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NOVEMBER 2011

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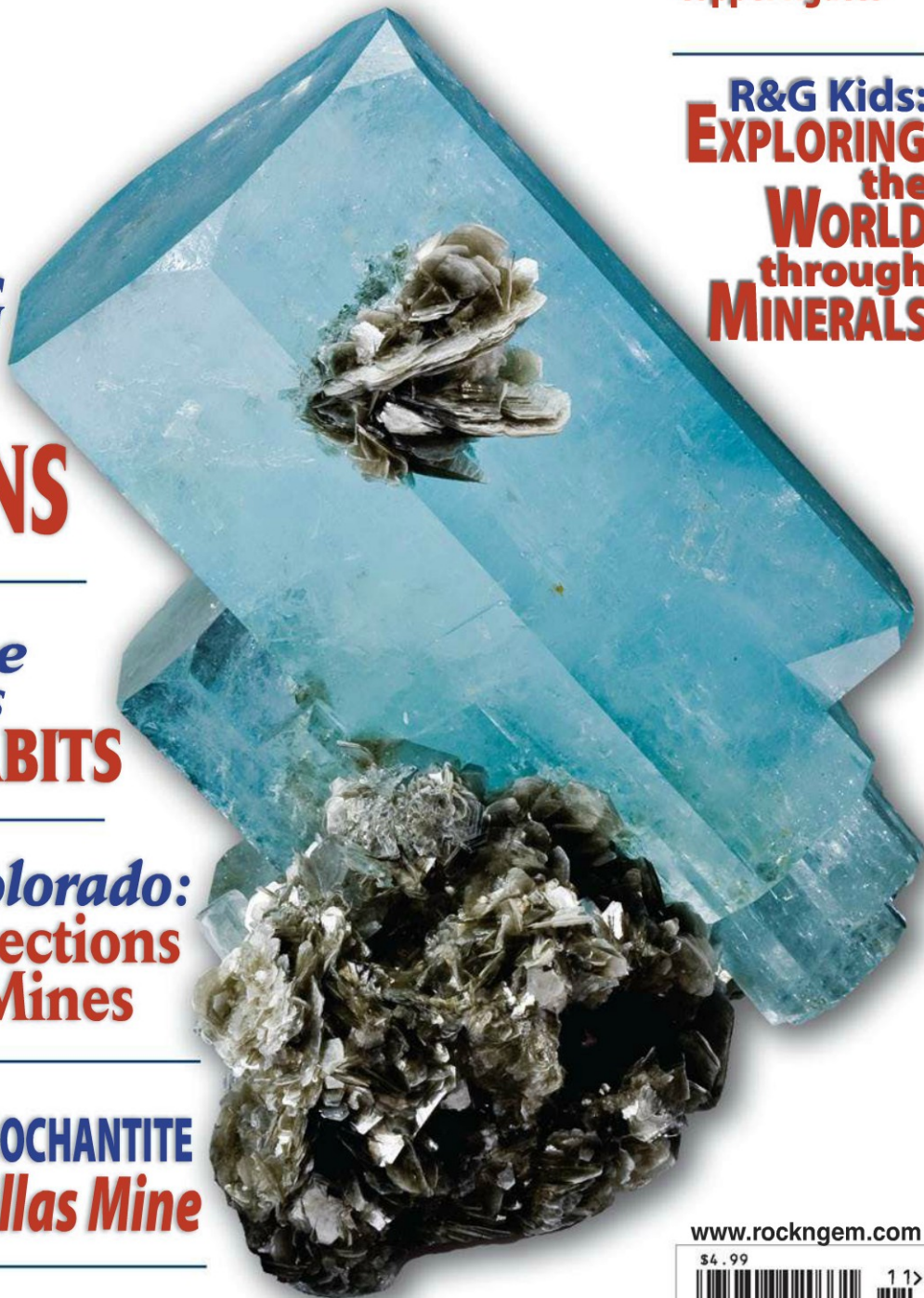
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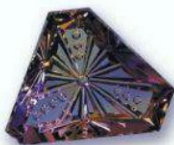


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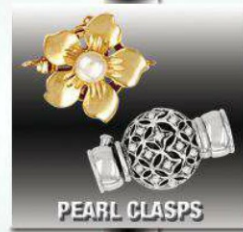
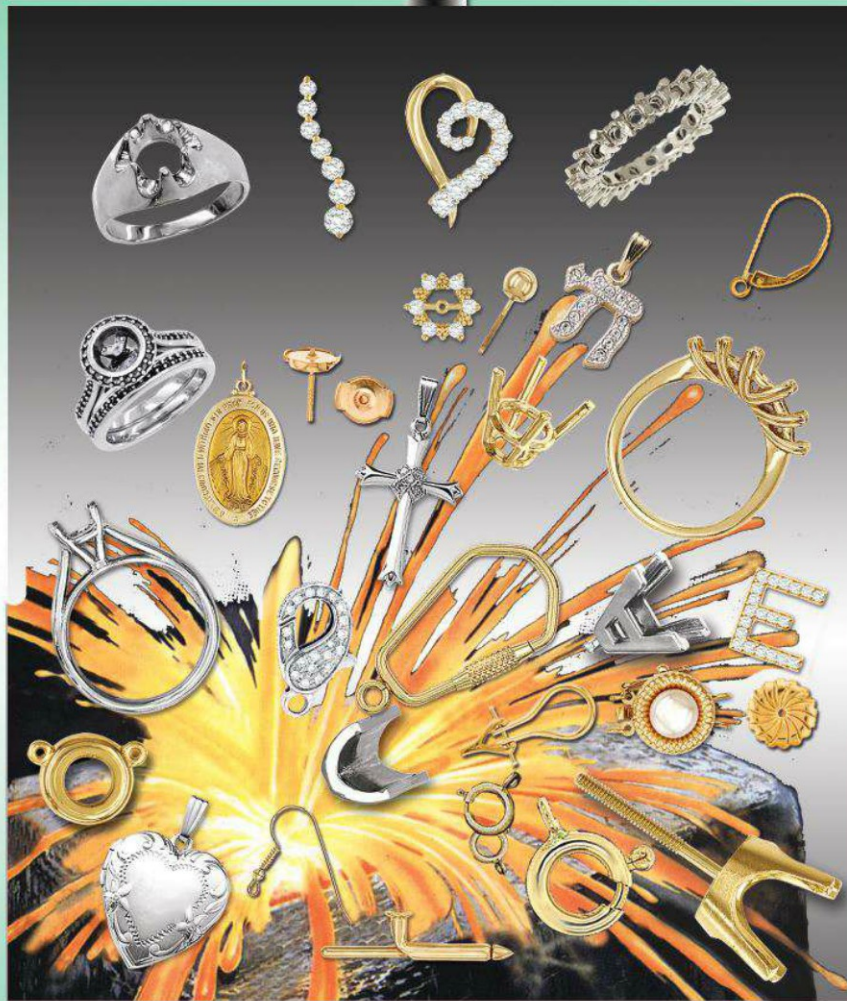
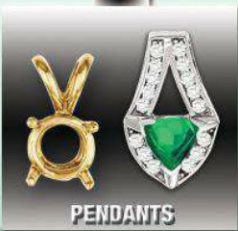
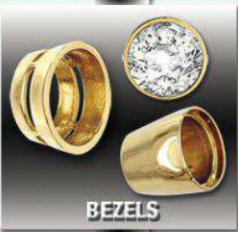
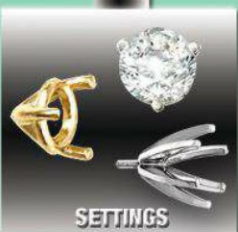
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# Rock & Gem

Volume 41, Number 11

November 2011

## ON THE COVER

Fine specimens form a distinguished collection that the collector is better able to enjoy. This complete, unrepai red, doubly terminated aquamarine crystal on muscovite is from Nagar (Hunza Valley) in the Gilgit District of Pakistan. (Joe Budd photo)

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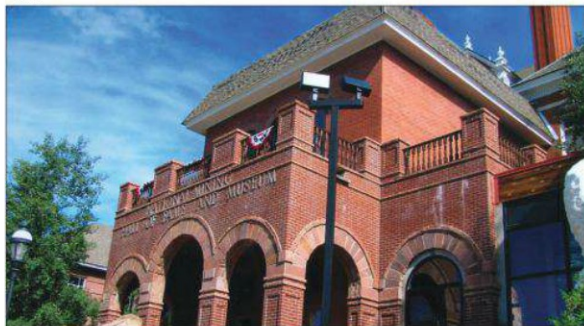
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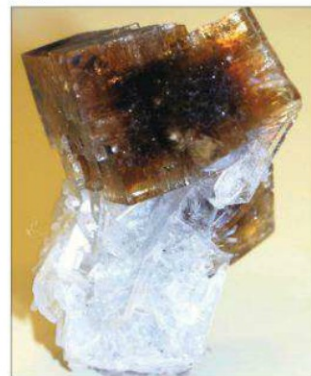
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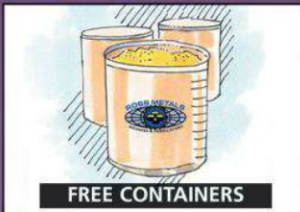
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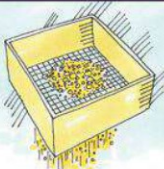


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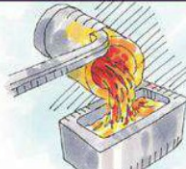


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## JMiller Media's Upgraded Executive Offices

JMiller Media is moving its headquarters to 3585 Maple St., Suite 232, Ventura, CA 93003, a space that has been designed specifically for its new multimedia publishing profile. Foremost among the enhancements is the in-house photography studio, which provides the infrastructure for creating quality photographs for all media platforms, as well as producing video content for its Web sites and online publications.

"This is the culmination of three years' effort in restructuring as we adapt to publishing in the new media environment," said Thomas Trimbach, General Manager. "We have evolved to meet the different needs of our audiences. Our print titles are now complemented by online media and a strong Web presence. And while print publishing remains at our core, it is only part of our offering."

Founded in 1962 by Jim and Jill Miller, JMiller Media is the independent publisher of three hobby publications: *Digital Photographer*, *Rock & Gem* and *COINage*.



## What's So Hot About Volcanoes?

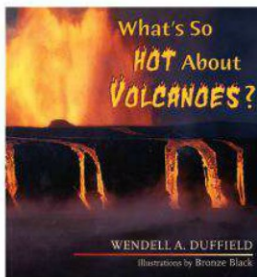
by Wendell A. Duffield

This delightful treatment of one of earth's most spectacular features give the reader an excellent account of volcanoes. An explanation of just what goes on in the earth to cause volcanoes is followed by a list of the various locations in the crust through which volcanoes erupt. Surface features that result from volcanic activity and the types of volcanoes are described.

Readers will find the section on pyroclastic eruptions to be particularly interesting. Three of America's most visited and interesting volcanoes that resulted from these violent eruptions are Mount St. Helens (Washington), Crater Lake (Oregon), and Yellowstone Park (Montana). These are discussed in enough detail to give the reader a good foundation of the whys and wherefores of these events.

Duffield was a scientist in volcano research for over 40 years. The section in which he deals with the question of predicting volcanic eruptions does a good job of giving readers a logical idea of where we are today in this inexact science.

For people who are fascinated by volcanoes and related features, this 96-page account of the subject offers 50 color photographs, 20 color illustrations, and a glossary, index and appendix. (Mountain Press Publishing Co., 2011)



—Bob Jones

## Fine Art Fossil Photography

The 23-image exhibition *Devonian Dreams: The Imagery of Art Murphy* opened at the Museum of the Earth in Ithaca, New York, on Sept. 23, 2011. Murphy, who has a background in painting and commercial photography, turned to digital photography for the past 20 years. His latest photographic project, which was inspired by nature, studies 380 million-year-old fossils that are found in abundance around his home in Catskill, New York.

"This exhibition represents my explorations into the layers of Devonian strata found in and around my home in the Hudson Valley and the fossils found therein," says Murphy. "The show will run concurrently with 'Treasures of the Earth,' comprised of fossils from the museum's permanent collection."

View the digital gallery of the exhibit on Murphy's Web site. A color catalog (with digital companion) is also available. The installation runs through Jan. 8, 2012. ([www.artmurphy.com](http://www.artmurphy.com))



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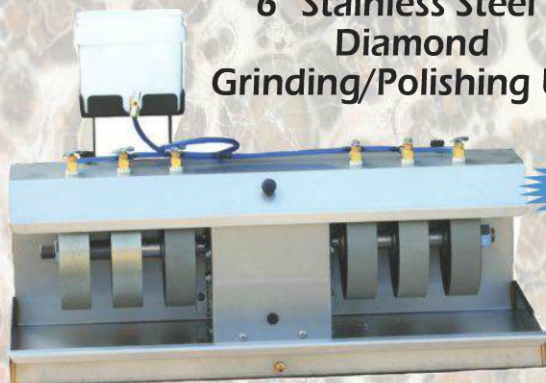
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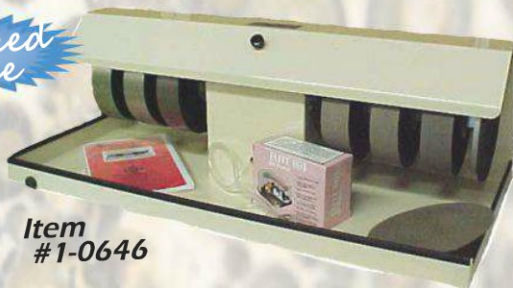
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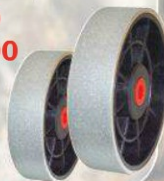
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by Janet Lynn Burgess

## RAFTSMAN OF THE MONTH

I began this project in a metal folding class where I folded, unfolded, hammered, and otherwise stressed metal into interesting shapes," says November Craftsman of the Month Janet Lynn Burgess. "I chose this particular piece of 20 gauge copper for making my pendant because it caught my eye as a well-balanced design to which I could add a cabochon. I had been looking at a piece of Graves Mountain kyanite with a quartz cap for a long time, trying to figure out what to do with it. I felt that the shapes of both the metal and the cabochon balanced each other well.

"Although I have learned to cabochon, I prefer to let someone else do that. In this case, a fellow member of the Western Piedmont Mineral & Gem Society in North Carolina, Gerald Munson, polished the stone. Since kyanite does not take a good polish and is rather rough, he chose to put a quartz cap on it. The resulting doublet gives great depth to the underlying stone and makes it more attractive than it could ever be on its own.

"My task as an enamellist was to put color on the metal that would enhance the stone, but also make its own statement. Both sides of the copper are enameled; the back side is a clear glass, and on the front I used a combination of colors to bring out certain aspects of the stone. It was not too difficult to find the correct combination of colors for what I wanted to do, but what really made the piece was to give the enamel a light etch to take off the shine. What we have is a matte glass in lavender/turquoise hues, with similar colors and textures in a shiny cabochon. The



overall effect is of the enamel enhancing the stone.

"It took three tries to get the stone set to the best advantage. Originally, I had wanted a bezel cup, but I wanted the copper color instead of the normal silver or gold. The first one I made of 24 gauge copper was pretty enough, but I thought it was not quite up to 'jewelry' standards. The second one I made deeper so that I could use a bezel pusher as one would normally do with a silver bezel. The problem with this one was that copper does not smooth out like silver; it is much too brittle.

"I changed direction, deciding to 'wrap' the stone, but because of the way it needed to mount on the enamel, I couldn't do the regular wire wrapping. I decided to cut a 22 gauge copper disk, with holes drilled for wire, and enamel it for color and stability. After enameling, I laid the stone on top and worked with a thin wire to hold the stone and add some visual interest.

"The final stage was putting all the pieces together. This new mount for the stone required a different spacing from what I had originally planned. The stone had to be mounted higher because of the size of the disk against the enameled copper. It was also tricky to mount the cabochon so that the piece would hang straight when worn. I decided to cut a ring of  $\frac{3}{8}$ -inch copper pipe about  $\frac{1}{4}$  inch thick to use as a mounting ring. Then the disk with the stone would rest on the fold of the metal and my little copper ring. I used silicone as the adhesive, since one cannot solder enamel. The chain is rose gold, which works well with the copper." ♦



### Would you like to be named Craftsman of the Month?

To enter the contest:

- Write a 500-word step-by-step description of how you crafted your lapidary project from start to finish. Save it as a document file.
- Take at least one sharp, close-up, color photo of the finished project. Photographic prints (no laser prints) or high-resolution (300 dpi at 4 inches by 5 inches) digital photos are acceptable.
- Burn your document file and digital photo (.tif or .jpg) to a CD.
- Mail your CD, photo, and a printed copy of your manuscript, along with your name and street address (required for prize delivery), to Craftsman of the Month, *Rock & Gem* magazine, 3585 Maple St., Ste.

232, Ventura, CA 93003. Submissions will not be returned, so do not send originals. Only winners will be notified. Contact the editor at (805) 644-3824 ext. 129 or [editor@rockngem.com](mailto:editor@rockngem.com) with any questions about these requirements.

Craftsman of the Month winners receive a two-speed Dremel Model 200 N/40 MultiPro kit and a wall plaque in recognition of their creativity and craftsmanship. Winning projects are also posted on our Web site, [www.rockngem.com](http://www.rockngem.com).





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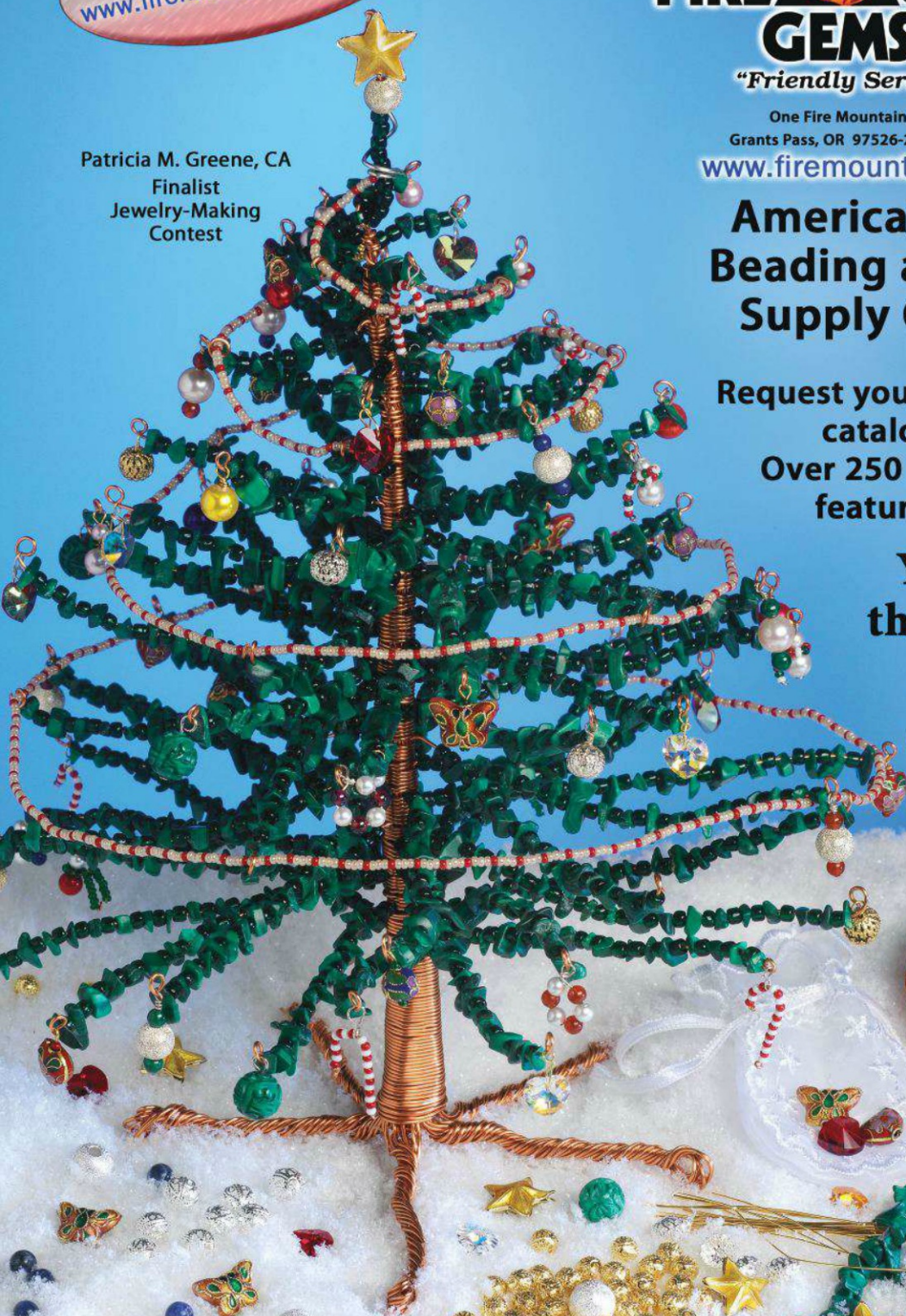
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Detroit, MI.....July 15-16-17  
Franklin, NC.....July 28-29-30-31  
Spruce Pine, NC...August 4-5-6-7  
Tucson, AZ....September 8-9-10-11  
Minneapolis, MN....September 25-26  
Detroit, MI.....Sept. 30-Oct. 1-2  
West Springfield, MA....October 7-8  
Asheville, NC.....October 25-26  
Orlando, FL.....October 28-29-30

## 2012

Orlando, FL.....January 6-7-8  
Asheville, NC.....January 10-11  
Tucson, AZ.....Jan. 28-Feb. 10

## Tucson

No G&LW Show at the Grant Inn  
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Las Vegas, NV.....June 1-2-3

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DATES SUBJECT TO CHANGE

# SHOW DATES

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Send show information at least four months in advance to **Rock & Gem Show Dates**, 3585 Maple St., Suite 232, Ventura, CA 93003-3517; e-mail: [editor@rockngem.com](mailto:editor@rockngem.com); or use the electronic form at [www.rockngem.com](http://www.rockngem.com).

