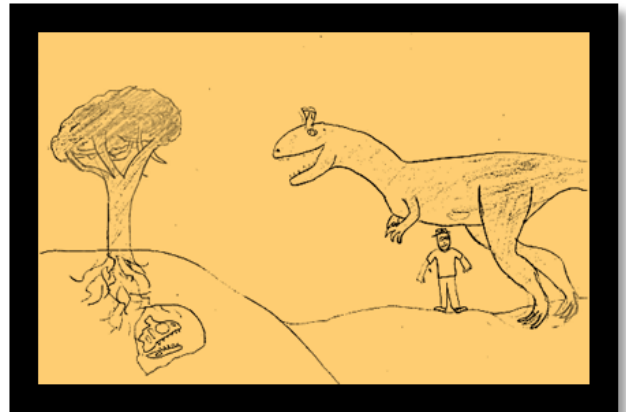
Cryolophosaurus

By Blake Reher

Deep in the frozen ground in desolate Antarctica,
Waits a fossil to be exposed by man or raging storm.
This cunning theropod was an age-old predator
Who fought to survive in a world filled with danger.
Hatched from an egg in the imposing Jurassic world,
Standing on two legs, running fast, and crowned with a regal crest—
This creature lived and reigned 183 million years ago:
Its name was *Cryolophosaurus*, a majestic dinosaur.
Found in an ice-covered tomb in Antarctica.



About the author: Blake Reher is the program assistant for the Colorado Springs Mineralogical Society Pebble Pups. He is also a volunteer ranger with the Florissant Fossil Beds National Monument. He attends high school in Colorado Springs. He is 16.



Mammoth

My body completely furry
To protect me from the flurry.
The flakes dance about my face
As the cold gives me a freezing embrace.
The cold, although it may be bold,
Tells me the stories of the old.
The quiet whistling of the wind
Unveils the mysteries deep within.

Jenna Salvat

January 12, 2016



2016 CSMS Officers Present at Meeting

Jean Luce, President	X
Lisa Kinder, Vice President	X
Ronald "Yam" Yamiolkoski, Secretary	X
Ann Proctor, Treasurer	X
Norma Rhodes, Editor	X
Sharon Holte, Membership Secretary	X
Doreen Schmidt, Member-at-Large	X
Ariel Dickens, Member-at-Large	X
Mark Lemesany, Past President	

2016 CSMS Chairpersons

Kim & Bodie Packham, Show Chairs
Sharon Holte, Field Trip Director
TBD, Science Fair Chair
Frank & Ellie Rosenberg, Librarians
TBD, Social Committee Chair
Ann Proctor, Store Keeper
Jackson Peirce, Webmaster

Sub-Group Responsibilities for Refreshments for General

May	June	July
Aug. No Meeting	Sept. Lapidary	Oct. Micromount
Nov. Board	December Christmas Party	

SECRETARY'S SPOT

by Ronald "Yam" Yamiolkoski

General Meeting Minutes of the Colorado
Springs Mineralogical Society
June 16, 2016

Special Guests: Dr. Bob Carnein - LGGMC, Blake Reher- CSMS ESS, and Casey Martin—CSMS ESS

The meeting was officially called to order by Jean Luce, President at 7:08 PM. Eight of the nine officers were present.

Jean Luce took time for the introduction of new members and guests. It should be noted that we had a packed house for this meeting.

Jean Luce introduced our speaker, Dr. Bob Carnein a member of the Lake George Gem & Mineral Club who among other things is responsible for their excellent monthly newsletter. Bob's topic for the evening was "Pyrite: It's more than just 'Fools' Gold". Besides showing a number of slides showing the various crystalline structures of pyrite and explaining how it is different from marcasite, Bob delved into the importance of pyrite, what its role is in the creation and discovery of other metals, in how it has been used, and the problems associated with it.

Steven Veatch gave a brief update on the activities of our Pebble Pups and Earth Science Scholars. Blake Reher will be having an article published in the magazine "Deposits". This will be the second time for Blake. Steve also said that some of the Pebble Pups would be helping out at the School of Mines. He said that they would be at the Show on Friday, Saturday and Sunday.