## NOVEMBER 2011

**4-6—BLACK CANYON CITY, ARIZONA:** Annual show, "Rock-A-Rama"; Braggin Rock Club; High Desert Park, 19001 E. Jacie Ln.; free admission; gems, rough, slabs, minerals, crystals, jewelry, equipment; contact Don, (623) 374-0202, or Braggin Rock Club, PO Box 308, Black Canyon City, AZ 85324

**4-6—EUGENE, OREGON:** Wholesale and retail show; Gem Faire Inc.; Lane County Events Center, 796 W. 13th Ave.; Fri. 12-6, Sat. 10-6, Sun. 10-5; adults \$7 weekend pass, children 11 and under free; jewelry, gems, beads, crystals, silver, rocks, minerals; contact Yooy Nelson, (503) 252-8300; e-mail: [info@gemfaire.com](mailto:info@gemfaire.com); Web site: [www.gemfaire.com](http://www.gemfaire.com)

**4-6—EUREKA, CALIFORNIA:** Show and sale; Humboldt Gem & Mineral Society; Redwood Acres Fairgrounds, 3750 Harris St.; Fri. 9-6, Sat. 10-6, Sun. 10-5; adults \$2, children \$1; flint knapper, live demonstrations, geode cutting; contact Toni Tyson, 82787 Charlestown Ave., Indio, CA 92201, (707) 502-9574; e-mail: [rockchick9233@aol.com](mailto:rockchick9233@aol.com)

**4-6—GOLDEN, COLORADO:** 5th annual show; Denver Area Mineral Dealers; Jefferson County Fairgrounds, 15200 W. 6th Ave.; Fri. 10-5, Sat. 10-6, Sun. 11-4; free admission; annual show and sale: 18 dealers, minerals, fossils, gems, jewelry; contact Pat Tucci, (303) 279-5504; e-mail: [ptucci@sprintmail.com](mailto:ptucci@sprintmail.com); Web site: [geodyssey-rocks.com](http://geodyssey-rocks.com)

**4-6—KANSAS CITY, MISSOURI:** 33rd annual Wholesale and retail show; Shows of Integrity; MCC/BTC Exhibit Hall, 1775 N. Universal Ave.; Fri. 10-7, Sat. 10-7, Sun. 10-5; adults \$6, 3-day pass \$10, ages 5-12 \$2, children under 5 free; more than 80 dealers, jewelry, beads, beading supplies, findings, gemstones, minerals, cabochons, gold, silver, diamonds, charms; contact Terry James, 18362 S. Hwy. 78, Leonard, TX 75452, (903) 587-2543; e-mail: [info@showsofintegrity.com](mailto:info@showsofintegrity.com); Web site: [www.showsofintegrity.com](http://www.showsofintegrity.com)

**5—TUCSON, ARIZONA:** 10th annual silent auction; Old Pueblo Lapidary Club; 3118 N. Dale; Sat. 9-2; free admission; contact Danny Harmsen, (520) 323-9154

**5-6—AMARILLO, TEXAS:** Annual show; Golden Spread Gem & Mineral Society; Amarillo Civic Center-Regency Room, 401 S. Buchanan St.; Sat. 10-6, Sun. 10-5; adults \$3, children under 12 free; prehistoric, outer space, down under, precious, unusual, cheap, artifacts, valuables, jewelry, Indian jewelry, beads, displays; contact Wanda Finley, 9170 FM 1151 Claude, TX 79019, (806) 944-5464; e-mail: [finfran@midplains.coop](mailto:finfran@midplains.coop)

**5-6—BREWER, MAINE:** Annual show; Penobscot Mineral & Lapidary Club; Brewer Auditorium, Wilson St.; Sat. 10-5, Sun. 10-4; adults \$1, children under 12 free; silent auctions, door prizes, demonstrations, children's activities; contact Lance Shope, 38 Sunset Strip, Brewer, ME 04412, (207) 989-3342; e-mail: [ishope67@yahoo.com](mailto:ishope67@yahoo.com); Web site: [penobscotmineralapidaryclub.com](http://penobscotmineralapidaryclub.com)

**5-6—CINCINNATI, OHIO:** Show; Intergalactic Bead & Jewelry Shows; Sharonville Convention Center-West Hall, 11355 Chester Rd.; Sat. 10-5, Sun. 10-5; dealers, precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals, demonstrations, jewelry classes; contact Angela, (888) 729-6904; e-mail: [angela.couch@beadshows.com](mailto:angela.couch@beadshows.com); Web site: [www.beadshows.com](http://www.beadshows.com)

**5-6—CONCORD, CALIFORNIA:** Annual show; Contra Costa Mineral & Gem Society; Centre Concord, Clayton Fair Shopping Center, 5298 Clayton Rd. (near Ygnacio Valley Rd.); Sat. 10-5, Sun. 10-5; adults \$5 (discount on Web site), children under 16 and Scouts in uniform free with adult; fluorescent room displays, 21 vendors, minerals, fossils, gems, crystals, jewelry, books, tools, equipment, lapidary supplies, 60 exhibitors, 12 demonstrators, beading, wire-wrapping, faceting, stone carving, youth activities, silent auction, prizes, raffle, woolly mammoth skull, giant jade, giant cave bear, giant auction; contact Harry Nichandros, P.O. Box 4667, Walnut Creek, CA 94596, (925) 289-0454; e-mail: [bob@cmgs.org](mailto:bob@cmgs.org); Web site: [cmgs.org](http://cmgs.org)

**5-6—EXTON, PENNSYLVANIA:** 42nd annual show, "Gemarama 2011"; Tuscarora Lapidary Society; School at Church Farm, 1001 E. Lincoln Hwy.; Sat. 10-6, Sun. 10-5; adults \$6 (two-day ticket \$9), children (under 12) \$1, Scouts in uniform free with adult Scoutmaster; dealers, finished jewelry, cut and uncut stones, fossils, minerals, beads, tools, findings, demonstrations, exhibits, children's activities, door prizes, silent auction; contact Lisa Roman, (215) 740-9224; Web site: [www.lapidary.org](http://www.lapidary.org)

**5-6—GREENWICH, CONNECTICUT:** Annual show; Stamford Mineralogical Society; Eastern Greenwich Civic Center, 90 Harding Rd.; Sat. 9:30-5, Sun. 10-4:30; contact Howard Heitner, (914) 779-2041; Web site: [www.stamfordmineralsociety.org](http://www.stamfordmineralsociety.org)

**5-6—LANCASTER, CALIFORNIA:** 10th annual show; Palmdale Gem & Mineral Club; Antelope Valley Fairgrounds, Van Dam Pavilion, 2551 W. Ave. H; Sat. 9-5, Sun. 9-5; free admission; gemstones, minerals, beads, lapidary, jewelry, display supplies, dinosaur program with Richard Wade, petrified wood programs with Walton Wright, kids' scavenger hunt, silent auction, demonstrations, raffle; contact Cheri George, 2255 W. Avenue O, Palmdale, CA 93551, (562) 243-8470; e-mail: [lizardwoman3@yahoo.com](mailto:lizardwoman3@yahoo.com); Web site: [www.palmdalegemandmineral.com](http://www.palmdalegemandmineral.com)

**5-6—MELBOURNE, FLORIDA:** 37th annual show, "Parade of Gems"; Canaveral Mineral & Gem Society; Melbourne Auditorium, 625 E. Hibiscus Blvd.; Sat. 10-5, Sun. 10-5; adults \$4; displays, demonstrations, door prizes, children's corner, "Rock Food" display, dealers, minerals, fossils, gems, beads, cabbing and faceting rough, finished jewelry, books, tools; contact Dave Wayment, (772) 532-6432; e-mail: [cmgs.show@att.net](mailto:cmgs.show@att.net)

**5-6—MIDLAND, MICHIGAN:** 17th annual show; Mid-Michigan Rock Club; Midland Resort Hotel Convention Center, 1500 W. Wackerly; Sat. 10-6, Sun. 10-4; free admission; rocks, minerals, jewelry, fossils, Kids' Corner, fossil dig; contact Deborah Acord, (989) 430-4471; e-mail: [jackdanred2@aol.com](mailto:jackdanred2@aol.com); Web site: [www.midlandrockclub.com](http://www.midlandrockclub.com)

**5-6—MIDLAND, TEXAS:** Annual show; Midland Gem & Mineral Society; Midland Center, 105 N. Main St., corner of Wall and Main; Sat. 9-6, Sun. 10-5; adults \$4, students (6-18) \$1, children (5 and under) free; dealers, demonstrations, exhibits, silent auction, kids' corner, geode cutting, fluorescent mineral room; contact Tom Wurster, PO Box 5043, Midland, TX 79704, (432) 682-6258 or (432) 230-2566; e-mail: [show@midlandgemandmineral.org](mailto:show@midlandgemandmineral.org); Web site: [www.midlandgemandmineral.org](http://www.midlandgemandmineral.org)

**5-6—OKLAHOMA CITY, OKLAHOMA:** Semi-annual show; Oklahoma Mineral & Gem Society; Oklahoma State Fair Grounds, 3001 Gen. Pershing Blvd.; Sat. 9-6, Sat. 9-5; admission \$6; Scout troops and science classes admitted with a sponsor; contact Vernon Dorton, 1801 Millridge Dr., Blanchard, OK 73010, (405) 823-0517; e-mail: [vldorton@yahoo.com](mailto:vldorton@yahoo.com); Web site: [www.omgs.org](http://www.omgs.org)

**5-6—RIDGECREST, CALIFORNIA:** 56th annual show; Indian Wells Gem & Mineral Society; Desert Empire Fairgrounds, Mesquite Hall, 520 S. Richmond Rd.; Sat. 9-5, Sun. 9-5; free admission; contact John DeRosa, (760) 375-7905; e-mail: [IndianWellsGems@hotmail.com](mailto:IndianWellsGems@hotmail.com); Web site: [www.indianwells.weebly.com](http://www.indianwells.weebly.com)

**5-6—SAN DIEGO, CALIFORNIA:** Annual show; San Diego Mineral & Gem Society; Al Bahr Shrine, 5440 Kearny Mesa Rd.; Sat. 9:30-5, Sun. 10-4; free admission; free gem I.D., more than 12 dealers, more than 40 exhibits, club sales, slabs, books, magazines, junior booth, door prizes, demonstrations, faceting, lost wax casting, silver chain making, sphere making, wire wrapping; contact Bob Hancock, (619) 889-6886; e-mail: [RHBOBHANCOCK@cs.com](mailto:RHBOBHANCOCK@cs.com); Web site: [www.SDMG.org](http://www.SDMG.org)

continued on page 32



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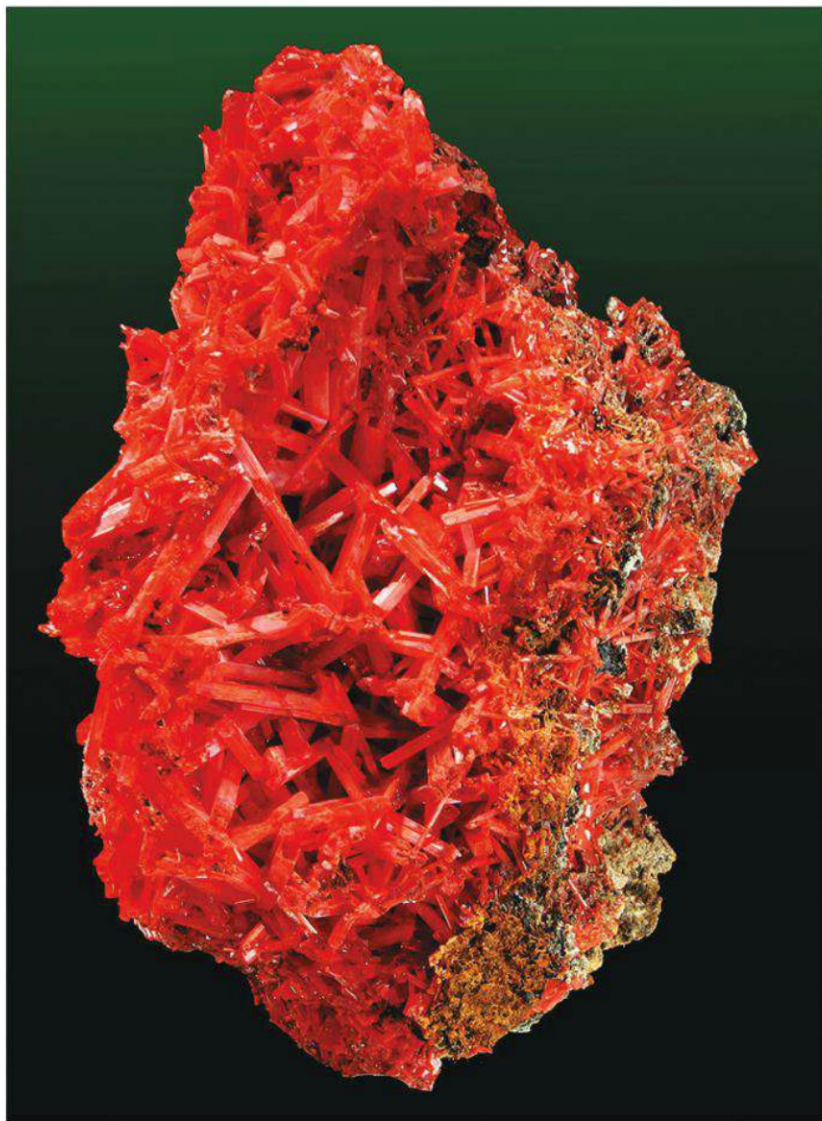


# Build a Better Collection

## 6 Factors to Consider in Selecting Fine Mineral Specimens

Story and Photos by Eric Greene

Many collectibles, such as stamps and coins, are assessed based on just two factors: rarity and condition. Evaluating a fine mineral or crystal specimen is more akin to looking at a sculpture. When viewing and displaying the specimen or debating its aesthetic merits, many criteria must be considered. Some of these, such as beauty, are highly subjective, while others, such as crystal habit, are fairly concrete and scientific. Of course, a specimen can be beautiful and important simply because you enjoy its appearance.



This 4<sup>8</sup>/<sub>10</sub>-inch crocoite specimen featuring square, hollow crystals and mesmerizing, brilliant red color was discovered in the 2010 pocket at the Adelaide mine in Tasmania, Australia.

Still, the more knowledgeable you become about the factors that affect the perception of a specimen's value, the better able you will be to identify and select fine quality mineral and crystal specimens.



The dictionary defines **beauty** as “The quality that gives pleasure to the mind or senses and is associated with such properties as *harmony* of *form* or *color*, excellence of *artistry*, *truthfulness* and *originality*.”



**LEFT:** One cannot help but admire the aesthetically pleasing combination of well-balanced, sharp crystals with bright, appealing color shown in these 4.7-inch red quartz crystals with hematite from Fujian, China.

**BELOW:** The stunning visual impact of dramatic color contrast is clearly illustrated in this 3¼-inch specimen of green prehnite balls on nearly black epidote crystals from the Kayes Region of Mali.

The better specimens you pick, the more distinguished your collection will be and the more you will be able to enjoy it. Who hasn't experienced disappointment when looking at specimens acquired as a novice collector? I certainly made mistakes back then, and I definitely don't want to repeat them today. The criteria listed below are my personal standards for selecting specimens for a display collection. I hope they will help you choose particularly worthy specimens for your personal collection from the millions available today at shows, on the Internet, and elsewhere.

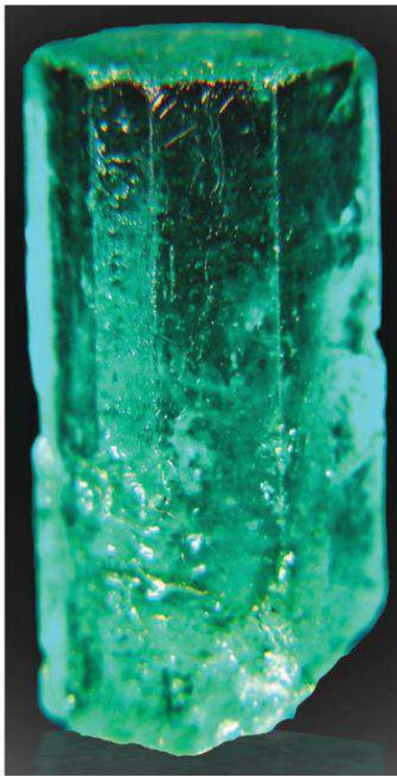
#### **BEAUTY**

The dictionary defines beauty as “The quality that gives pleasure to the mind or senses and is associated with such properties as harmony of form or color, excellence of artistry, truthfulness and originality.” We all know that beauty is in the eye of the beholder, so what is perceived as beautiful will vary from person to person. Nevertheless, when looking at a mineral specimen, there are some elements of beauty that are pretty universal.

For example, how are the crystals placed on the specimen? Are they grouped nicely? Are they presented in a balanced fashion or are they crowded together, all on one side,







Since the dawn of time, people have been fascinated by the mesmerizing transparency of gem emerald crystals like this 7.12-carat beauty from Muzo, Colombia.

or too near the top or bottom? Are they of varying sizes, proportional to one another, or all one size? Is the color bright and appealing, as appropriate for the species? Are individual crystals sharp and well defined? Do the crystals and matrix relate well to each other in size, ratio and form? Does it have an attractive composition, with a pleasing sculptural or architectural feel to it, with appealing three-dimensional viewing angles? Do the crystals interact with space in a pleasing way?

Just as in viewing a work of art, these highly subjective factors contribute to the perceived beauty of a fine mineral specimen. This perception results from an aesthetic arrangement that appeals to your eye and plays a major role in the pleasure you get from looking at a specimen.

#### COLOR AND CONTRAST

It's simple: Vivid colors catch the eye and make a high-impact visual impression. Therefore, minerals with bright, highly saturated, intense colors are naturally more desirable than white, black or gray minerals. Keep in mind that lighting makes a huge difference in how the eye perceives color. Specimens viewed in sunlight almost always look significantly better than when viewed in fluorescent, incandescent or hal-

ogen light. A customer once wrote to my company, concerned about the lack of yellow color in a citrine crystal she purchased from our Web site, [www.treasuremountainmining.com](http://www.treasuremountainmining.com). I suggested she take it out in the sun to see its true color. She wrote back that the color was great, but that she was still disappointed that it didn't look that color in her display cabinet! Confusion over this issue prompted us to include a link in all our listings to an article detailing what we do to ensure accurate color representation in our photos.

To sum it up, we recognize sunlight as the universal standard that everyone, anywhere in the world, can use to judge color in a mineral specimen. That's why, when photographing our minerals, we use lighting that is as close as possible to 5400° Kelvin, which is the color temperature of sunlight. You might consider using similar lighting in your display cabinet to show off your minerals at their best.

Another physiological factor is that the eye sees colors differently depending on their background color. You may recall the arrangement of color opposites on the color wheel from your school days: green is opposite red, orange opposite blue, and yellow opposite purple. When viewed side by side, color opposites both appear to be more vibrant, intense and saturated than either color alone. This is the principle behind color contrast. Similarly, light colors set on dark colors appear brighter and more vivid, and also clearly define crystal edges and enhance three-dimensionality, thus making the specimen more appealing to the eye.

Another form of contrast is that between the crystals on a specimen and a duller matrix. Neophytes sometimes ask how to get the crystal out of the rock, but the fact is that a specimen on or in matrix is far more interesting and appealing (and has more scientific value) than a loose crystal.

The late Marvin Rausch built a world-class collection by specializing in high-contrast mineral specimens, such as red rhodochrosite on blue fluorite from the Sweet Home mine, green prehnite on near-black epidote from Massachusetts, and more. Though he had only 600 specimens in his collection, about 50 of them had graced the covers of a major mineral magazines and the rest exhibited intense colors. You could do worse than to follow his lead!



A close-up of a parallel-growth smoky quartz crystal from Minas Gerais, Brazil, illustrates the flash and brilliance of vitreous luster, which gives the crystal the look of glass.



## LUSTER AND TRANSPARENCY

"Luster" describes the way in which light interacts with the surface of a crystal. There are 13 terms that are commonly used to describe luster:

**Adamantine:** the brilliant look of very gemmy crystals (diamond)

**Dull:** a non-reflective surface of any kind (feldspar)

**Earthy:** the look of dirt or dried mud (psilomelane)

**Fibrous:** the look of fibers (asbestos)

**Greasy:** the look of grease (opal)

**Gumdrop:** the look of a sucked-on piece of hard candy (stream-worn gemstones)

**Metallic:** the look of opaque and highly reflective crystals (pyrite)

**Pearly:** the look of the inside of a mollusk shell or a shirt button (talc)

**Resinous:** the look of crystals with a golden, soft sheen (amber)

**Silky:** the look of silk, similar to fibrous, but more compact (fibrous malachite)

**Submetallic:** the look of a poor metallic luster, opaque but reflecting little light (sphalerite)

**Vitreous:** the look of glass, and the most common luster (quartz)

**Waxy:** a fairly dull look, as if coated with wax (jade)

Because reflected light is highly appealing to the eye, specimens that have the glint of light, say from a cut diamond, or the gleam of gold are perceived to be more attractive than those with dull surfaces. Transparency, which is closely related to luster, is also highly desirable in the crystals on a specimen.

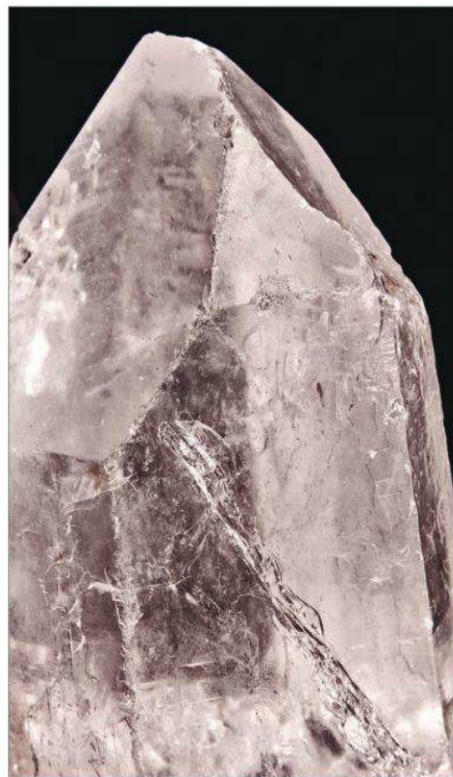
Gemmy, or "gem", crystals are so called because they have the appearance of a cut gemstone. Since the earliest times, people have been fascinated by the unique properties of a solid object that is transparent. At least part of this attraction is that light shining through a crystal creates a luminescent glow, which the eye finds mesmerizing.

## DAMAGE

You can't get around this fact: damage is damage (and more often than not, even the appearance of damage is damage). Damage can range from infinitesimal, barely visible wounds (called "Wilburs" after world-class collector Dave Wilbur), to dings, bruises, nicks, breaks, internal fractures, cleaves (breakage along natural cleavage planes), contacts (where a crystal grew against another crystal), and broken off, missing

crystals. I have yet to see a mineral specimen that is truly perfect, though there are a select few that are nearly so. Realistically, some degree of compromise is required, especially for those without the financial resources to spend hundreds of thousands of dollars for a world-class specimen. My main rule is that if damage is really noticeable and interrupts my enjoyment of the specimen, then I don't want it. That being said, I consider where the damage is (e.g., off to the side is better than smack dab in the middle). I also consider the rarity of the mineral: damage on amethyst is unacceptable because there's so much of it available, while I might be willing to live with damage on a 1/4-inch kammererite specimen because this mineral is so rare.

What about saw marks on the bottom or back of a specimen? Purists avoid these, preferring a "natural" specimen. But who's fooling who? A well-placed saw cut can turn an average specimen into an excellent one, either by cutting off damaged areas, achieving a better balance between crystals and matrix, or by giving a specimen an enhanced orientation that displays the crystals just so. And, using today's equipment and techniques, saw cuts can be disguised so well that they look just like natural breaks and become "invisible".

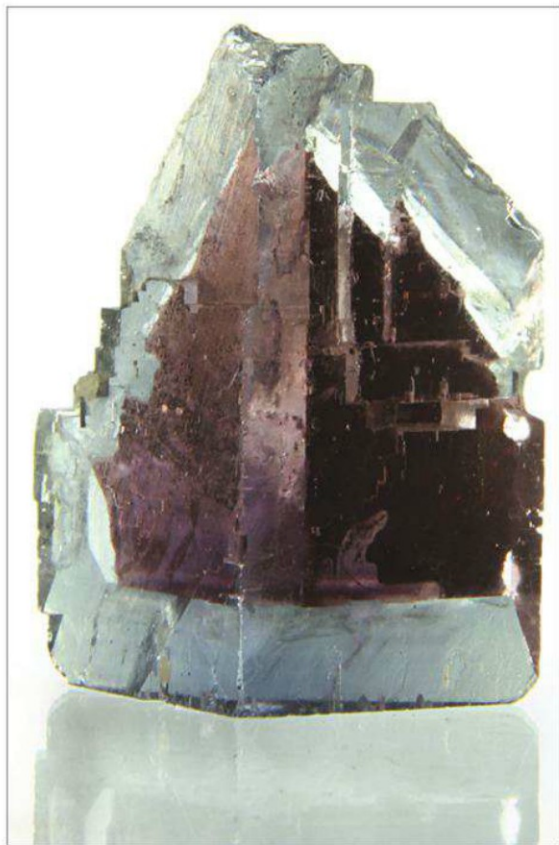


Here's a 3.6-inch, clear quartz crystal from Minas Gerais, Brazil, that was struck by lightning, which left a shallow "trench" on the surface of the crystal!

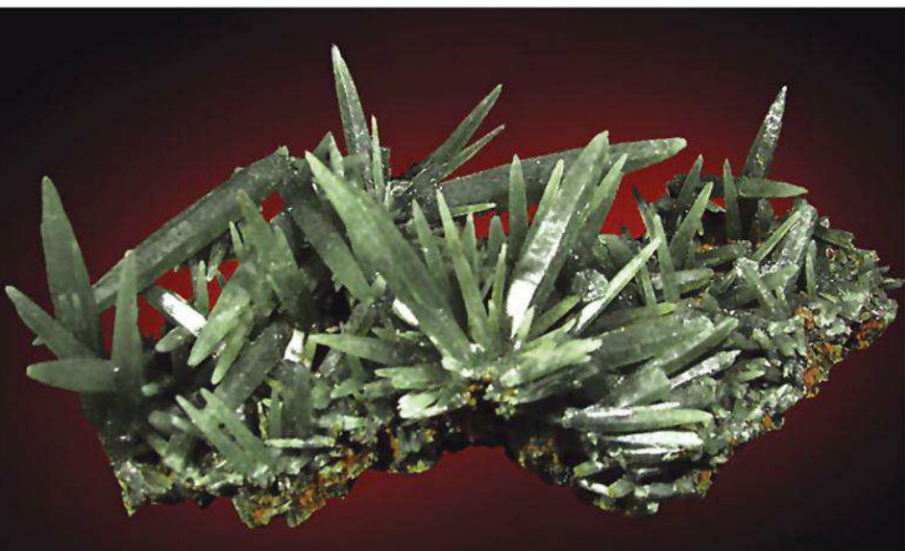


The presence of repairs is no longer a deal breaker for collectors, particularly with significant or rare specimens like this 3 1/2-inch world-class cerussite crystal from Tsumeb, Namibia.





This very collectible 2½-inch pale blue fluorite crystal from the Minerva mine #1 in Hardin County, Illinois, shows an exceptionally sharp purple phantom inside.



This large crystal group of green prase quartz with hedenbergite inclusions from Serifos Island, Greece, measuring 6½ inches across, is a marvelous example of the beauty of crystals interacting with space.

Finally, there's the question of repairs and reconstruction/restoration. Due in part to the outstanding restoration work performed on Sweet Home rhodochrosite by Bryan Lees' talented crew at The Collector's Edge, most collectors no longer consider a repair an automatic deal-breaker. The sky-high prices of the Sweet Home material, and their escalating values since the mine was closed, have proved that invisible or near-invisible repairs do not automatically negate the investment value of a specimen. And sometimes repair is the only way to preserve a really significant specimen of great value or rarity.

#### **CRYSTAL SIZE, FORM, ETC.**

Large, perfect crystals are rare, and thus are automatically more desirable to a mineral collector than smaller, imperfect crystals of the same species. It's only human: Almost everyone wants to own the biggest, the brightest, or the best "shiny objects", and mineral collectors are no different. On the other hand, keep in mind that while a 6-inch tourmaline crystal is rare and thus more valuable than a 3-inch one, a near-perfect, transparent 3-inch crystal is more appealing to the eye than a larger one that is flawed.

In addition to size, other factors to consider are a crystal's sharpness, definition and form and the quality of the termination. Cleanly defined edges, without rounding or irregularity, are highly prized. Picture-book, classic terminations that are symmetrical, attractively shaped, and in proportion are more desirable than ones that are irregular or overly complex because they add to one's enjoyment of a specimen, rather than distracting from it.

#### **DID LIGHTNING STRIKE?**

Always buy specimens that are a joy for you to behold. Almost 10 years ago, when my company was set up at the Inn Suites in Tucson to sell green fluorite we had mined from the William Wise mine in Westmoreland, New Hampshire, a customer came in to look around. I asked him what kind of minerals he collected, and he said, "I'm a lightning-bolt collector." Seeing the perplexed look on my face (I admit I was thinking he meant fulgurites), he said, "Yes, I buy specimens that strike me like a bolt of lightning." He got it exactly right. He would only buy specimens that have what mineral dealer Stuart Wilensky calls the "Wow Factor". Wilensky says this is the most important criteria, and the least scientific. It's a double whammy: a powerful gut feeling combined with a mighty wallop to the naked eye.

Lees uses a dramatic, theatrical approach when showing a fine mineral specimen to a discerning collector. He leads the buyer into a darkened room, uncovers the specimen, then turns on specially arranged brilliant lighting set up in advance to create a powerful visceral and visual impact. To test for this phenomenon yourself, just note your own reaction when you first see a specimen in person. If you exclaim, "Wow!", then all the other criteria are probably just icing on the cake. 💎

*Eric Greene has been an avid, active field collector since 1986. He is president of TreasureMountainMining.com, an Internet mineral dealership.*





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## S HOP TALK

by William A. Kappelle

### In Search of the Perfect Cab

I will make a guess that anyone who has gotten into the lapidary hobby has, at one time or another, dreamed of making the perfect cab. Not many, however, have achieved their goal. Most of us are happy if Aunt Freda thinks our efforts are beautiful. Of course, we could sell a couple of the kids and buy an automatic cabbing machine that would crank out perfect cabs while we drink coffee and watch TV, but that's not the point of the whole thing, is it? No, the point is to achieve that perfection with our own hands.

Many—perhaps even most—of us will never make the perfect cab simply because it takes more than just carefully following the necessary steps. There must be exceptional eye-hand coordination, rock steady hands, good eyesight, and patience, patience, patience. Here are the mechanical steps. The rest is up to genetics.

Step one is to choose the rough rock carefully. Look for fractures, soft spots, and other flaws. We can't see inside the beast, but try to orient it so that you get the pattern you want in the slab. When you are ready, take a deep breath and cut a slab (or slabs) from the stone.

Step two is to prepare the slab. Examine it very carefully. Don't be afraid to use a loupe, a magnifying glass, and good lighting. Look for fractures, vugs, small pits, and other imperfections that could cause problems during grinding and polishing. When you are satisfied that the material is OK to work with, use your template to choose the pattern orientation you like and outline the shape with an aluminum or brass scribe, waterproof Sharpie® pen, or whatever your favorite tool is. Whatever method you use, be sure that the line will remain visible through all of the water that will splash on it. It is also necessary to have a sharp and true line. Make sure that your template is true and that there are no rough edges or little bumps on it.

Step three is to cut out and grind the preform. Using your trim saw, cut away the excess slab material. I wouldn't go any closer to the outline than about 1/16 inch. You can always grind away a little excess, but it is really hard to grind it back on. When you begin the grinding, be sure you have adequate lighting that is arranged so there are no shadowy areas. I strongly recommend that you have something to rest the preform on. Don't attempt this step freehand.

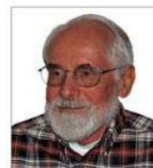


Grind slowly and carefully down to the edge of your line. Be sure that you keep the preform moving or you will grind a flat spot into the cab. Most lapidaries stop at this point, but I would suggest that you go through a couple of the sanding steps, as well, just to be sure you have a perfectly smooth girdle.

When the girdle is smooth, make a line around the perimeter and begin your rough grind. This will have to be done freehand, so be extra careful to grind exactly to the line. The fine grind, sanding and polishing steps are just textbook processes. The important thing is that **every trace of the scratches from the previous polishing step must be removed before you move on to the next size of grit.** There is no way to emphasize this too much.

If you use magnification and still don't trust your vision, resort to the old trick of covering the stone with that waterproof Sharpie. When the ink is gone, the scratches are gone. Good luck. 💎

Please feel free to send your questions and comments about any of my columns to Shop Talk, 25231 Pericia Dr., Mission Viejo, CA 92691 or [wakappelle@cox.net](mailto:wakappelle@cox.net).





# Opals: The Queen of Gems

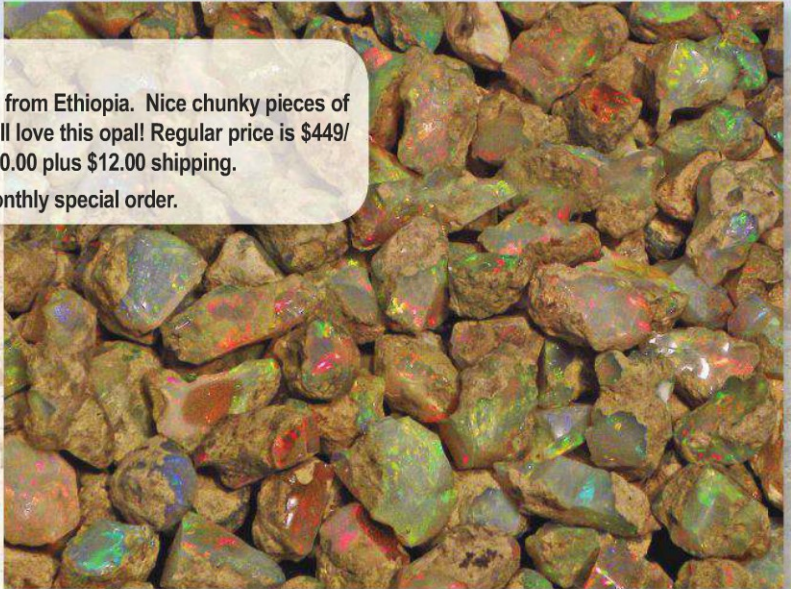
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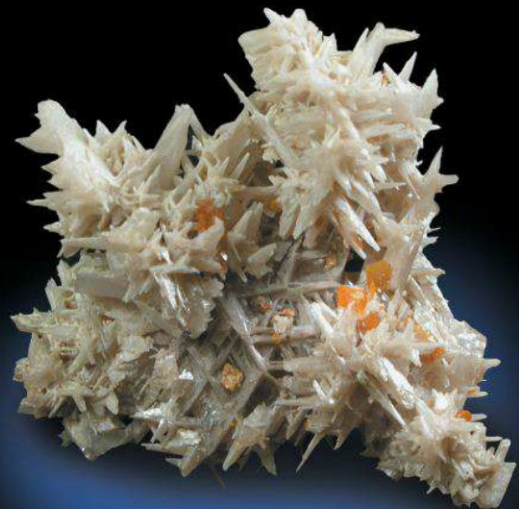
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# MEXICAN BROCHANTITE

## Another World-Class Species from the Milpillas Mine

Story and Photos by Bob Jones

The Milpillas mine, in Sonora, Mexico, is already noted in the collector community for superb malachite pseudomorphs and some of the most brilliant azurites ever found. Recently, this well-known mine has become the source for some of the finest brochantites ever found. The brilliant emerald-green crystals are found on a grayish white rhyolite matrix.

Brochantite is one of the minerals that are commonly found in arid copper deposits. Its crystals are most often hairlike, sometimes ranging to slender needles, but are rarely stout, discrete crystals. The color of the mineral is always green, thanks to the copper ions that are an integral part of its chemistry. The color of brochantite can range from light green to very dark green depending, in part, on the thickness of each crystal.

While velvety encrustations of brochantite are very common, well-formed crystals are not. This is why the new find of brochantite in the Milpillas mine is so exciting. The mine produces superb "forests" of free-standing needles that are tightly packed and completely cover their grayish white rhyolite matrix. In addition, a significant number of specimens have come forth with blades that are exceptionally thick and an inch or more long. These rank among the finest brochantite crystals ever found! To the delight of collectors, quantities of collectible specimens sporadically appear on the market. Since the operators of the mine at Milpillas discourage collecting by miners, it is encouraging that a number of specimens are available.

Brochantite,  $\text{Cu}_4(\text{SO}_4)(\text{OH})_6$ , is a copper sulfate hydroxide and forms as a secondary mineral in copper deposits. The common habit for the mineral is hairlike needle crystals that are seldom  $\frac{1}{4}$  inch long and form velvety coatings. The Milpillas brochantites are exceptional because many



This excellent example shows how densely packed the brochantite crystals from the Milpillas mine can be.

of them are discrete crystals well over an inch long and 2mm to 3mm thick.

The Milpillas brochantite crystals grow in complete disarray, jutting off in every direction and crossing over each other. Sometimes, they lie flat along the matrix, but most often they are free standing at an angle.

The color of brochantite ranges from pale green to a rich green that is nearly black. The cause of the color is most likely the copper ions that are part of the chemistry of the species. The intensity of the color is directly related to crystal size: hairlike crystals are a light green, while thicker crystals

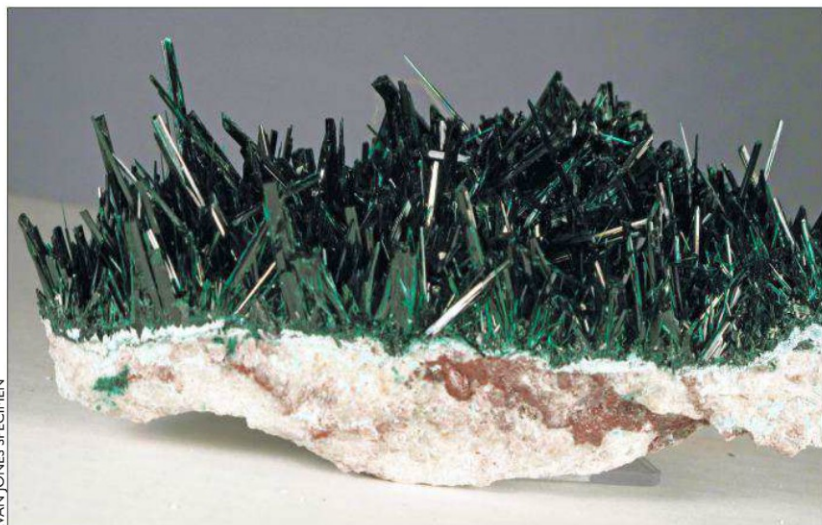


are a darker shade. Specimens in which the hairlike crystals are very tightly packed are a rich emerald green.

Collectors always enjoy seeing a good brochantite specimen because of its stunning green color and luster that often exceeds that of malachite. The better specimens are composed of a forest of bright-green needles, usually under an inch and rarely up to 2 inches long. The needles are brittle but, when they're in perfect sprays or in reniform coatings, brochantite can be one of the most colorful species in a display cabinet.

Brochantite was first found in the Ural Mountains of Russia, probably at the Gumeshevsk mine, near Ekaterinburg, the city named for Catherine the Great. It was accepted as a new mineral in 1824 and named for a noted French geologist, Brochant de Villiers. One of the early names for the mineral intrigued me: Specimens found in Cornwall were called "warringtonite" after the English town in which my mother happened to be born.

Name almost any copper deposit in the arid regions of the world, and brochantite will have been found there as a secondary hydrous copper sulfate that formed where the acidity of solutions was low. It is usually found in quite fine specimens. Some of the better ones have come from arid regions



This is an exceptional example of 1- and 2-inch brochantite needles that are free standing on matrix.

of Chile, Katanga (Democratic Republic of Congo), and Tsumeb (Namibia). Even the ancient silver mine at Laurion (also Lavrion), Greece, which was so important to the emergence of democracy in that peninsular country, produced fine specimens years ago. The most brilliant brochantites were found at Ain Barbar, Algeria, and at the Kabolela mine at Katanga. The new material from Milpillas equals and sometimes exceeds the quality of specimens from these sources.

Years ago in the United States, collectors could visit the Blanchard mine at Bingham (Socorro County), New Mexico, and find

nice fluorites, excellent linarite, and very colorful, velvety crusts of bright-green brochantite that were most often found nestled in shallow depressions of rock as tightly developed needle crystals.

Arizona has had its share of brochantite sources, some of which are very well known to collectors. The Shattuck mine at Bisbee produced bright-green needles that were often associated with other copper species. Morenci, in the eastern part of the state, has also been a source of good brochantite.

The most intriguing Arizona brochantite source is actually an old mine in the Grand Canyon. Most collectors don't even realize



This lovely combination specimen of brochantite and cyanotrichite came from the long-defunct Grandview copper mine located deep in Arizona's Grand Canyon.

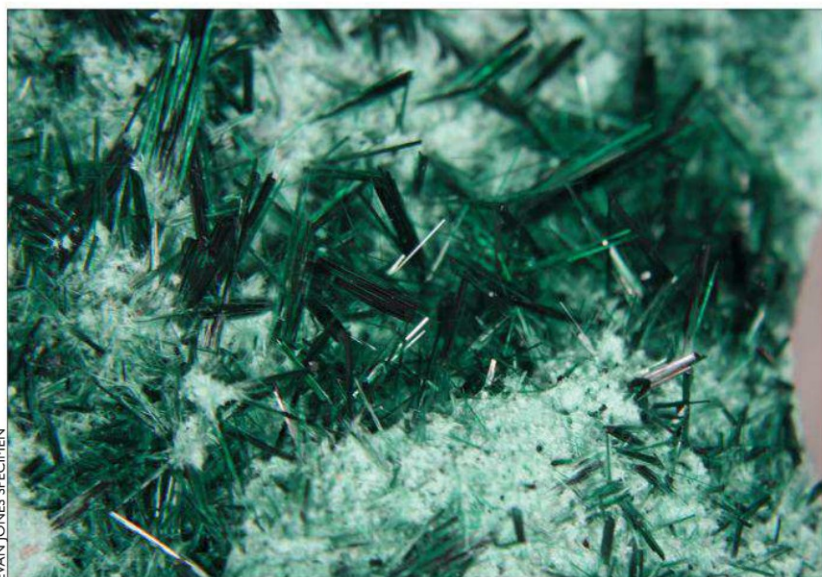


These discrete brochantites, measuring over an inch long, developed individually in a random arrangement.



there is a copper mine in that national landmark. If you walk the fairly difficult Kaibab Trail down into the canyon, you'll pass right by the tunnel opening of the Grandview mine, a copper deposit that was worked many decades ago. This oddly located mine has yielded some really fine combination specimens of bright-green brochantite and lovely blue cyanotrichite, both in tiny velvety needles and drusy crusts. Of course, collecting here is completely forbidden, and rightly so.