Steve also mentioned that the Western Interior Paleontological Society (WIPS) will be having its Founders Symposium in March of 2017. The general topic will be the paleontology of the Jurassic Morrison Formation.

Lastly, Steve reminded everyone that he always needs material for his PP/ES. He gives these rocks, minerals and fossils to the kids for their collections and sometimes uses them as the focus of a research project.

Because of time constraints, Jean Luce did not introduce all of the Group Leaders present, but did a quick overview. **SEE PICK & PACK FOR MORE INFORMATION ON CSMS GROUPS.**

Jean Luce introduced Kim Bodie, Show Chair who provided an update on our upcoming show in June. She reported that we had 55 dealers. General setup will be at 9:00 AM on Thursday, June 2nd at the Mortgage Solutions Finance Center on N. Academy. Volunteers are needed for the setup of tables and chairs, club activity areas, signage and security during setup. We also need volunteers for the Silent Auction and for the ticket booth during the show. Kim had signup sheets for the various jobs and urged people to sign-up. The club bought aprons for volunteers to wear and we are looking for the gold T-shirts that we used in the past for security volunteers. Kim said that she has flyers for hand out. There will be some yard signs put out during the show in addition to a large banner at the site. Kim also mentioned that we will be having our annual show Pot Luck on Saturday night and that there have been donations of meat (Arby's) and money from Norma's company to purchase meat and other items. Kim stressed that we will need salads & deserts to be donated by members to fill out the Pot Luck menu.

Jean Luce recognized Marilyn Hanlon and Mike Nelson for representing us at the Rocky Mountain Federation annual show. Mike will have a report in the June Pick & Pack. Jean Luce drew some names for the door prizes that were available until time got in the way.

The meeting was adjourned at 8:46 PM.

Pyrite: It's More Than Just "Fools' Gold"

by Bob Carnein

Of all the sulfide minerals you're likely to encounter, pyrite (FeS_2) is by far the most common. It occurs in all three basic classes of rocks, as well as being a common constituent of hydrothermal ("hot water") mineral deposits, where it's often found with other sulfides. Examples include galena (PbS), sphalerite (ZnS), and chalcopyrite (CuFeS_2), as well as more exotic minerals, such as molybdenite (MoS_2), tetrahedrite ($\text{Cu}_{12}\text{Sb}_4\text{S}_{13}$), and a large variety of other important ore minerals.

Pyrite bears a superficial resemblance to gold. Its brassy yellow color and metallic luster resemble those of some naturally occurring gold-silver alloys (e.g. electrum). Its specific gravity, at 5.02, is just high enough to make it noticeably heavier than most other common minerals. (For comparison, quartz is 2.65; gold is 15 to 19.) As a result, some inexperienced and overly optimistic prospectors have been known to collect bags full of it, thinking they had struck it rich. Hence the nickname "fools' gold".

Most collectors view pyrite as a common mineral that sometimes occurs as attractive specimens, but is otherwise of little consequence. Crystals, which are isometric ("cubic"), can be large and impressive and may show a number of simple or combined forms. The most familiar include cubes, octahedrons, and pyritohedrons (aka pentagonal dodecahedrons) (see Figs. 1, 2, and 3). Nearly every mineral show includes