Sources of this lovely mineral have tended to produce only limited numbers of specimens, so you don't see brochantite on the market very often. Another reason may be that the needle aggregates can easily be



This brochantite has exceptionally long crystals that range from 1 inch to over 2½ inches.



Up close, one can see the relationship between crystal thickness and light or dark green color.

crushed if they are mishandled. Still, brochantite is so beautiful that any good specimen added to a collection is attractive and exciting to look at!

I find it fascinating to track what is happening with the Milpillas deposit. As mining continues at depth, still in the upper oxide zone, an obvious sequential deposition of species has occurred. One has to wonder what will emerge as mining carries on to greater depths! Of course, the oxide zone will eventually be breached and the flow of all of these superb secondary minerals will become a trickle. I suspect that some notable collectors are buying up a more than one example of each species in anticipation of that day and preparing to be able to do some serious trading in the future!

After a few initial groups appeared, the mineral is now coming forth in decent quantities. The specimens being mined vary in size. Many are nice 1- and 2-inch matrix specimens topped with a lovely

cluster of ½-inch to 1-inch diverging needle sprays. Less common are the larger matrix plates, some of which measure a foot across. Some of the larger specimens hold scattered clusters of needle sprays, while others are completely covered with velvety brochantites and still others are covered by free-standing needles as long as 2 inches! The variety of crystal forms and specimen sizes should satisfy every collector.

Collecting brochantite is always difficult, as the needle crystals tend to be quite brittle. There are two reasons there are more small specimens available than cabinet-size specimens. The rhyolite on which the brochantite formed is tough, really tough. Granted, it is somewhat brittle, but for a miner to extract larger specimens requires more diligent effort. When the rhyolite breaks—in some cases, almost shatters—smaller pieces are the result. Fortunately, the brochantite crystals are firmly attached to the matrix.

Yet another reason is the prohibition of specimen collecting by the mine operators. Miners have to resort to collecting specimens that are more easily carried to the surface. Smaller matrix specimens are much more easily obscured for transport at the end of the shift, so miniature to small cabinet-size pieces are more abundant.

Sometimes, larger specimens have been hidden for later, more convenient removal. The old adage, "Where there's a will there's a way" aptly applies to all miners! I have seen untrimmed specimens in which the matrix rock is almost boulder size and sports one rich area of crystals that has to be released from the mass. I marvel at the ingenuity of the miners who figured out how to bring rocks weighing 10 and 20 pounds to the surface undetected. They must wear very baggy pants or shirts!

## MALACHITE AND AZURITE

The Milpillas deposit is remarkable as it has, in the less than two decades, produced quantities of some of the world's best malachite pseudomorphs. As if that is not enough to excite the collecting community, the mine has also produced a quantity of some of the world's finest azurite. The azurites are in superb textbook to complex crystals that are brilliantly lustrous. It has been interesting to observe this mine's specimen production sequence.

The first specimens that hit the market were simple velvety malachites of fine quality. These were soon followed by some azurites and a large number of velvety malachite pseudomorphs after azurite. When this happened, collectors really began to take notice of this new specimen source.

The malachite pseudomorphs from Milpillas come in clusters of 1- and 2-inch crystals. Some of them are quite sharp, while





In rare cases, brochantite forms discrete bladed crystals, which tend to be a darker green due to their thickness.

others are decidedly rounded, but all are very attractive and they made a refreshing entrance into a market that was eager to absorb these lovely specimens.

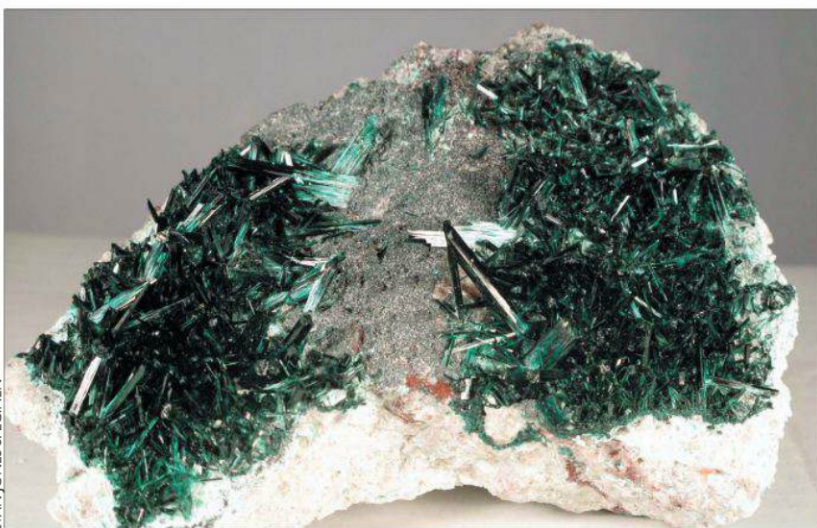
Not long after the malachite pseudomorphs made their appearance, the Milpillas mine began to produce azurites of quite remarkable size and quality. Some single crystals fit nicely on the palm of your hand. Others were in diverging clusters with crystals as much as 2 inches long.

Initially, most azurites occurred in small groups 1 or 2 inches across. But as miners learned how to collect, larger specimens began to reach the surface, in spite of strict controls on collecting by mine owners.

The quality of the azurites gradually improved, and crystals with amazingly high luster became common. In addition, there were crystals that showed three phases

of growth: azurite crystals would become pseudomorphed by malachite, then overlain with a thin layer of brilliant azurite. I described these "electric blue" azurites in the April 2011 *Rock & Gem* ("Mexico's Electric Blue Azurites", page 12). These are, without question, some of the finest azurites on the market today. Now the Milpillas mine has, once again, produced a world-beater species: brochantite.

Just how long the supply of brochantite specimens will continue to come from Milpillas is anyone's guess. Specimens have only been coming forth for about a year, and as of this writing there seems to be no letup. The past history of this mine suggests the supply might continue for some time. Watch for these showy emerald-green needles and crystals. They are among the finest examples of this copper sulfate hydroxide known. 💎



The tough rhyolite matrix, which has a tendency to shatter, makes it difficult to separate distinct clusters of brochantite without damaging them, so this specimen was left intact.

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# ROCK SCIENCE

by Steve Voynick

## A More Perfect Quartz

My desktop paperweight is a 6-inch-long, 2-inch-thick quartz crystal that weighs nearly 2 pounds. Although its water-clear transparency is reminiscent of Arkansas rock crystal, this paperweight is actually synthetic quartz that was "grown" in an autoclave at New Jersey's Bell Laboratories, which was then a subsidiary of AT&T.

Quartz was first synthesized in 1845. This was a significant scientific achievement, but it had no immediate commercial value. The abundance of natural quartz easily satisfied all gemological and industrial demands.

In 1880, however, French physicists Pierre and Jacques Curie discovered its remarkable electrical properties. By applying mechanical stress to quartz crystals, the Curie brothers generated an electrical potential (voltage) across certain crystal faces. They named this effect "piezoelectricity". The Curies next discovered that applying electrical current to quartz physically deformed the crystal by slightly changing certain crystal-face angles.

In 1918, researchers learned that the application of electrical current to thinly sliced quartz "wafers" caused them to vibrate mechanically at a natural resonance frequency that was later measured at exactly 32,768 cycles per second. They also found that the frequency of the current emerging from the wafers was regulated precisely to that of the quartz-resonance frequency.

Several years later, scientists at Bell Laboratories designed a quartz oscillator that controlled a clock with unprecedented accuracy, triggering a rush for "electronic-grade" quartz crystals. They had to be single (untwinned) crystals with near-perfect, undistorted crystal lattices and large enough to be cut into various-sized wafers.

Commercial quantities of natural, electronic-grade quartz, were obtained from sources in Arkansas and Brazil. Thin wafers of natural quartz were soon regulating time and frequencies in everything from chronometers and radios to radars and bomb-sights. During World War II, electronic-grade quartz, because of its scarcity, was classified as a strategic material.



Synthetic quartz crystals have a host of scientific, industrial and consumer uses.

By the 1960s, as demand for natural, electronic-grade quartz boomed and supplies dwindled, researchers began synthesizing a more perfect quartz using a hydrothermal technique that replicated the process of natural quartz formation.

In quartz synthesis, powdered natural, quality (but non-electronic-grade) quartz, called "lascas", is mixed with an aqueous solution of basic sodium carbonate and placed in steel autoclaves that can withstand high temperatures

and pressures. Seed crystals—thin sheets cut from electronic-grade, natural quartz—are suspended from racks at the top of the autoclave, which is then sealed and heated from the bottom to 400° Celsius (742°F).

The lascas dissolves into a silica-rich solution, which rises by convection to the cooler, upper part of the autoclave, where it becomes supersaturated and the silica crystallizes onto the seed crystals. Under closely controlled convection flow, temperature and pressure, the synthetic crystals develop an electronically perfect lattice structure. After about 80 days of growth, they are removed and cut into tiny wafers, ready for a plethora of scientific, industrial and consumer uses.

Today, 275 tons of lascas are converted each year into 200 tons of rough, electronic-grade, synthetic quartz that costs about \$60 per pound. Small amounts of synthetic quartz containing iron and manganese chromophores mimic citrine and amethyst and are often passed off as natural gems, but most synthetic quartz is used in electronic applications such as personal computers, cell phones, and digital games.

And that makes my desktop crystal not just an eye-catching paperweight, but a reminder of the remarkable properties of quartz—both natural and synthetic. ♥

Steve Voynick is a science writer, mineral collector, former hardrock miner, and the author of books like *Colorado Rockhounding* and *New Mexico Rockhounding*.





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# A NEW RED GOLD STRIKE

## Copper Agates from Michigan's Upper Peninsula

Story by Wayne W. Sukow, Ph.D.

**B**ack in 1962, I discovered microscopic crystal aggregates of native copper in Lake Superior agates collected from the glacial tills of Wisconsin and Minnesota. I saw many tiny sparkling pinkish “trees” in the clear chalcedony. Later, I reported the presence of native copper flecks and massive native copper in agates found in situ and along beaches in Michigan’s Upper Peninsula, affectionately known as “Copper Country”. At that time, only a few collectors, sworn to secrecy, collected them.

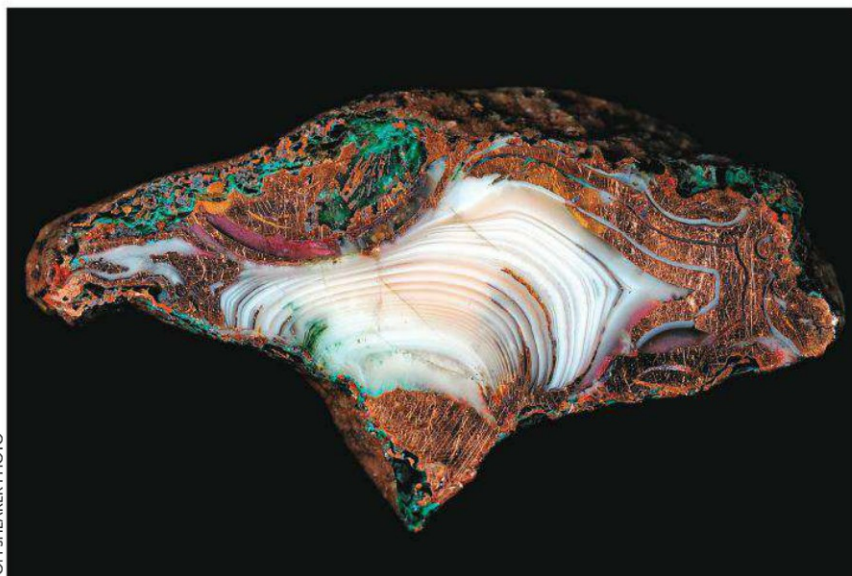
A decade later word leaked out, as does the news about any new, rich collecting site. That site was the mine dumps of the Wolverine #2 copper mine in Houghton County, Michigan. Then came the collecting explosion as mine dumps were being crushed for road fill. Get some before the dumps are gone! was the rallying cry. Although small in size, these copper replacement agates have become highly sought after and pricey collector’s items.

For a time, the mechanical crushing of large basalt chunks continually provided fresh and more manageable copper-poor rock at the mine. These chunks of hard, tough basalt contain small nodules of these copper-perfused agates. The

enclosed native copper ranges from tiny to large flecks and from a random distribution to faithful replacement of some of the intricate fortification bands and, finally, to agates that are mostly massive copper nodules. The mine dumps are fast disappearing—some say those from the Wolverine #2 are gone—but collectors still search.

During the early, rich history of copper and silver mining in Michigan’s Upper Peninsula, local miners called copper the “red metal”. Because of its abundance and economic impact, not unlike a gold strike, the copper was referred to as “red gold”. Today, there’s a new red gold strike in copper replacement agates, which is providing a few local collectors with significant income. Residents of the Upper Peninsula, who proudly identify themselves as “Yoopers”, call these copper replacement agates “copper agates”.

When I began collecting these agates, some of which I bought from master collectors David L. Schuder and David Harris, I called them “copper-perfused



TOM SHEARER PHOTO

In the center of this agate are beautiful white and tan chalcedony fortifications, with a few copper crystals on a few bands. On the outer edge there's massive copper to wide copper replacement of the quartz bands.



agates". Why? One definition of the word "perfused" is "to sprinkle, cover over, or permeate with a liquid"; a second is "to force a fluid through (a body part or tissue)"; and a third is "to permeate or suffuse something, either with a liquid or with light" (word netweb.princeton.edu/perl/webwn).

I'll restate the third definition with slightly altered wording: A copper perfused agate is a chalcedony nodule in basalt that has been permeated by a hot, copper-rich solution that has been forced to flow through the surrounding matrix and many agates in a localized area of flood basalts. The "forced flow" will be interpreted as flow at high pressure and temperatures approaching those of magma. Although I am neither doing an extensive discussion of the processes nor the events leading to the formation of these copper-perfused agates, I will present some ideas and believe that, by the end of this article, you'll have some ideas about their formation.

In examining more than 400 copper agates, I have seen many variations in the amount of copper, size of copper replacement, pattern of replacement, and associated mineral inclusions. There also are some common structural changes in the agate, including the interface of the agate with the surrounding matrix, evidence of metamorphic change in the matrix itself, apparent replacement of the agate's coarse quartz with calcite, and some prehnite replacement.

Most of the copper agates that are pictured in this article are between 1cm and 2.8cm in their maximum dimension. Only a few are over 2.5cm. Basically, they're small and often gemmy! I was surprised by what I saw when I looked at more and more of these copper agates.

## MATRIX AND OUTER LAYER

Copper agates that are still in the matrix show little or no husk. Yet, a variation in the texture of the matrix from fine to coarse is seen. The types of matrix in which the copper agates are found have several textures. The first is black, fine-grained basalt that is typical of many copper bearing basalts in the Copper Country. The second is a dark gray-black matrix that is coarse grained and shows small aggregates of light-colored minerals, which give it a patterned appearance. This variety also contains green crystals as part of the matrix. X-ray and electron spectroscopy measurements done by Dr. Lance Kearns from James Madison University in Harrisonburg, Virginia, have established that they are feldspar crystals. It is suggested that the green hues of the crystals may be due to

DAN ERICKSON PHOTO



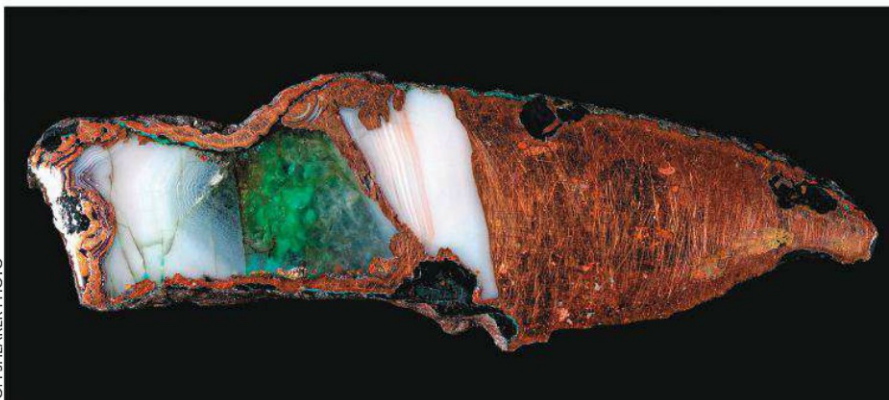
Bashing the hard, tough basalt host rock with a 5-pound sledge to free a copper agate makes it difficult to recover specimens that have few, if any fractures.

WAYNE SUKOW PHOTO



Densely packed copper flecks have replaced part of a wide white chalcedony band in this agate. Tiny flecks of copper are also found in some of the fortification bands.

TOM SHEARER PHOTO



David Harris found this unusual copper agate and immediately gave it the nickname "the Arrow Head". The bright green area just to the left of center is botryoidal malachite under a clear mass of calcite.





WAYNE SUKOW PHOTO



DAVID SCHUDER PHOTO



WAYNE SUKOW PHOTO

**TOP LEFT:** The copper agate's husk and range of pastel shades indicate it's from the Kearsarge Lode. The green crystals were determined to be feldspar.

**TOP RIGHT:** This Kearsarge Lode agate has it all: copper, tenorite, pastel pink, tan, white, and clear chalcedony bands, a white chalcedony origin for the curved banding, and a beautiful fortification pattern of pumpeyite greens and white. Most unusual are the two blue bands located near the lower portion of the agate.

**LEFT:** Etching revealed copper crystals in a calcite-filled cavity on the lower right. The other green-yellow mineral on the bottom is epidote, which had not been reported previously. The matrix is waxy green feldspar.

copper minerals. The third matrix is lighter colored with a brownish hue and medium-size grains. The copper agates from this matrix differ from those of the Wolverine #2 mine; these agates often have a dull tan-brown husk, whereas the Wolverine #2 mine agates only have a black coat—probably chlorite or another earthy mineral—in place of a chalcedony husk.

From this information, I concluded that the formation of copper agates is evidence of a high-temperature and high-pressure metamorphism, along with a very alkaline copper mineral solution in the agate-bearing basalts. The hot alkaline solution solubilized both the coarse quartz (euhedral

quartz) and iron oxides in the fortification bands, which reduced the copper in solution to the metallic form found in the agate bands today. Consequently, I believe that the copper agates found in situ at the Wolverine #2 mine and the greater Kearsarge Lode copper mines are a post-agate formation phenomenon.

All these copper agates are characterized by a variation in the size of the visible copper from massive (noncrystalline) copper to small, but easily visible copper crystals to tiny copper flecks.

Another recurring feature of the copper agates from the Wolverine #2 mine—and, to a much lesser extent, those from the Kearsarge

Lode—is that the husk seems to have disappeared. At the Wolverine #2, in some instances the husk is totally gone, apparently replaced by a much softer dark-greenish-black substance, which may be chlorite.

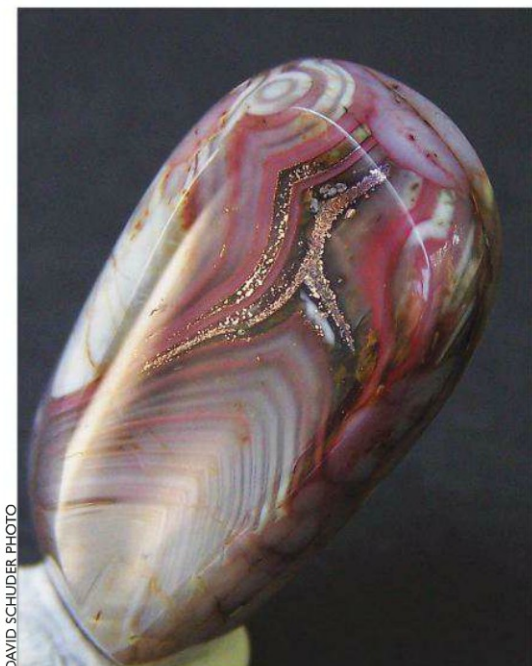
## THE INTERIORS

Significant differences appear in the interiors of copper agates, along with some common characteristics. Let's begin with things they have in common:

1. The thin outer contact between the agate and matrix is invariably a soft blackish-green material, which may be chlorite.

2. Many of the agates continue to show the white chalcedony that is a stressed form





DAVID SCHUDER PHOTO

**TOP LEFT:** Very fine copper crystals in clear chalcedony color the rose-pink bands in this agate. These crystals range from isolated singles to crystals so jammed together that they look like massive copper.

**TOP RIGHT:** The thin outer shell of copper encloses chalcedony with varying concentrations of tiny pumpellyite crystals, which produce the many shades of green. The few copper flecks provide a nice contrast.

**RIGHT:** During sanding and polishing, we cut through a dark outer coating to reveal tiny native copper crystals with a cubic habit, which were stacked one on top the other.



DAVID SCHUDER PHOTO



DAVID SCHUDER PHOTO

of quartz and harder than the more familiar "perfect" quartz crystals.

3. Some have massive calcite inside.

4. Invariably, they are white or clear, quite unlike the more common classic red-and-white banded Lake Superior agate. Where has all the iron gone? Has the copper in solution been reduced to metallic copper while transforming the iron oxides to a water-soluble form? This well-known reaction can also precipitate silver from solution.

5. In addition to the native copper, there's evidence of a variety of copper minerals and copper crystals.

6. The basalt matrix in which these agates are found has a variety of textures such

as different grain size, patterns formed by secondary minerals, copper minerals, tiny copper crystals, and feldspar crystals of different colors and sizes.

Taken together, these commonalities suggest metamorphic changes in the matrix. At the same time, the agate cavity's environment was subjected to the same drastic temperature, pressure and alkalinity changes, and elements and ions in solution.

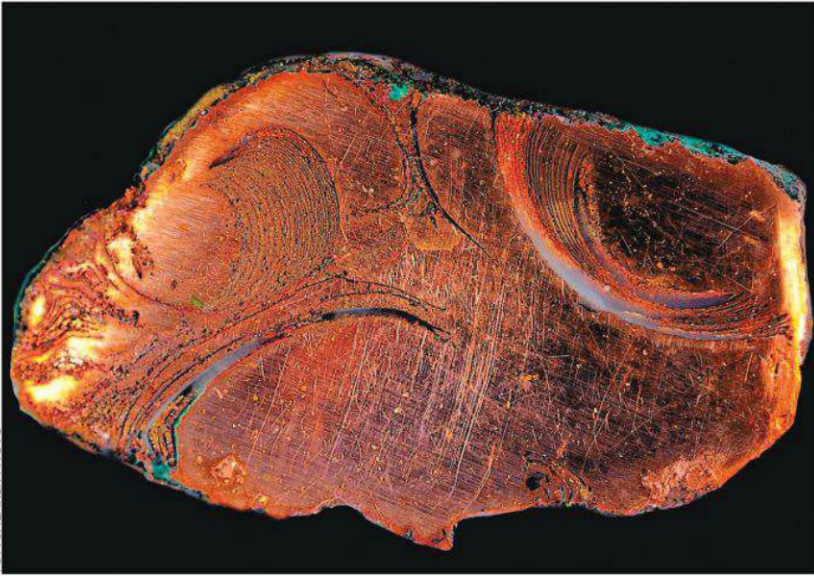
Invariably, collectors are interested in the beauty and aesthetics of the specimen. In this light, the variations seen in the interiors of copper agates may not excite all collectors. However, some collectors are wowed by and wonder about the intricacy

of the copper replacement of fortification bands. I'm in this latter group. The more I see of these unique agates the more I want to gain ideas about their formation. That made it necessary to study more and more of them.

My method of study is to notice reoccurring features rather than look for minor but noticeable differences to see how many arbitrary categories I can see. I see this as trying to understand the copper agates' DNA and not just the outward expression of it.

Collector copper agates, which appeal to the high-end buyer, are those that appear to be works of art, with beautiful native copper forming typical fortification bands,





TOM SHEARER PHOTO

With the help of a 10X loupe, you can see fine bands of native copper alternating with fine bands of whitish chalcedony in what seems to be a solid copper nodule.

eyes, graceful swirls, onyx banding, and other patterns. Collector copper agates are in the middle of a continuum that begins with those agates that have only a few copper flecks randomly distributed and extends to those that are solid masses of copper. It bears repeating that collector copper agates are works of art that are made by natural processes and events, without any interference from mankind. These copper agates may be showy.

Not surprisingly, copper agates are also found in the dumps of other mines that recovered the rich copper and silver content of the Kearsarge Lode. I consider them to be collector agates, as well, not only for the

copper that's in them, but the many new and varied combinations of colors and inclusions. These copper agates are strikingly different than those from the Wolverine #2 mine, but that's another story.

#### ETCHED COPPER AGATES

What collector would try to change nature's handiwork, which is expressed so wonderfully by these copper agates? Maybe one or two of us would, and I'm one of them. The other was my very good friend Pete Rodewald, who unfortunately joined the heavenly rockhounds just over a year ago.

Pete and I were motivated to try etching them for two reasons: the first was to

ascertain whether some really did, as we suspected, have calcite in their interiors; the second was that we desired to more fully understand how they might have come about.

Pete and I made a joint purchase of a 100-piece collection of copper agates at the Wonderful World of Agates Symposium in Oshkosh, Wisconsin, in the summer of 2008. Pete had a good supply of sulfamic acid, and we began etching a few of the agates, which appeared to the naked eye to have calcite in them. The acid treatment should have etched away the calcite, leaving behind the chalcedony bands and copper. And that's exactly what happened.

The first thing we discovered was that at least some of the copper was not attached to the chalcedony bands. The bottom of the bucket had some "copper-sand" in it, which was clearly crystalline copper!

We also discovered that some of the bands that remained after the acid treatment were composed of prehnite. Has the prehnite replaced the chalcedony? I'm not ready to state an opinion at this time.

The sulfamic acid treatment of the copper agates verified the presence of massive calcite in some of them, which has not been reported previously.

Etching of the agates may be considered a small change in nature's handiwork. However, at the same time, it revealed new and more subtle things about these agates, including the complexity of the copper crystallization inside the agates, verification of calcite masses, the occurrence of prehnite as bands in the agates, and epidote films on chalcedony bands. Even more subtle are two agates in which the acid treatment revealed the disperse film of green material throughout the agate and on the outer surface. We are not certain what it is. That determination requires more intense laboratory work. Are there any volunteers?

In preparing to write this article, I not only reviewed my earlier work on copper inclusions in Lake Superior agates ("Inside Lake Superior Agates, Part I", *Lapidary Journal*, January 1987, pp. 50-56; "Inside Lake Superior Agates, Part II", *Lapidary Journal*, August 1990, pp. 81-87). I also did a literature search of previous publications that might be helpful. I found none on native copper inclusions in agates, except my own work. However, I did find an article by A.J. Hall, D. Banks, A.E. Fallick, and P.J. Hamilton entitled "An Hydrothermal Origin for Copper-Impregnated Prehnite and Analcime from Boylestone Quarry, Barrhead, Scotland" (*Journal of the Geological Society*, 1989, Vol. 146, Issue 4, p 701-713). They argued that such copper impregna-



TOM SHEARER PHOTO

What appears to be a wide, plum-red, curved fortification band on the upper left is a thin coat of the red copper oxide chalcotrichite covering a botryoidal mound of native copper.



tion is consistent with water interacting with hot alkaline basalt. The hot alkaline solutions that were thus produced digested feldspars in the basalt and then re-precipitated the minerals into fractures and veins as the hydrous alumino silicates analcime and prehnite.

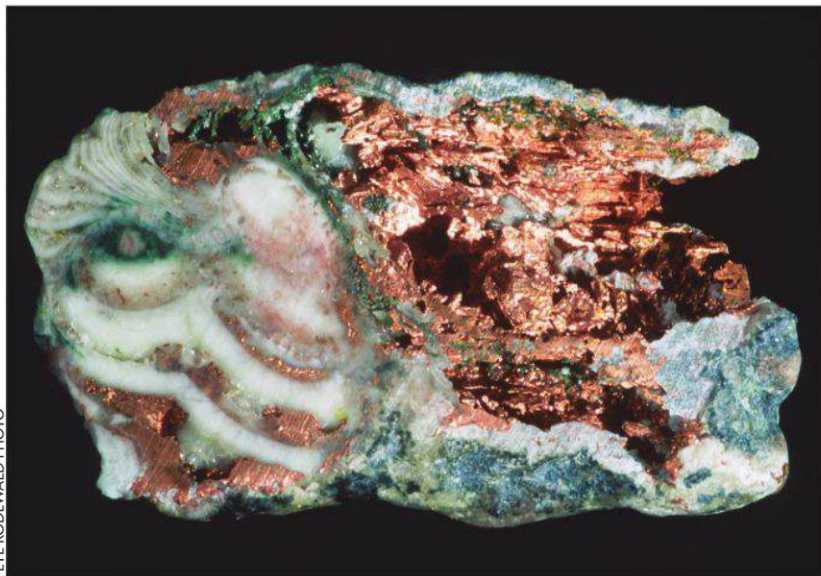
Had Banks, et al. studied the copper perfused agates from the Kearsarge Lode and the Wolverine #2 mine, they might have said that water—both meteoric and magmatic—interacted with the copper-rich basalts of Copper Country and became laden with water soluble copper minerals and other minerals. These waters also became highly alkaline, which is presumed from absence of coarse quartz in copper agate. At the same time, chalcedony bands often remain in part or whole, since the chalcedony is less soluble in the alkaline solution than the coarse quartz.

Given adequate time, this copper-rich, hot, and very alkaline solution eroded the agates' husks and slowly perfused the agates that were in situ in the basalt. The hot alkaline solutions slowly solubilized the coarse quartz in the agate bands and in other pockets, including the center cavity of the agate and, to a much lesser extent, some of the less soluble chalcedony of the agate bands. Fibrous white chalcedony bands are common in many copper agates.

In this chemical sequence, the copper present is envisioned as being oxidized and remobilized from disseminated copper minerals in the basalt to add water-soluble copper salts to the hot alkaline solutions. Subsequently, in the agate cavities, the solutions, which were rich in feldspar minerals and copper salts, re-precipitated them as the hydrous alumino silicates analcime and prehnite and various copper minerals.

As the solution cooled further, the copper salts in solution were re-precipitated as native copper, through a reduction mechanism, both between and upon the greenish prehnite and/or white chalcedony bands, which helped crystallize the reduction of copper ions in solution into elemental copper. Presumably, the original agates were charged with iron minerals that are known to be characteristic of many agates in these basalts. These newly solubilized iron salts are known to catalyze the reduction of copper ions in solution into elemental copper.

Since the green copper carbonate has been seen in these copper agates, it's also reasonable to assume that there were some organic materials dissolved in the original solution, which provided a source of CO<sub>2</sub> that was necessary for precipitation of the green copper mineral malachite.



PETE RODEWALD PHOTO

Etching revealed both the outer surface and the inside of this agate. Untouched are the smooth, white chalcedony bands, native copper, and epidote.

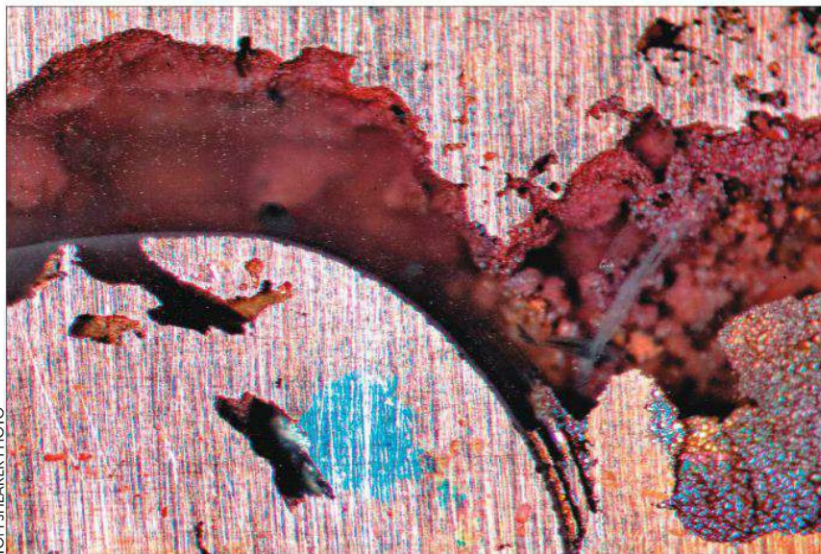
### RAREST OF THE RARE

Another agate in my collection is extremely rare—much rarer than the gemmy copper agates! It is a fitting specimen with which to end this story, as the mineral and agate collecting community should be aware of it. My logic is that, since it is so rare, it might encourage other collectors to look for and collect small agates with an unusual pink color on beaches and in Copper Country mine dumps. The agate has a banded fortification pattern of white, gray and pink. The pink coloring in the bands is due to very fine copper crystals.

From studying my agate, which came from a beach on the Keweenaw Peninsula,

and similarly colored ones, I've come to understand that these shades of pink are a signal that the agate may contain tiny—though large enough to be seen with the unaided eye—crystals of copper. There are fortifications of white and clear gray chalcedony on the lower left half.

Other rarest of the rare Copper Country agates are from the Wolverine #2 mine. Some contain blebs of native silver, which is not a singular occurrence, as I have several others. If I can acquire and study several more copper agates with these silver blebs, there may be another story and I have a title for it: "Ag Agate: An Agate with Noble Metal".



TOM SHEARER PHOTO

The silver-aqua spot in this very rare agate is a 3mm silver bleb surrounded by massive copper.



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Show Dates from page 10

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**5-6—STURTEVANT, WISCONSIN:** Annual show; Racine Geological Society; Fountain Banquet Hall, 8505 Durand Ave.; Sat. 10-5, Sun. 10-5; free admission; club displays, silent auction, rock identification, door prizes; contact John Lowman, 3223 Spruce St., Racine, WI 53403, (262) 554-5370; Web site: rgs-wi.tripod.com

**11-13—ANCHORAGE, ALASKA:** Show; Chugach Gem & Mineral Society; Anchorage Sheraton Hotel, 2nd Floor, 401 E. 6th Ave.; Fri. 5-9, Sat. 10-5, Sun. 11-4; free admission; dealers, displays, silent auction, kids' rock bingo; contact Anita Williams, PO Box 92027, Anchorage, AK 99509-2027, (907) 522-4664

**11-13—HAMBURG, NEW YORK:** Show and sale; GemStreet USA; Erie County Fairgrounds, The Grange Bldg., 5600 McKinley Pkwy.; Fri. 10-6, Sat. 10-6, Sun. 11-5; adults \$7, seniors (60+) and students (12-17) \$5, children under 12 free; gems, jewelry, beads, fossils, minerals; contact Jane Strieter Smith, (216) 521-4367; Web site: www.gemstreetusa.com

**11-13—HUMBLE, TEXAS:** 58th annual show; Houston Gem & Mineral Society; Humble Civic Center, 8233 Will Clayton Pkwy.; Fri. 9-6, Sat. 9-6, Sun. 10-5; adults \$7, seniors and students \$6, children under 12 free; displays, working exhibits, fluorescent mineral exhibit, Rock Food Table, swap area, more than 40 dealers, minerals, fossils, jewelry, slabs, rough, spheres, meteorites, beads, petrified wood slabs; contact Theresa Peek, Houston Gem & Mineral Society, 10805 Brooklet, Houston, TX 77099, (281) 530-0942; e-mail: show@hgms.org; Web site: www.hgms.org

**11-13—KINGSPORT, TENNESSEE:** Annual show; Mystery of Natural History Museum; MNHM Bldg., 321 Broad St.; Fri. 10-6, Sat. 10-6, Sun. 10-5; adults \$3, children 3 and up \$1, under 3 free; contact Mary McNabb, (423) 765-9900; e-mail: kptmuseumassn@usa.com

**11-13—MORGANTON, NORTH CAROLINA:** Annual show; Morganton Parks & Recreation; Collett Street Recreation Center, 300 Collett St.; Fri. 10-6, Sat. 10-6, Sun. 12-5; adults \$3, students \$2; dealers, exhibits, minerals, gems, jewelry, specimens, lapidary supplies, interactive gem mining booth, educational booth with a gem and mineral scavenger hunt, door prizes; contact Gary Leonhardt, 300 Collett St., Morganton, NC 28655, (828) 439-1866; e-mail: recreation@ci.morganton.nc.us; Web site: www.ci.morganton.nc.us

**11-13—ORLANDO, FLORIDA:** Fall show; Central Florida Mineral & Gem Society; Central Florida Fairgrounds, 4603 W. Colonial Dr.; Fri. 1-6 Sat. 10-6, Sun. 10-5; adults \$5, seniors and students \$2, \$1 off with ad; minerals, metaphysical stones, beads, jewelry, cabochons, sterling silver, demonstrations, faceting, cutting and polishing cabochons, silver smithing, children's sluice table, Scout merit badge help; contact Gordon Oakley, 5032 Lido St., Orlando, FL 32807, (407) 592-4358; e-mail: oakleysmall@gmail.com; Web site: www.cfmgss.org

**11-13—PASCAGOULA, MISSISSIPPI:** Annual show; Mississippi Gulf Coast Gem & Mineral Society; Magnolia State Gem, Mineral & Jewelry Show; Jackson County Fairgrounds, 2902 Short Cut Rd.; Fri. 10-6, Sat. 9-6, Sun. 10-5; adults \$3, children 12 and under free; door prizes, raffle, 20 dealers, gold panning and sluicing; contact James Darnell, 7121 Oakhurst Dr., Ocean Springs, MS 39564, (228) 875-2310; Web site: www.mcgcms.org

**11-13—PUYALLUP, WASHINGTON:** 7th annual show; NW Opal Association, Cascade Mineralogical Society; Puyallup Fairgrounds, Meridian St. S and 9th Ave. SW; Fri. 10-5, Sat. 10-5, Sun. 10-4; adults \$4, children (under 12) free; contact Lyle Jorgensen, (425) 483-0557; e-mail: mechanix@comcast.net

**11-13—SACRAMENTO, CALIFORNIA:** Annual show; Sacramento Mineral Society; Scottish Rite Temple, 6151 H St.; Fri. 10-5, Sat. 10-6, Sun. 10-4; adults \$5, children (12 and under) free; 75th Diamond Jubilee, Siberian Cave Bear exhibit, hourly prize drawings, rock exhibits, fossils, opals, carvings, beads, mineral and rock specimens, custom and wire-wrapped jewelry, meteorites, mystic stones, rock slabs, crystals, findings, nephrite, jadeite, faceted stones, polished rocks, rings, pendants, diamonds, lapidary equipment; contact Terry Rubstello, 8251 Tanow Court, Sacramento CA, 95828, (916) 682-5330; e-mail: onerockcollector@gmail.com; Web site: www.sacramento.mineralsociety.org

**11-13—SANTA ANA, CALIFORNIA:** Wholesale/retail show, "Fall West Coast Gem & Mineral Show"; Martin Zinn Expositions; Holiday Inn-Orange County Airport, 2726 S. Grand Ave.; Fri. 10-6, Sat. 10-6, Sun. 10-5; free admission; open to the public, more than 80 wholesale and retail

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**11-13—TACOMA, WASHINGTON:** Wholesale and retail show; Gem Faire Inc.; Tacoma Dome, 2727 E. D St.; Fri. 12-6, Sat. 10-6, Sun. 10-5; adults \$7 weekend pass, children 11 and under free; jewelry, gems, beads, crystals, silver, rocks, minerals; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

**12—RICHMOND, VIRGINIA:** 20th annual Rock Swap; Richmond Gem & Mineral Society; Ridge Baptist Church Meeting Hall, 1515 Eastridge Rd.; Sat. 9-3; free admission; swapping, rocks, minerals, fossils, shells, geology-related items, dealers, mineral specimens; contact Murray Rosenberg, (804) 740-0019; e-mail: mdr63sdr@verizon.net

**12—VALLEJO, CALIFORNIA:** 2nd annual show; Vallejo Gem & Mineral Society; Vallejo Veterans Bldg., 420 Admiral Callaghan Ln.; Sat. 9-5; adults \$1, children under 14 free with adult admission; free raffle prizes; contact Dan Wolke, 255 Essex Way, Benicia, CA 94510, (707) 745-1816; e-mail: dncwolke@sbcglobal.net; Web site: www.iwired.org

**12-13—CORDOVA, TENNESSEE:** Show; Intergalactic Bead & Jewelry Shows; Woodland Hills-Grand Ballroom, 10000 Woodland Hills Dr.; Sat. 10-5, Sun. 10-5; dealers, precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals, demonstrations, jewelry classes; contact Angela, (888) 729-6904; e-mail: angela.couch@beadshows.com; Web site: www.beadshows.com

**12-13—EDMONDS, WASHINGTON:** Annual show; Maplewood Rock & Gem Club; MRGC clubhouse, 8802 196th St. SW; Sat. 9-5, Sun. 10-5; free admission; display cases, games, demonstrations, raffle prizes, free rocks for kids; contact Susan Cooper, 1526 192nd St. SE, #A2, Bothell, WA 98012, (206) 650-5971; e-mail: ducanasas@hotmail.com; Web site: maplewoodrockclub.com

**12-13—FAIRFAX, VIRGINIA:** 20th annual show; Northern Virginia Mineral Club; George Mason University, Student Union Bldg. II, Rte. 123 and Braddock Rd.; Sat. 10-6, Sun. 10-4; more than 20 dealers, minerals, fossils, crystals, gems, jewelry, carvings, meteorites, demonstrations, exhibits, door prizes, silent auction Sun., kids' mini-mines, fossil dig; adults \$5, seniors \$3, students (13-17) \$3, children (12 and under), Scouts in uniform and GMU students with valid ID free; contact Tom Taaffe, (703) 281-3767; e-mail: rockcllctr@aol.com; or Jim Kostka; e-mail: jkostka@juno.com; Web site: www.novamineralclub.org