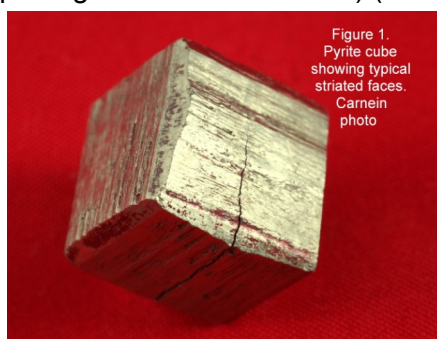


Figure 1.
Pyrite cube
showing typical
striated faces.
Carnein
photo

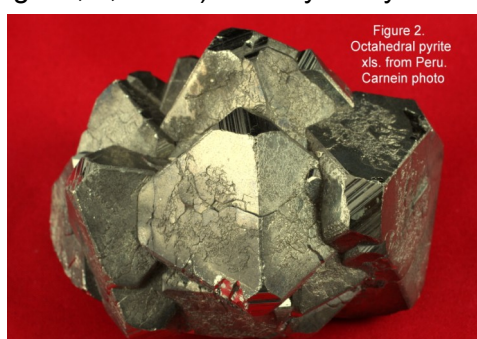


Figure 2
Octahedral pyrite
xls. from Peru.
Carnein photo



Figure 3
Pyritohedral pyrite
xls. from Elba.
Carnein photo

dealers selling spectacular groups of cubic pyrite crystals (often reassembled!) from Navajun, near Logroño, Spain. Many Colorado localities (most notably Leadville, Climax, Central City, Rico, and Gilman) yielded handsome crystals or crystal groups of interest to collectors. Pyrite crystals from the Leadville district include cubes up to almost 12 inches on edge (see Roots, 1951; Muntyan and Muntyan, 1994; and Eckel, 1997 for more information on Colorado pyrite).

Some pyrite is chemically unstable in the presence of moist air. The writer has had specimens eat through labels and cardboard trays in storage cabinets in the humid air of Pennsylvania (Figure 4). Beautiful crystals may crack and crumble, yielding whitish iron sulfates that are extremely soluble in water. What's worse, the fumes emitted by rotting pyrite may attack other minerals stored in the same drawer. You can literally smell it as it decays. What, you might ask, is the problem?

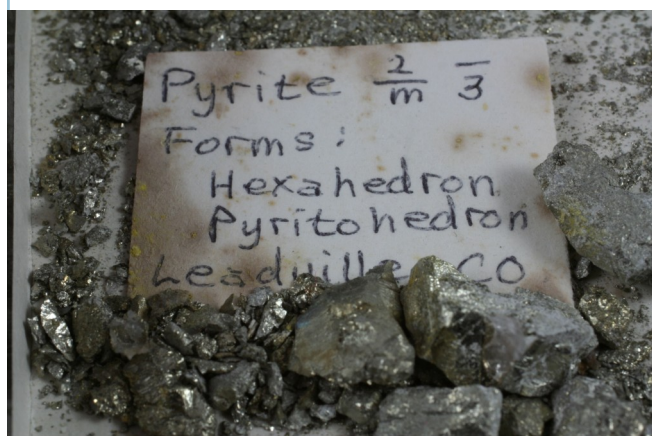


Fig. 4 Deceased Leadville pyrite crystal in the writer's collection.

The problem of decaying pyrite is far worse than just a matter of destruction of mineral specimens. When pyrite breaks down out of doors, it can produce an acidic brew that kills plants and animals in streams. The rust-colored streams of the Appalachian coal fields and some mining areas in Colorado are visual cues to the presence of pyrite in the rocks. When mining breaks up rocks, any contained pyrite is exposed to air, moisture, and helpful bacteria. Sulfur released as the pyrite breaks down contributes to the formation of sulfuric acid. Oxygen in the air combines with the iron to form various colorful iron oxides and hydroxides (e.g. "limonite", goethite, and hematite), all of which are chemically stable. These

(Continued on page 10)

iron compounds attach themselves to rocks in the stream bed, producing what some folks call "yellow boy"—a highly visible indication of acid-mine drainage (Figure 5). Acid-mine drainage has destroyed the wildlife in thousands of miles of streams in mining states, including Colorado. Nation-wide, the costs of cleaning it up are estimated in the billions of dollars, and all treatment methods require periodic renewal.



Figure 5. Yellow boy in acidified stream.