**12-13—JACKSON, MISSISSIPPI:** Show and sale; The Greater Southern Gem & Jewelry Shows; Trade Mart Facility, Mississippi Fairgrounds, 1207 Mississippi St.; Sat. 9-6, Sun. 10-5; adults \$6, children under 6 free; dealers, demonstrations, opals, gemstones, minerals, fossils, jewelry, precious stones, rare stones, rough, classes, gold and silver at discount prices; contact Stan Bennett, 242 Faith Hill Dr., Ridgeland, MS 39157, (601) 898-0407; e-mail: stan@tompkinsdesigngrp.com

**12-13—LAKE HAVASU CITY, ARIZONA:** 42nd annual show; Lake Havasu City Gem & Mineral Society; LHC Community Center, 100 Park Ave.; mineral and jewelry displays, dealers, demonstrations, educational geological presentations; contact C. Russell, (928) 846-0927

**12-13—NEW YORK, NEW YORK:** Show and sale; Excalibur Mineral Corp.; Holiday Inn Midtown Manhattan, 440 W. 57th St. (between 9th Ave. and 10th Ave.); Sat. 10-6, Sun. 11-5; adults \$6, children under 12 free with adult; minerals, gems, gemstone gifts, jewelry, crystals, fossils, beads, lectures, exhibits, door prizes, kids' events; contact Excalibur Minerals, (914) 739-1134; e-mail: info@excaliburmineral.com; Web site: www.excaliburmineral.com

**12-13—SEDRO WOOLLEY, WASHINGTON:** Annual show; Skagit Rock & Gem Club; Sedro Woolley Community Center, 720 State St.; Sat. 9-5, Sun. 10-5; free admission; special displays, demonstrators, raffle prizes, door prizes, silent auction, dealers, children's activities; contact Vi Jones, (360) 424-8340; e-mail: rocks1x1vi.george@frontier.com

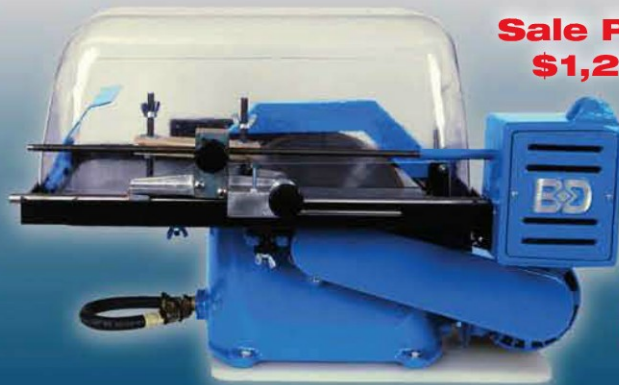
**12-13—YUBA CITY, CALIFORNIA:** 20th annual show, "Festival of Gems and Minerals"; Yuba Sutter Fairgrounds; Franklin Hall, 442 Franklin Ave.; Sat. 9-5, Sun. 9-4; free admission; exhibits, demonstrations, silent auction, children's activities, exhibits, dealers; contact Erik Anspaugh, (916) 567-9750; e-mail: rocks@Hughes.net; Web site: www.sutterbuttes.net

continued on page 54



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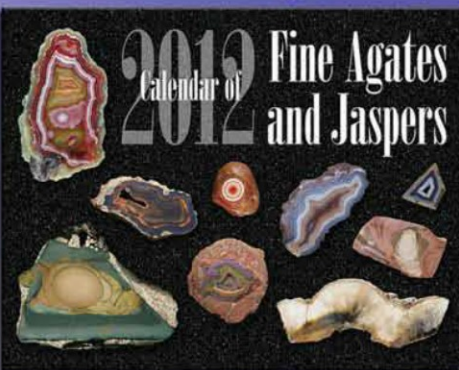
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# FOSSIL PARK FINDS

## Collecting Fossils and Minerals in Ohio's Silica Formation

Story and Photos by Jake Gorczyca



Brachiopods are abundant at Fossil Park, and you can find most of them resting upon the surface of the shale. No digging or rock splitting is required.

**F**ossil Park is part of the Toledo Olander Parks System and is located near Sylvania, Ohio, northwest of Toledo. It has a paved driveway and parking lot, a modern bathroom facility, and some trails for hikers and cyclists. The park's purpose is to grant collectors access to Ohio's Silica Formation shale, which was previously only accessible via quarries. Some of these quarries actually dump some of their spoils into a shallow pit at Fossil Park to keep the collecting area supplied with Silica Formation shale. It's a great place to take younger children, as most of the fossils are lying on the surface and therefore don't require a lot of hard labor to find. Also, this sort of park doesn't present the typical hazards of a quarry or gravel pit.



I've had two opportunities to visit Fossil Park and I've come home with some very nice specimens both times. My first opportunity came when my pastor took a group of students from his home school co-op's earth science class there on a field trip. He also invited anyone from his church to attend, and I accepted immediately.

The trip from Jackson, Michigan, took about an hour, but our growing anticipation concerning the fossils that might await us made it seem shorter. When our group arrived at the park, we followed a paved trail down a gentle slope into a pit where the quarries dump the shale. The pit is 40 or 50 feet in diameter and probably 10 or 15 feet deep. A fence separates the designated collecting area from the rest of the pit and there were signs that showed us what kind of fossils we were likely to find. There were picnic tables under some pavilions in the collecting area where we could set our finds. There was also a tank of water that we could use to clean our specimens. The rest was nothing but a lot of gray shale.

Most of the shale pieces were not very large. There were some boulders resting against one side of the pit within the collecting area and some smaller stones about the size of a person's head to the size of a baseball among them, but the rest of the area was composed of chips that are smaller than a 50-cent piece. There was also a fine layer of gray-colored shale dust that coated almost everything in sight. I'm not sure whether the collecting area looks more like an old mining camp or the surface of the moon.



**A paved trail leads down a gentle slope into a pit where local quarry operators dump loads of the Silica Formation shale to keep the fossils hunters supplied.**

It was not very long until we began to find fossils. I don't remember exactly how long it took me to find my first, but I doubt that it was more than 10 minutes. It was a brachiopod that looked to be either a spirifer or mucrospirifer. The fossil was composed of the same gray material that I described earlier, but the material that makes up its shell has a different, glossier, more shell-like appearance that causes it to look like a petrification and not a cast. There is a great deal of detail preserved upon its surface.

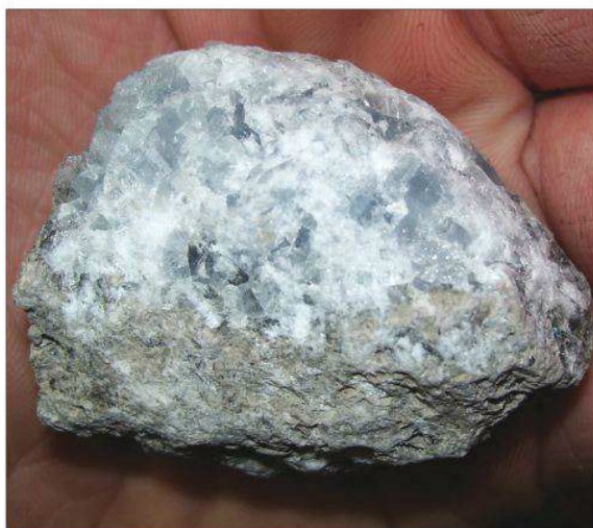
As I kept looking, I continued to find more brachiopods, most of which were similar in appearance to the first. And like the first, they were resting on the surface of the shale, so I didn't have to dig or split rock to find them. They range in size from  $\frac{3}{4}$  inch to  $1\frac{1}{2}$  inch long along the hinge of the shell. Some of these brachiopods have been replaced by pyrite, though a few specimens are tarnished to a maroon color. They measure about  $\frac{3}{4}$  inch across.

Brachiopods are not the only fossils available at Fossil Park. In addition to the shellfish, I uncovered a horn coral that was  $2\frac{1}{4}$  inches long. It was gray and had a fine coating of shale dust like the brachiopods. I uncovered a few trilobite fossils, but none were complete. Most were either posterior ends or heads. I also managed to find what appears to be the cast of some sort of mollusk, similar to a modern clam, but a bit rounder. Like the other fossils, it is gray in color, but since it is only a cast, it lacks that shell-like look that the others display. It has a football-shaped cross section and measures about  $1\frac{1}{2}$  inches at its widest. The cast is of both shell halves and it appears that they were connected at the time of fossilization, but I only have the anterior portion of the fossil. It may be a dalmanella brachiopod, but I have yet to fully identify it.

I found almost all these fossils lying on the surface of the ground, but a few were contained within some larger pieces of shale. Since sharp tools are not allowed in



**I would guess that these creatures are phacops trilobites judging by their compound eyes and by the fact that the species has been found in silica shale before.**



**You can distinguish celestine from calcite because celestine is harder than calcite and has a different crystal shape.**



the park, I had three choices when it came to breaking open the larger stones: either attempt to split them with my bare hands, take them home and break them open there, or hit them with other rocks. I chose the third option and received a nice tear wound on my finger to show for it. I think these kinds of injuries are probably why sharp tools are banned. The rules say nothing about breaking rocks open with other rocks, but after my experience I wouldn't recommend it.

There are a lot of crinoids at Fossil Park, but most are single disks and not the familiar columns. These disks range in size from 5mm to about 9mm in diameter, and I would guess that they are all either from platycrinites or taxocrinus crinoids. If you want to find crinoids at Fossil Park, the best method I can suggest is to crawl around on your hands and knees and look very closely at the ground. I found a great number of disks that way, and they seemed to be especially abundant in the little drainage paths that carry water from the higher levels of the collecting area to the bottom of the pit. In my opinion, these tiny rainwater channels are the best place to find crinoids.



Compact white calcite that is generally opaque, but with some individual crystals that are transparent, can be found in the Silica Formation shale.



Pyritized fossils form when iron from the soil in which the animal dies combines with the sulfur that is present in the chemical makeup of the animal's body.

It is true that we went to Fossil Park to collect fossils—as expected from the name—but I was certainly not opposed to taking home a few minerals. That is, of course, if I could find any. While I was searching near the large boulders I described earlier, I came across a mass of very light-blue crystals that were sitting upon a grayish matrix. They were packed very closely together—so tightly, in fact, that I was only able to distinguish a few individual crystals from the mass. They seem to be transparent, but their compact nature causes the whole aggregate to appear almost opaque. The crystals nearest to the surface of the mass are damaged and appear white. I have identified this mineral as celestine, as it has the correct crystal shape and light blue color, and it is harder than calcite.

There is also a good deal of pyrite available to the collector at Fossil Park, but most of what I found was in the form of fossils. One member of our group did find a mass of cubic pyrite crystals that was an inch or so across. These crystals had not been tarnished, so their bright, brassy color was still present.

By the end of the day, I'd accumulated multiple brachiopods, a few trilobite heads and tails, a beautiful mass of celestine crystals, and a good number of crinoid disks. I'm sure that everyone went home with at least a few brachiopods and stories about a new rockhounding trip to share.

I next visited Fossil Park three years later with my pastor, Ed Utz. We arrived at about 10:30 a.m. and our plan was to look around until noon, take a short journey to Sylvania, Ohio, for lunch, and then return to the park to do some additional searching. I'd already found a great number of fossils during my last trip, so I was a bit more intent upon looking for minerals like celestine and pyrite this time.

The sky was filled with gray clouds that morning, which was not a cheerful sign, but

we didn't mind. After a little while, some tiny raindrops began to fall, but still we were still determined to hunt. I wandered the whole park and Pastor Ed stayed at the center of the pit to search the piles of shale there. While I was walking around, I managed to find an agglomeration of what appears to be calcite topped with chalcopryite. The crystals are so small that their hardness and streak are difficult to judge, so my identification may be inaccurate.

After I showed Pastor Ed the calcite specimen, I decided to try the boulders again. They seemed like a good place to look, as I had found some trilobite tails and the celestine among them last time. My decision proved to be a good one because my efforts at the boulders were rewarded with a chunk of shale that was topped with a layer of calcite. The calcite was white and, like the celestine, so compact that it appears opaque as a whole, but some individual crystals are transparent. The matrix measures about 3½ inches by 1¾ inches and its thickness gradually increases from a little over an inch at one end to nearly 2 inches at the other. The crystals themselves make up a layer that is about ¼ inch thick and covers the entire face of the stone. I'm certainly pleased with that find!

After this, I left the boulders behind and began to look around near the center of the pit. There I found a small piece of shale that contained a great many brassy-colored pyrite crystals. All of them were so small that they're best appreciated under magnification. They appear to be octahedrons and measure only a millimeter or two from apex to apex.

Once I'd found the pyrite, my collecting slowed a little. By about noon, the sun had begun to shine brightly, but I hadn't found any noteworthy specimens except for a few trilobite heads. By this time, however, a few families with younger rockhounds had arrived, so my somewhat stagnant collecting





**Pyrite crystals at Fossil Park tend to be embedded in the shale matrix and are so small they're best appreciated under magnification.**



**You can find a lot of crinoid disks and other small fossils by crawling on your hand and knees and looking very closely at the surface of the soil.**

was brightened by the opportunity to identify the minerals and fossils they found. They found a lot of brachiopods and crinoids, some of which had even been replaced by pyrite or chalcopyrite. One little girl brought me a pyrite concretion that was about an inch long and as big around as a peanut in its shell. It was tarnished, so its surface was mostly maroon with a little brassy-orange tinge showing through, but its condition was good enough to allow us to see the flattened pyrite cubes upon its surface. What a find! After seeing such a beautiful concretion, I naturally wanted to find my own and went out in search of one. For a while, I looked in a lot of different places, but was unable to locate such a gem.

Around 1 o'clock, Pastor Ed and I decided to take our lunch break, but just before we left, I saw a little brown sphere lying on the ground. I picked the thing up and broke it with my fingers, which released a very faint sulfur smell. The interior of this rock was both gray and yellow and, thinking I'd found native sulfur, I excitedly put it away and we left to have our meal.

After lunch, we popped into a local bookstore, where I found a book on the subject of rock and mineral identification and skimmed through it, stopping at the page about native sulfur. I learned that the mineral is occasionally found in shale deposits, which added further credibility to my assumption.

Next, we returned to Fossil Park to try to secure a few last specimens before returning home. We poked around, but didn't find anything worth keeping, as far as we were concerned. Then I decided to try looking by the boulders again. I scrutinized the smaller pieces that rested at the base of the pile for some time before I finally came across two small crystals. Both are transparent and colorless, albeit a little cloudy. One appears to be celestine, but the other, an irregular octahedron, hasn't been identified yet.

At 3:30 that afternoon, I photographed the last of my specimens and we returned to Michigan. At home, I was able to conduct a few tests with these minerals so that I could better identify them, though there are two that have resisted all my attempts so far. I viewed the little brown sphere that smelled of sulfur under a stereo microscope and learned that the gray patches are actually striking crystals that appear to be selenite and that the yellow patches do look a lot like sulfur, but since both are so small that I cannot test their hardness or streak I've had a difficult time identifying them more precisely.

Fossil Park is located at 5675 Centennial Road, west of Sylvania. From Jackson, take U.S. Highway 127 south to U.S. Highway 223 and head southeast to Memorial Highway, which cuts south above Ottawa Lake, Michigan. After about three miles, turn right onto Clark Road and continue 1.5 miles to Lynch Road. Jog right on Lynch, then left where Clark Road continues, and cross into Ohio. Clark Road will become Centennial Road, and after almost a mile you will see Fossil Park's driveway on the left.

From Toledo, Ohio, take Interstate 475 west to U.S. Highway 235. Exit Central Avenue W. (U.S. Highway 20) and head west. Go about 2½ miles, then turn right onto Centennial Road. In about 3 miles, you'll see Fossil Park on your right.

The park is open year round, but the fossil collecting area is only open from the third weekend in April through the first weekend in November. It is open daily from 8:30 a.m. to 90 minutes before sunset. Fossil Park is open to the public and admission is free. All tools other than brushes are prohibited in the park, including hammers, chisels, screwdrivers and shovels. If there is a piece of shale that you'd like to break open but cannot split with your hands, I suggest that you take it home. And while I haven't seen this

rule posted anywhere, I would also recommend keeping younger children away from the pile of boulders, as footing there is not completely sure. You'll also want something to carry your fossils home in, as well as adequate sun protection. I would also advise wearing a sturdy pair of jeans since there will be a lot of crawling around on pieces of broken shale involved in your search. For more information about Fossil Park, visit [www.olanderpark.com/pages/Fossil.htm](http://www.olanderpark.com/pages/Fossil.htm). ♦



**Because of its iridescent tarnish chalcopyrite is often called "peacock pyrite."**



# ROCK & GEM Kids

## Chalcopyrite

$\text{CuFeS}_2$

Chalcopyrite, or copper iron sulfide, is similar to pyrite ( $\text{FeS}_2$ ). Both are iron sulfides. Both are yellow. Both leave a green-black streak on a streak plate. But in addition to iron and sulfur, chalcopyrite has the extra element of copper in its chemical composition. Ordinary pyrite tends to be pale yellow, but the copper gives chalcopyrite a richer golden or brass-yellow color.

Chalcopyrite can form tetrahedral (four-sided) crystals, bubbly botryoidal clusters (sometimes called "blister ore"), or compact masses. When freshly exposed, it has a brass-yellow color, but upon tarnishing, it develops an iridescent sheen that reflects a rainbow of metallic colors, particularly purple.

Chalcopyrite may form in association with sulfide veins from volcanic activity and hydrothermal (hot water) mineral solutions. It can also form in what are called "porphyry copper ore deposits" that are created during the crystallization of magma. It is often associated with minerals like pyrite, sphalerite, galena, pyrrhotite, quartz and calcite.

Chalcopyrite is the most widespread of copper minerals and is considered the most important ore of copper. In fact, it's sometimes called "yellow copper". Some economically important open-pit mines are found in the American Southwest at Bingham, Utah; Ely, Nevada; and Ajo, Arizona.

With its colorful iridescent sheen, tarnished chalcopyrite is a popular collectible that can be purchased in most rock shops and museum gift shops, and at rock and gem shows. If there are no localities nearby where you can collect your own, you can easily find small specimens of the massive, granular variety that are both affordable and beautiful.

—Jim Brace-Thompson



Tetrahedral chalcopyrite crystals



Tarnished chalcopyrite

The Quiz is open to U.S. residents 17 and younger. Mail your answers to **November Quiz, Rock & Gem magazine, P.O. Box 6925, Ventura, CA 93006-9899**. Five winners will be drawn from the valid entries received by **Nov. 31, 2011**. Valid entries must include the correct answers, the entrant's name, age and address, and the signature of a parent or guardian. This month's prize is a set of four pins from the annual Denver Gem & Mineral Show and a Colorado Minerals coloring book.



## The Quiz

1. Chalcopyrite and pyrite both have the elements \_\_\_\_ and \_\_\_\_ in their chemical formulas.
2. Chalcopyrite crystals are \_\_\_\_ (four-sided) in form.
3. \_\_\_\_ chalcopyrite has a colorful iridescent sheen.
4. Tufa and travertine are soft and hard varieties of \_\_\_\_.
5. \_\_\_\_ objects have become covered with stony material.

Check your answers at [www.rockngem.com](http://www.rockngem.com) beginning December 1.



## AMAZING MINERALS!

### Mother Shipton's Cave and Petrifying Well

Mother Shipton was a prophetess who, legend says, lived in a cave in North Yorkshire, England. Villagers from Knaresborough would ask her to foretell their futures. Because of her uncanny knack of being right, some considered her a witch.

Perhaps one of the things that boosted her supernatural reputation was the Petrifying Well located near her cave. Mineral-rich spring water flows over the lip of a cliff in a waterfall into the well below. Calcium carbonate in the water is deposited on the cliff face as tufa (a soft, porous variety of limestone) and travertine (a harder, fibrous form of limestone), slowly forming a rock curtain over time.

Objects that lie under the flow of water slowly become petrified. For centuries, the townspeople considered the well's apparent ability to turn leaves and twigs into stone to be magic. By "petrify", we mean "covered with stony material". This is different from "petrification", in which the mineral actually replaces organic material.

Ever since the Petrifying Well became a visitor attraction in 1630, visitors have liked to hang objects under the waterfall to be petrified. A top hat and bonnet left there in 1853 are now only visible as bumps in a wall of rock. Today, any number of ordinary objects can be seen suspended under the falls. Teddy bears seem to be the most popular, though, since they take only three to five months to turn to stone.

With a parent's supervision, learn more about this natural wonder at [www.mothershiptonscave.com](http://www.mothershiptonscave.com).

—Lynn Varon



## JUNIOR ROCKHOUND SPOTLIGHT:

### Emma Explores the World

Emma Hughart's late grandfather, Dr. Charlie A. Crutchfield, amassed a large mineral collection, which Emma's mother, Laura, shared with her. Thus began Emma's exploration of minerals, which in turn helped her explore the world, as she learned where each mineral had come from. Choosing from her grandfather's collection of specimens, Emma assembled a competitive display for the Ventura (California) County Fair entitled "Minerals Around the World". She used pins and ribbons to connect the minerals to their countries of origin on a map. Her display won the First Place and Best of Show ribbons in the junior division.

I met Emma at the fairgrounds and asked her what had inspired her to become a mineral collector. "Grandpa began collecting when he was 10, like me," she noted. Walking home one day, he saw a man with minerals in a wagon.

"What are you doing with these, mister?" Charlie asked.

"Getting rid of 'em!" was the reply.

Charlie gladly took the specimens and began reading about minerals in the library. This ignited an interest in chemistry, and he went on to become a chemical engineer. Charlie collected minerals in the field and bought them at gem shows. While volunteering at the Los Angeles Museum of Natural History to help categorize minerals, he was occasionally given spare specimens. Eventually, he had collected 1,000 minerals, all of which he meticulously cataloged.

Emma said, "My grandpa and grandma collected minerals from around the world—and now their adventure is passed on to me." She pointed to an amber-colored zincite from Poland as her favorite specimen, but asked where she would most like to collect, she quickly replied, "France!"

Emma encourages you, too, to explore the world of minerals and to share your explorations. Does your county fair have categories for collections? Can you join a local rock club and display your collection at a show? There are many ways to share your love of minerals with your community. In the hobby of mineral collecting, there's a whole world to explore!

—Jim Brace-Thompson



Emma Hughart's "Minerals Around the World" display won First Place and Best of Show ribbons at the 2011 Ventura County Fair.



## SHOWCASE



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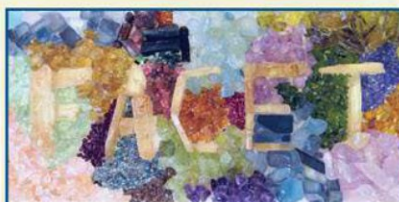
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**November 11 – 13 Santa Ana, CA;** West Coast Gem, Mineral & Fossil Show; Holiday Inn 2726 South Grand Ave. Room #148; Fri. & Sat. 10am - 6pm, Sun 10am - 5pm

**January 28 - February 11(2012) Tucson, AZ;** Martin Zinn Expositions Arizona Mineral & Fossil Show; The Hotel Tucson City Center "Formerly The Inn Suites" 475 N. Granada, Tucson AZ Room #235; 10am - 6pm Daily, Sat. Feb 11th 10am - 5pm

**April 20 - April 22 Denver, CO;** Colorado Mineral & Fossil Show - Spring; Holiday Inn Denver Central; 4849 Bannock St., Denver, CO 80216; Fri. & Sat. 10am - 6pm, Sun. 10am - 5pm

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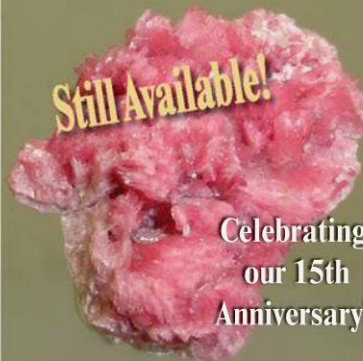
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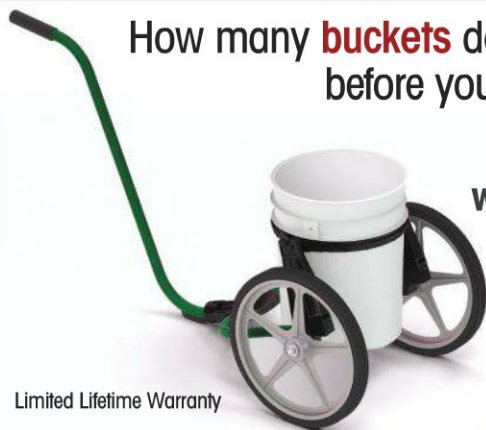
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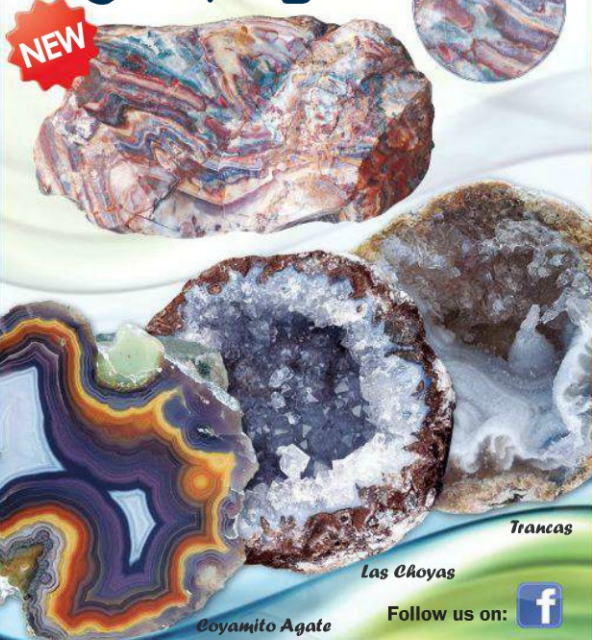
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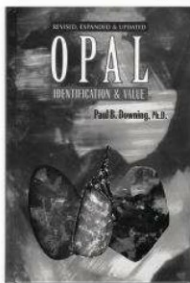
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# READER

## A Rockhound's Hike

I was hiking down a wooded path when something caught my eye,  
A spike of light shot to my brain, so find it I did try.  
Somewhere along a stormy night a crystal broken free,  
Washed up from some long distant stream, to stop in front of me.

I picked it up wiped off the dirt, and placed it in the light,  
Its geometry was so perfect, the angles set forth right,  
The way the light danced in its form, a dazzling sight to see,  
What an awesome wonderful thing that nature's given me.

My thoughts then wandered near and far, considering the cause,  
That makes this clear and crisp structure that made me stop and pause.  
Hydrothermal actions deep in the crust, the convections of this earth,  
Amazing that a simple drink begins a crystal's birth.

The attractive forces between the parts that seem so very small,  
Cause molecules to stack together and rise up nice and tall,  
They shape this piece of artwork, because of how they touch,  
Who says that microscopic things cannot affect so much?

But all of this had happened so deep inside the globe,  
That to fathom how it came to me is more than I can probe,  
Erosion and tectonics, the two go hand in hand,  
As they force this special form to be found upon the land.

Back from my thoughts, and back to earth, I do the usual thing,  
Place this lovely rock into my pocket, a treasure for a king,  
And then as if, it weren't enough, I then begin to look,  
To try and find another, it seems that I am hooked.

My nature stroll has turned about, diverted down a road,  
From walking straight and being tall, to crouched down like a toad,  
My gaze on trees and animals has altered to the ground,  
As I continue collecting minerals, adding more to what I've found.

—John Green

## Depth of a Stone

Like ephemeral flecks of cloud  
suspended in clearest water  
the truth lies within.  
A stone tells no lies.  
Banded ripples distort the surface  
clashing colors slipping along  
outlining fractures, faults, and failures  
with a gleaming crystalline core.  
Broken down: silicon, oxygen, iron  
the elements combined as if asleep.  
Solidified. Preserved. Entombed ...  
for all to observe and judge.  
Leaves of manganese and veins of silver  
decorate its formal face.  
Polished. Reflective. Glistening.  
What is the depth of a stone?

—Aaron Wiltsey



# POETRY

## Without a Clue, One Thing to Do

This Class Rocks

A rock was needed to teach a school class.  
 No one could find the rock, and time did pass.  
 The teachers looked and could not find a clue.  
 They said, "There's only one thing we can do."  
 They asked for help and got it from a cop.  
 They said, "Any further delay must stop.  
 Without specimens how can we teach rocks?  
 We've searched everywhere, even in our socks."  
 Now the cop that they called was Sherlock Holmes.  
 He and Dr. Watson came from their homes.  
 Sherlock deduced and solved many a crime.  
 They all knew he could do it one more time.  
 He carefully inspected the school scene,  
 While he learned about rocks and what they mean.  
 The class was smart, they answered and they talked.  
 Sherlock Holmes saw that this class really rocked.  
 He guaranteed he'd find the rock today.  
 Everyone then heard Dr. Watson say,  
 "Sherlock you found the rock; the time is noon.  
 How could you find this rock so very soon?  
 You didn't even have to leave the room.  
 And you used no tools, not even a broom.  
 How could you find it immediately,  
 When everyone else searched so futilely?"  
 The teachers and the class with one intent  
 To hear the answer leaned forward and bent.  
 The answer was a familiar one,  
 "It was sedimentary, dear Watson."

—Ronald J. Yadusky, BS, MD, FACS

## Gold Fever

Keeping Secret Is Hard to Do

When you find gold in your gold pan,  
 That's when you start to make a plan,  
 So you can get to all the rest.  
 This fact is true; I do not jest.  
 What may help you in this your quest,  
 May be to have a rockhound guest,  
 To warn you how you'll be deceived,  
 To have your gold from you relieved.  
 Believe me there is gold fever;  
 You'll soon be a new believer.  
 Rockhounds, they know what's gone before.  
 They'll help you make your own big score.  
 You first will need to stake a claim  
 Of ownership put in your name.  
 That in itself is not enough,  
 'Cause keeping claims secret is tough.  
 Everything can give you away,  
 From what you do to what you say.  
 For all loose talk you'll have to pay.  
 They'll mine your site when you're away.  
 You'll be besieged and be followed.  
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## READER POETRY from page 43

If any trace of gold is found,  
They'll follow you just like a hound.  
Don't use your gold to buy supplies,  
Keeping claims secret is so wise.  
The world seems full of claim jumpers,  
Through sellers of water pumbers.  
I'm sure, also, that you'll be told  
That there are those who'll kill for gold.  
Those playing cards know what's the best,  
You keep your cards close to your vest.  
Mud between logs had some gold dust.  
A stranger saw, and felt he must  
Have this log house and gold nearby.  
He asked the farmer could he buy.  
In modern times the real gold fields  
Screen tons of dirt for their small yields.  
And you may never see glitter.  
These changing times make some bitter,  
If they have not kept up study,  
Or had a rockhound as buddy.  
Gold is where you find it, you know,  
But telling where that is, go slow.

—Ronald J. Yadusky, BS, MD, FACS

### The Mohs Hardness Scale

Test Hardness by Scratch

Resistance to scratch is hardness.  
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What's high in scale scratches the low,  
That's how this hardness scale does go.  
Friedrich Mohs found this hardness scale.  
Only ten steps it does entail.  
Two and a half is finger nail,  
It will scratch all talc without fail,  
For talc starts scale at number one.  
Scratch it with fingernail for fun.  
Three and a half is any coin.  
It scratches calcite when they join.  
A coin will scratch calcite for you,  
But fingernail it will not do.  
For calcite's three, and that is right,  
So fingernail won't scratch calcite.  
Five and a half is a knife blade.  
It won't scratch glass, don't be afraid.  
For glass is six and quartz seven,  
Corundum's nine and diamond's ten.  
Red corundum is called ruby,  
I doubt if any scratch you'll see.  
Blue corundum is sapphire.  
Resistance to scratch adds desire.  
Ruby and sapphire both match,  
So they give each other a scratch.  
Diamond's rare; quartz is often found.  
These minerals are in the ground.  
Gypsum is two, fluorite is four.  
This scale includes just a few more.  
Apatite five and Topaz eight,  
Diamonds scratch all in a line straight.  
Orthoclase feldspar is a six.  
All the minerals in this mix,  
Represent to us what is hard,  
They give a challenge to a bard.

—Ronald J. Yadusky, BS, MD, FACS





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# Mineral Collections and Mines

Story and Photos by Steve Voynick

## Find Them Both in Leadville, Colorado

The image of Leadville, Colorado, varies considerably in the eye of the proverbial beholder. Geologists see Leadville as a textbook example of a massive lead-silver replacement deposit, while historians view it as the richest and wildest silver camp of the Western frontier. To tourists, this town at 10,152 feet above sea level is the heart of the Colorado Rockies and North America's highest incorporated city. From the more pragmatic perspective of working miners, it's the community that will serve the soon-to-reopen Climax molybdenum mine.

In the eyes of mineral collectors, however, Leadville is notable for having more publicly displayed mineral collections than most cities many times its size. Four of Leadville's six museums exhibit nearly 2,000 mineral specimens. Some Leadville collections are world-class, and few have ever been displayed elsewhere. Most of these specimens are at the National Mining Hall of Fame & Museum (NMHF&M), which has become known as much for mineral collections as for mining exhibits.

Leadville's mineral-related attractions also include a surface tour of the historic Matchless Mine, which was once part of the mining empire of 19th-century silver baron Horace Austin Warner "HAW" Tabor. And a tour of the recently opened Hopemore mine takes visitors 600 feet down a narrow shaft to see what mines in the historic Leadville Mining District were really like.

Leadville's rich history makes it a perfect venue for mineral collections and mine tours. Since 1860, miners in the Leadville and nearby Climax districts have driven 550 miles of underground workings, extracting molybdenum, silver, gold, lead and zinc with a combined value conservatively estimated at more than \$5 billion.

Located in the central Colorado Rockies, Leadville lies on the western slope of the 14,000-foot-high peaks of the Mosquito Range. Created some 65 million years ago with the uplift of the modern Rocky Mountains, the Mosquito Range consists of blocks of granite basement rock that were thrust upward through overlying formations of limestone and dolomite. Fractures provided conduits for the upward movement of magma and associated metal-rich, hydrothermal solutions, which emplaced metal-sulfide mineralization in vein and limestone-replacement deposits. Both types contained substantial amounts of silver, lead, zinc and gold, along with lesser amounts of copper.

After subsequent Pleistocene glaciation uncovered the upper sections of these deposits, exposure to water and atmosphere oxidized the sulfides into carbonates. Creeks then concentrated the heaviest minerals—argentiferous lead carbonate and native gold—into small placers of extraordinary richness.

The image of Leadville, Colorado, varies considerably in the eye of the proverbial beholder. Geologists see Leadville as a textbook example of a massive lead-silver replacement deposit, while historians view it as the richest and wildest



This remarkable stalagmitic specimen of native sulfur is displayed at the NMHF&M.



Prospectors discovered these placers in 1859. Within a year, 10,000 fortune-seekers had rushed to Oro City, the ramshackle boomtown that was the forerunner of present-day Leadville. By 1865, when rapidly depleting placers had turned Oro City into a ghost town, miners had recovered 250,000 troy ounces of gold worth nearly \$5 million.

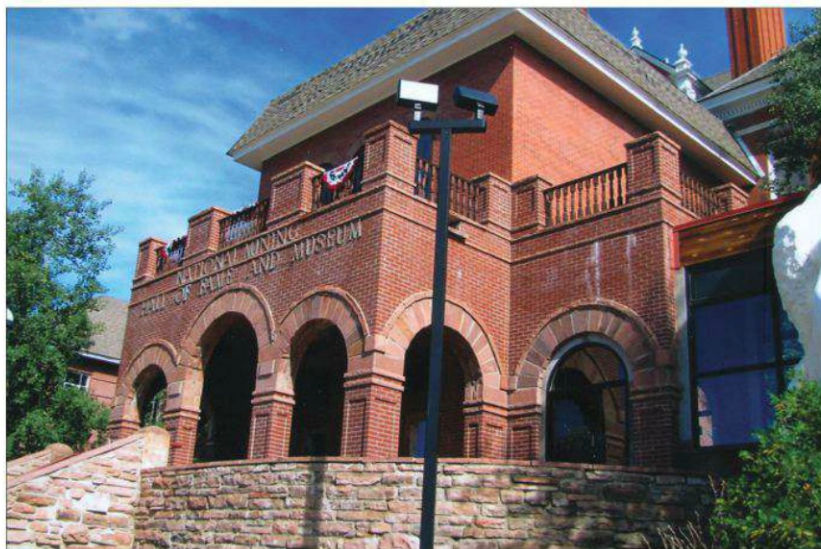
Oro City miners had long cursed the heavy, black sand that clogged their sluices. In 1874, this sand, which originated in nearby lode deposits, was identified as argentiferous cerussite—lead carbonate carrying small amounts of silver. But with lead then selling for a penny per pound, there was little interest in the deposits. Nevertheless, when a new camp sprang up near a small lead smelter, miners optimistically named it “Leadville”, after the only metal that seemed to offer even a modicum of economic hope.

Then in 1877, miners sank shallow shafts into deposits of argentiferous cerussite containing several thousand troy ounces of silver per ton. By 1880, Leadville (population 30,000) was the largest city between St. Louis and San Francisco. That year, 400 Leadville mines turned out 10 million troy ounces of silver and 33,000 tons of lead.

The legendary figure who emerged from Leadville’s silver boom was former shopkeeper H.A.W. Tabor. In 1878, HAW, as he was known, grubstaked two prospectors with \$64 in return for a one-third interest in anything they found. At only 16 feet, the prospectors struck a fantastically rich silver-lead deposit. HAW and his wife, Augusta, bought out their partners and soon became Leadville’s first millionaires. But HAW, who served as Colorado’s lieutenant governor and briefly as a U.S. senator, quickly mired himself in a national scandal by leaving Augusta for Elizabeth Bonduel McCourt Doe, a young divorcee known as “Baby Doe” because of her delicate beauty.

Leadville’s silver boom ended abruptly in 1893 when the repeal of the Sherman Silver Purchase Act deflated the silver market. Hundreds of silver mines closed, and HAW’s fortune was wiped out.

By 1900, although silver prices remained depressed, national industrialization had created strong demand for lead and zinc, metals that Leadville had in abundance. Leadville boomed again during the two world wars and the Korean Conflict, while surviving the inevitable post-war depressions. Time finally ran out on Leadville in 1960, when the last of its mines, mills and smelters closed.



The National Mining Hall of Fame & Museum, located in Leadville, Colorado, has become known as much for its world-class mineral collections as for its mining exhibits.



The Crystal Room at the NMHF&M displays a number of small collections, including specimens from the prestigious Proctor Collection (foreground).

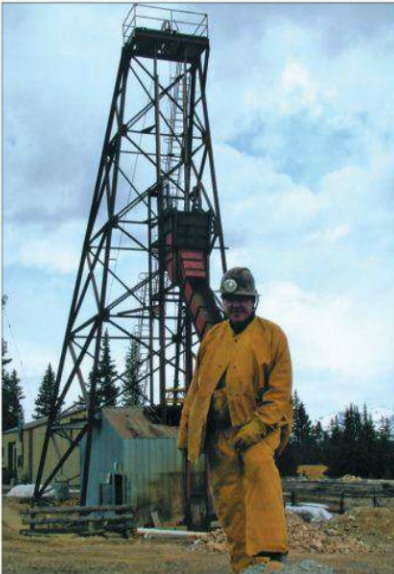


The Anaconda Collection includes these three superb specimens of Australian opal.





The right wall of the Prospectors Cave, taken from the Idorado mine, consists of crystals of calcite and quartz, while the left wall, originally from the Eagle mine, consists entirely of cubic and dodecahedral pyrite.



Miner and tour leader Bob Calder welcomes visitors to the Hopemore mine.

By then, however, Leadville fortunes were tied to molybdenum, an alloying metal that toughens steel. Twelve miles north of Leadville, atop 11,318-foot-high Fremont Pass, the Climax mine had begun working an enormous deposit of molybdenite (molybdenum disulfide) in 1917. By 1960, Climax had grown into the world's largest underground mine. It reached its peak in 1980, with 150 miles of underground workings, a sprawling open pit, a daily production of 50,000 tons of ore, and 3,200 employees, who sustained Leadville's economy in lavish, boomtown style. Then in 1982, the molybdenum market crashed, Climax suspended production, and Leadville once again fell into a deep economic depression.

As Leadville worked to promote tourism in the late 1980s, the recently founded and cash-strapped NMHF&M was looking for a home in any one of a half-dozen western mining towns. The NMHF&M had little to offer except the potential to grow into a major tourist attraction. Leadville, meanwhile, had a potential home ready and waiting—a vacant, 90-year-old, Victorian-style brick schoolhouse. Desperate to attract the museum, Leadville made the four-story, 71,000-square-foot building available for the bargain-basement lease rate of 50 cents per year. The NMHF&M jumped at the opportunity.

Fortunately, the NMHF&M had an ace in the hole: close ties to mining-industry professionals. Industry contributions and state grants funded both renovations and acquisition of the first mineral collections and mining exhibits. The museum never looked back. Today, many of its 25,000 annual visitors are attracted primarily by its mineral collections.

"Our mineral collections are unusual because most were assembled by mining professionals," says Bob Hartzell, the NMHF&M's executive director. "Some specimens occasionally adorned mining-corporation lobbies, but most were put in storage, sometimes for decades. Until we received these collections, few had ever been publicly displayed. We also have specimens on loan from other museums and from top private collections. Most, however, have been donated to us and are permanently displayed. We now have nine major mineral collections or mineral-related exhibits."

The major collections on display at the museum include:

**The Frost Collection**, assembled over 40 years by Dr. John E. "Jack" Frost, former

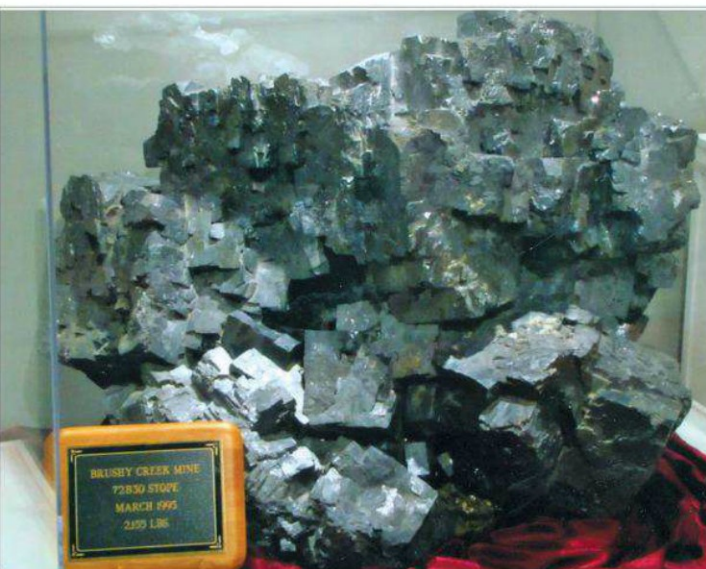
president of Frost Minerals International in Houston, Texas. During his years as a globe-trotting exploration geologist, Frost developed an eye for fine mineral specimens, acquiring them from mines, miners, and other geologists. In 2006, Frost's 701-piece collection was formally appraised at \$150,000. The following year, Frost donated his entire collection to the NMHF&M. Today, the Frost Mineral Gallery displays miniature- to cabinet-size specimens in large glass cases that line a 50-foot wall. The specimens are arranged geographically by source: North America, Mexico, Oceania and Australia, South America, etc.