Of course, pyrite also breaks down as a result of slow, natural weathering processes, without the help of mining activity. In a moist climate, the dilute sulfuric acid normally forms in such small quantities that it is simply washed away, while iron oxides may coat fractures and mineral grains in the host rocks. In an arid climate, weathering processes are even slower. If rain water containing sulfuric acid soaks into the rock and soil over millions of years, rather than running off, the acid may gradually attack other minerals that are otherwise relatively stable. For example, in ore deposits that contain galena, sphalerite, and chalcopyrite, acid from the breakdown of pyrite attacks these minerals, releasing lead, zinc, and copper cations (positively charged atoms). These are carried by water through pores and cracks in the rocks. Above the water table, if oxygen (O^{\cdot}), carbonate (CO_3), sulfate (SO_4) or other (negative) anions are present, the metal cations combine with the anions to form an amazing array of interesting and beautiful oxygen-containing minerals. For example, lead from galena may recombine to form cerussite ($PbCO_3$) or anglesite ($PbSO_4$); zinc may form hemimorphite (zinc silicate) or smithsonite ($ZnCO_3$); and copper commonly produces malachite and azurite (both copper carbonates). There are hundreds of examples (400 or so for copper alone). Were it not for the presence of pyrite in the original rock, most of these minerals would occur only as inconspicuous crusts.

In arid regions, a thick cap of these secondary oxidized minerals may accumulate above the water table, along with iron oxides—the residue of thousands of feet of weathered ore, most of which has been lost to erosion. Besides making nice specimens for collectors, the resulting oxidized minerals may themselves be locally important ores. They are generally close to the surface and cheap to mine and process. Examples include the minerals cited above. Any metal ions that make it below the water table without being precipitated are re-deposited as secondary sulfide minerals, sometimes in bonanza quantities.

Ironically, although pyrite is often called fools' gold, it sometimes contains enough gold to constitute an important gold ore. In Colorado, significant amounts of gold occurred in pyrite in the Georgetown, Summitville, Red Mountain, Alma, and Telluride areas. The current huge open-pit gold mine north of Victor exploits some pyritic gold ores, in which calaverite is intimately mixed with pyrite in very small grains. Because gold is nearly insoluble, weathering of some pyritic ores may concentrate gold with the insoluble iron-oxide residue left behind when pyrite decays. As a result, in the old days, savvy prospectors commonly focused their attention on "rusty rocks" (Figure 6).



Figure 6. Gold in iron hydroxides, Cripple Creek district. Carnein collection; Jeff Scovil photo.

So, don't only think of pyrite as an environmental nightmare or as lowly "fools' gold". Although it seldom has much intrinsic value, pyrite is indirectly responsible for some of the most beautiful, coveted, and valuable mineral specimens seen in museums and at shows. It may even contain some real gold!

References Cited Eckel, E.B., 1997, *Minerals of Colorado, Updated and Revised by R.R. Cobban, et al.*: Friends of Mineralogy-Colorado Chapter, Inc., Golden, CO, Fulcrum Publishing, 665 p. Muntyan, B.L., and J.R. Muntyan, 1994, Colorado pyrite: Rocks and Minerals, v. 69, no. 4, p. 220-235. Roots, R.D., 1951, Pyrite: Rocks and Minerals, v. 26, nos. 11-12, p. 598-600.

Classifieds



Our Staff...

Norma Rhodes—Editor

We encourage everyone to submit articles, photos, illustrations or observations.

Share your experiences, your new finds, or simply your experience at our last field trip.

Handwrite it, type it, or email it. Format does not matter. All submissions are welcomed. The DEADLINE for items to be included in the next Pick & Pack, is the **21st of the month**

To submit an item:
For hardcopy photos or articles, mail to the address below or bring them to the General Meeting. All hardcopy photos remain the property of the submitter and will be returned. Electronic photos should be submitted at resolutions above 200 dpi in TIF, BMP, JPG, or PIC format. Articles are preferred in word. Editors will correct font.

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To promote and disseminate knowledge of the earth sciences, especially as they relate to mineralogy, lapidary, and fossils.

To encourage study, collection, and fashioning of minerals.

To accomplish the same through social meetings, lectures, programs, displays, shows, and field trips.

The Pick & Pack is published 10 times each year to assist and promote the above.

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