**The Missouri Collection**, donated to the NMHF&M in 1998 by the Doe Run Co., one of the world's largest lead producers, out of St. Louis, Missouri. This collection of 32 cabinet- to large-cabinet-size specimens was collected over decades in the underground mines of east-central Missouri's lead-rich Viburnum Trend. Specimens include a spectacular pink calcite dripstone and large, museum-grade crystals of calcite, galena, sphalerite and pyrite. The largest specimen is a mass of nearly pure galena that weighs 2,155 pounds! Recovered from Doe Run's Brushy Creek mine in Reynolds County, Missouri, in March 1995, this extraordinary specimen exhibits superb cubic crystal development and consists of 87% lead.

**The Anaconda Collection**, 139 small-cabinet-size specimens, that were donated to the NMHF&M in 1995 by the ARCO Coal Co., the corporate successor to the historic Anaconda Minerals Co. Assembled over the course of a century by Anaconda exploration geologists, mine managers, and executives from mines and mineral prospects on four continents, this superb collection is displayed under 50 glass domes. Some specimens were once exhibited at the Anaconda corporate headquarters in Butte, Montana. Especially interesting are specimens of rough Australian black opal and such rare, brightly-colored copper minerals as chenevixite, olivenite, and kröhnkite.

**The Phelps Dodge Copper Collection**, donated in 1990 by the Phelps Dodge Co. (now Freeport-McMoRan), a major copper producer for nearly a century. These 80 specimens of native copper from northern Michigan were assembled by company executives during the 1930s and '40s, when the state's last mines were still producing. Some specimens are as long as 2 feet; the most impressive and valuable are several large-cabinet-size "half breeds", specimens containing both native copper and native silver.





The largest mineral specimen at the NMHF&M—a mass of nearly pure galena that weighs 2,155 pounds and stands 3 feet high—is part of the Missouri Collection.



Rare, brightly colored olivenite (green) and kröhnkite (blue) are among the copper minerals that make up the Anaconda Collection.

**The Gold Room**, displaying gold specimens and artifacts from the 17 states that have hosted historically significant gold rushes. The Gold Room is the only exhibit of its kind in the nation. It offers the opportunity to compare the physical variations of gold from different states. Displays include Alaskan nuggets, Montana leaf gold, gold in quartz from California and New Mexico, wire gold from Colorado, and even samples of today's very-low-grade gold ores from Nevada. Some specimens are on long-term loan from state historical societies and museums in the gold-rush states. Also displayed are 100 leaf-gold specimens from Idaho Springs, Colorado; 6-troy-ounce nuggets from Fairplay, Colorado; a 24-troy-ounce Australian nugget that was found with a metal detector; and a gleaming, 22-troy-ounce specimen of crystallized gold from Leadville's famed Little Jonny mine.

**The Boyles Brothers Drilling Co. Collection**, donated in 1990 by that Salt Lake City, Utah, core-drilling company. Its 200 specimens of ores, rock and minerals, mostly miniatures, were assembled over decades by supervisors of the Boyles Brothers drilling teams that conducted core-drilling exploration at mines and mineral prospects worldwide.

**The Prospector's Cave**, a walk-in mine replica with only two "specimens": 6-foot by 8-foot wall sections taken from two historic Colorado mines. One consists entirely of pyrite, the other of calcite-quartz. The pyrite wall, covered entirely with nicely developed, cubic and dodecahedral pyrite crystals, was removed intact from the now-closed Eagle mine at nearby Gilman in 1978. The calcite-quartz wall was removed from the Ildorado mine near Telluride shortly before its closure in 1979. Glittering with

crystals of white calcite and colorless and milky quartz, this wall was recovered with the aid of hydraulic splitters that broke it into four major sections that weigh about 400 pounds each.

**The Wyoming Jade Collection**, consisting of 17 large-cabinet-sized blocks of polished nephrite jade in gray, green and black, and in snowflake and streaked patterns. This collection was donated by Wyoming uranium- and jade-mining companies in 1990.

**The Proctor Collection** (now part of the Scott Rudolph Collection), which is represented in part at the NMHF&M. This collection, assembled by Keith and Mauna Proctor of Colorado Springs, Colorado, is one of the nation's most prestigious private mineral collections. The Proctors' display consists of 30 cabinet-size specimens, including striking examples of Sweet Home mine rhodochrosite from nearby Alma, Colorado, zeolites from India, and calcites and sphalerites from classic Tennessee localities.

Other unusual and eye-catching mineral displays at the NMHF&M include a 4-foot-high stalagmite of pure sulfur donated by the Freeport Sulfur Co. (now Freeport-McMoRan); a collection of Colorado diamonds, including rough stones, cut gems, and the diamond "indicator" minerals ilmenite, pyrope and diopside, from the Kelsey Lake Diamond mine; a selection of 16 rough and worked pieces of Afghan lapis lazuli; and rough and gem emeralds from Zimbabwe's Sandawanda mines. A beautiful Utah variscite is one of a dozen specimens on loan from the National Museum of Natural History (Smithsonian Institution). Other specimens are on loan from the Harvard Mineralogical Museum.

The NMHF&M has just unveiled two major new exhibits. "Expanding Boundaries: Harrison Schmitt and the New Mining Frontier", was inspired by National Aeronautics and Space Administration (NASA) astronaut Harrison Schmitt, the only geologist to walk on the moon and a member of the NMHF&M board of governors. The exhibit features a dozen meteorite specimens up to 2 feet in size.

Also new is a \$250,000 exhibit highlighting the Climax molybdenum mine that was funded mainly by the Freeport-McMoRan Foundation. This exhibit focuses on the history and development of the Climax mine, one of the great stories of American mining, and the many interesting and diverse uses of molybdenum.

Within easy walking distance of the NMHF&M, three historical attractions also display mineral collections: the Healy House, the Heritage Museum, and the House with the Eye. During recent renovations at the Healy House, a beautifully restored 1878 private home and boarding house owned by the Colorado Historical Association, workers discovered a box of mineral and ore specimens from long-closed Leadville mines and other Colorado mines in the dusty attic. Because the specimens and their labels had become separated, the Healy House called on local mining engineer Bob Elder to sort things out. The properly labeled, 160-piece collection is now on permanent display at the Healy House.

The House with the Eye is a private residence from the 1880s that is named for an unusual stained-glass representation of a human eye mounted in a roof alcove. The house turned museum in 1963 and operated until 1987. For the next 24 years, it fell into disrepair. It was meticulously restored





**The Anaconda Collection consists of 139 specimens that were collected by company exploration geologists, mine managers, and executives over the course of a century.**



**The NMHF&M's Missouri Collection includes 32 cabinet- to large-cabinet-size specimens from the underground mines of east-central Missouri's lead-rich Viburnum Trend.**

in 2011. During the restoration, workers found a collection of 250 specimens of minerals and ores, many more than a century old, from Leadville mines. Again, local mining experts helped label the specimens, which are now permanently displayed at the House with the Eye in a room dedicated to the history of Leadville mining.

The Heritage Museum, owned by the Lake County Civic Center Association, also displays a 150-piece collection of Leadville ores, minerals and rocks that dates from the 1880s to the present.

Those interested in buying local mineral specimens should visit The Rock Hut on Leadville's historic Harrison Avenue. Owned by Irene and Jim Witmer, the latter a former chief of engineers at the Climax Mine, The Rock Hut's display cabinets are filled with 2,500 specimens, some 500 of which are from the Leadville and Climax areas. Local specimens include rhodochrosite from the Climax mine and the nearby Sweet Home mine, and golden barite and galena-quartz from the Black Cloud mine, Leadville's last producing mine, which operated from 1972 until 1999.

Visitors are also welcomed at the Matchless and Hopemore mines. The Matchless, located 1.5 miles east of downtown Leadville on 7th Street, was once part of HAW Tabor's silver empire. HAW purchased the mine in 1879 for \$110,000, then watched it produce \$7 million in silver over the next 13 years. When HAW died penniless in 1899, he left his second wife, Baby Doe, in poverty. Subsequent owners of the inactive Matchless pitied the destitute and increasingly eccentric widow, allowing her to live in the mine's tiny cabin. She stayed there for 36 years, sometimes trading pieces of the mine's high-grade silver ore for groceries. The 80-year-old Baby Doe died alone at the Matchless in March 1935, an event that marked the end of an era.

The NMHF&M acquired the Matchless in 2005 and now offers surface tours of the original timber headframe, hoist house, blacksmith shop, and Baby Doe's cabin. Legend has it that HAW's final words to Baby Doe were, "Hang onto the Matchless, it will make you rich again."

HAW's faith may not have been unfounded. In 2006, the Boart Longyear Corp. and the Newmont Mining Corp., both supporters of the NMHF&M, joined together in a project: Boart Longyear took 1,000 feet of drill cores at the Matchless and Newmont assayed them. At a depth of just 200 feet, the cores revealed silver-rich mineralization worth several hundred dollars per ton—very rich by today's ore-grade standards.

The Hopemore mine offers underground tours. A former gold-silver-lead-zinc-copper producer dating to 1908, the Hopemore is located 3.2 miles east of downtown Leadville at the lofty elevation of 11,560 feet. The mine tour is the dream of former hardrock miner and talented visual artist Bob Calder, who opened it to the public in 2010 to help preserve Leadville's mining history. Although the Hopemore workings are more than a century old, its steel headframe and electric hoist are modern. The mine is state permitted and complies fully with current mine-safety regulations.

Most underground mine tours are well-lighted and have relatively spacious, graded walking areas. While these mines provide an underground experience, few of them convey the true conditions present in early underground mines. At the Hopemore, only four people (wearing hard hats and slickers) can squeeze into the tiny cage that rattles 600 feet down a narrow shaft to a dimly lighted, cramped level station. The Hopemore drifts are just 6 feet by 6 feet in size, a reminder that early miners removed only the rock that was absolutely necessary to follow ore veins.

Calder personally guides underground tours, explaining local geology and mining history, the basic hardrock-mining process, and frontier-era and modern drilling techniques. Where drifts cut through mineralized veins, pyrite and chalcopryrite gleam from the rock and emit the distinctive, sulfurous smell of oxidizing sulfide minerals. Visitors with a touch of claustrophobia are admittedly relieved to return to the surface, but are nevertheless grateful for the opportunity to have seen what early underground mines were really like.

Leadville seems to be heading toward another mining boom, at least one of modest proportions. After a \$500 million upgrade of its surface facilities, the Climax mine will reopen in 2012 as an open-pit operation with 400 employees. And Climax should be mining well into the future. Its ore reserves, pegged at 137 million tons, contain well over \$1 billion in molybdenum.

Unlike Climax, the future of Leadville's historic mining district remains uncertain. But as Calder points out in his underground tours, early miners left behind a wealth of metals. In 1970, the former U.S. Bureau of Mines estimated that the Leadville Mining District still contains 840,000 troy ounces of gold, 26 million troy ounces of silver, and large tonnages of lead and zinc. Considering today's soaring metal prices, especially those of silver and gold, Calder believes that at least limited mining of high-grade ores will be conducted in the near future.

Leadville is located 100 miles west of Denver at the junction of state Route 91 and U.S. Highway 24. The NMHF&M is open daily year round. For further information, visit [www.mininghalloffame.org](http://www.mininghalloffame.org) or call (719) 486-1229.

The Hopemore mine is open from June through October. Call (719) 486-0301 for reservations. For further information, visit [www.HopemoreMineTour.com](http://www.HopemoreMineTour.com).



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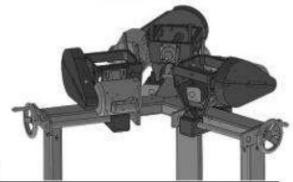


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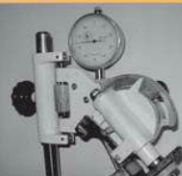
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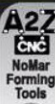


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## Show Dates from page 33

### NOVEMBER 2011

**18-20—COLUMBIA, SOUTH CAROLINA:** Annual show; Columbia Gem & Mineral Society; Jamil Temple, 206 Jamil Rd.; Fri. 10-7, Sat. 10-6, Sun. 10-5; adults \$4, children 12 and under free, military and dependents free Sun.; geode sales and cutting, beads, jewelry, South Carolina amethyst clusters, crystals, fossils; contact Susan Shrader, PO Box 6333, Columbia, SC 29260, (803) 736-9317; e-mail: ashdrad@mindspring.com; Web site: www.cgams.org

**18-20—MARIETTA, GEORGIA:** Annual show; Cobb County Gem & Mineral Society; Cobb County Civic Center, 548 S. Marietta Pkwy.; Fri. 10-6; free admission; lapidary demonstrations, gem, mineral, fossil and jewelry displays; contact Mary Ingram, 2771 Fernvalley Rd. NE, Marietta, GA 30066, (404) 915-3588; e-mail: mandmgram@gmail.com; Web site: www.cobbcountymineral.org

**18-20—PORTLAND, OREGON:** Wholesale and retail show; Gem Faire Inc.; Oregon Convention Center, 777 NE MLK Jr. Blvd.; Fri. 12-6, Sat. 10-6, Sun. 10-5; adults \$7 weekend pass, children 11 and under free; jewelry, gems, beads, crystals, silver, rocks, minerals; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

**18-20—SPRINGFIELD, OREGON:** Show; Springfield Thunderg Club; Willamalane Center for Sports and Recreation, 250 S. 32nd St.; Fri. 12-7, Sat. 10-7, Sun. 11-4; contact John Randall, PO Box 312, Springfield, OR 97472, (541) 683-2661, or Bob Smith, (541) 736-0060

**18-20—ST. LOUIS, MISSOURI:** Annual show; St. Louis Mineral & Gem Society; Affton Community Center, 9801 Mackenzie Rd.; Fri. 4-8, Sat. 10-7, Sun. 10-5; adults \$3, students \$1, children 13 and under and Scouts in uniform free; free rockhound starter kit for all children 13 and under; contact Melissa Perucca, (636) 861-3865; e-mail: PeruccaM@aol.com; Web site: www.StLRockClub.com

**19-20—BREMERTON, WASHINGTON:** Show, "Fall Festival of Gems"; Kitsap Mineral & Gem Society; Kitsap County Fairgrounds, The President's Hall, 1200 NW Fairgrounds Rd.; Sat. 10-5, Sun. 10-5; free admission; dealers, demonstrations, club displays, junior events, silent auction, raffle; contact Jim McClure, (253) 265-3011; e-mail: pogy2@centurytel.net; Web site: www.kmgs.org

**19-20—CHARLOTTE, NORTH CAROLINA:** Show; Intergalactic Bead & Jewelry Shows; Metrolina Tradeshows Expo-Bldg. B, 7100 Statesville Rd.; Sat. 10-5, Sun. 10-5; dealers, precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals, demonstrations, jewelry classes; contact Angela, (888) 729-6904; e-mail: angela.couch@beadshows.com; Web site: www.beadshows.com

**19-20—FORT WORTH, TEXAS:** Wholesale and retail show; The Bead Market; Armon Carter Exhibit Hall Will Rogers Center, 3400 Burnett Tandy Dr.; Sat. 10-5, Sun. 10-4; beads, gemstones, vintage beads and buttons, pearls, Swarovski Elements, crystals, lampwork, PMC, seed beads, glass beads, bone beads, jewelry, tools, books; contact Rebekah Willis, (903) 240-7198; e-mail: rebekah@thebeadmarket.net; Web site: www.thebeadmarket.net

**19-20—LEBANON, PENNSYLVANIA:** Show and sale, "Gem Miner's Holiday Festival"; Mid-Atlantic Gem & Jewelry Association; Lebanon Expo Center, Rte. 72 and Rocherty Rd.; Sat. 10-5, Sun. 11-4; adults \$5, children under 12 free; gems, jewelry, minerals, fossils, beads; contact MAGMA, (301) 565-0487; Web site: www.gem-show.com

**19-20—OXNARD, CALIFORNIA:** Annual show; Oxnard Gem & Mineral Society; Oxnard Performing Arts Center, 800 Hobson Way; Sat. 9-5, Sun. 10-4; free admission; free rock for each child, lapidary demonstrations, glass-bead making, wire wrapping, rock polishing, dealers, gems, minerals, fossils, stone beads, Idaho opals, silver craft, finished jewelry, tools, lapidary supplies, books; contact Norb Kinsler, 6550 Swan St., Ventura, CA 93003, (805) 644-6450; e-mail: show\_info@oxnardgem.com; Web site: www.oxnardgem.com

**19-20—PAYSON, ARIZONA:** 14th annual show; Payson Rimstones Rock Club; Mazatzal Hotel & Casino Event Center, Bingo Hall, Tonto Apache Reservation; adults \$3, children under 12 free; gems, minerals, fossils, lapidary equipment, education center, spinning wheel, silent auction; contact Margaret Jones, (928) 476-3513 or (928) 970-0857

**19-20—WORCESTER, MASSACHUSETTS:** Annual show; Worcester Mineral Club; National Guard Armory, 701 Lincoln St., I-290 Exit 22; Sat. 10-5, Sun. 10-4; adults \$3, seniors and students \$2, children under 6 and Scouts in uniform free; 14 dealers, exhibits, door prizes, demonstrations, raffle, unique

gifts, minerals, fossils; contact Lawrence Bull, Worcester Mineral Club, PO Box 2278, Worcester, MA 01613-2278; Web site: www.worcestermineralclub.org

**25-27—MOBILE, ALABAMA:** Show; Mobile Rock & Gem Society; Greater Gulf State Fairgrounds, Cody Rd. and Ziegler Blvd.; Fri. 2-7, Sat. 9-6, Sun. 10-5; contact Jerry Shirey, 2911 Pretty Branch Dr. W, Mobile, AL 36618, (251) 786-4777; e-mail: rockhoundjls@aol.com

**25-27—SALEM, VIRGINIA:** 32nd show; Roanoke Valley Mineral & Gem Society; Salem Civic Center, 1001 Boulevard; Fri. 2-7, Sat. 10-6, Sun. 12-5; adults \$3 for three days, children under 16 free; contact Roanoke Valley Mineral & Gem Society, PO Box 203, Boones Mill, VA 24065, (540) 204-7505

**26-27—MONTEREY, CALIFORNIA:** Wholesale and retail show; Gem Faire Inc.; Monterey County Fairgrounds, 2004 Fairground Rd.; Sat. 10-6, Sun. 10-5; free admission; jewelry, gems, beads, crystals, silver, rocks, minerals; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

**26-27—SAN FRANCISCO, CALIFORNIA:** Show, "San Francisco Crystal Fair"; Pacific Crystal Guild; Fort Mason Center, 99 Marina Blvd.; Sat. 10-6, Sun. 10-4; adults \$6, ages 12 and under free; 30 dealers, minerals, gems, crystals, beads, metaphysical healing tools; contact Jerry Tomlinson, PO Box 1371, Sausalito, CA 94966, (415) 383-7837; e-mail: jerry@crystalfair.com; Web site: www.crystalfair.com

**26-27—WICKENBURG, ARIZONA:** 11th annual show, "WOWW Gem Fair"; Wickenburg Gem & Mineral Society; Wickenburg Community Center, 160 N. Valentine St.; free admission; Sat. 9-5, Sun. 9-5; more than 40 dealers, gems, minerals, jewelry, door prizes, grab bags, spinning wheels, raffle; contact Beth, (480) 540-2318 or (928) 684-0380

### DECEMBER 2011

**2-4—EL PASO, TEXAS:** Annual show; El Paso Mineral & Gem Society; El Maida Auditorium, 6331 Alabama; Fri. 10-6, Sat. 10-6, Sun. 10-5; adults \$3, seniors \$2, students \$3, children under 12 free; gems, minerals, fossils, beads, jewelry, tools, books, equipment, geode cutting, silent auction, demonstrations; contact Jeannette Carrillo, 4100 Alameda Ave., El Paso, TX 79905, (915) 533-7153; e-mail: gemcenter@aol.com; Web site: epmgs.com

**2-4—INDIANAPOLIS, INDIANA:** Show and sale; GemStreet USA; Indiana State Fairgrounds, The Pioneer, Our Land Bldg. 1202 East 38th St.; Fri. 10-6, Sat. 10-6, Sun. 11-5; adults \$5, children under 12 free; gems, jewelry, beads, fossils, minerals; contact Jane Strieter Smith, (216) 521-4367; Web site: www.gemstreetusa.com

**2-4—SANTA BARBARA, CALIFORNIA:** Wholesale and retail show; Gem Faire Inc.; Earl Warren Showgrounds, 3400 Calle Real; Fri. 12-6, Sat. 10-6, Sun. 10-5; adults \$7 weekend pass, children 11 and under free; jewelry, gems, beads, crystals, silver, rocks, minerals; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

**2-4—SPRING HILL, FLORIDA:** Annual show; Withlacoochee Rockhounds; Slovener American Club, 13383 County Line Road; Fri. 9-5, Sat. 9-5, Sun. 9-5; adults \$3, students \$1, children under 12 free; demonstrations, gem and mineral auction, replica of Aaron's Breastplate, famous diamonds, dealers, rocks, minerals, fossils, jewelry; contact Ralph Barber, (352) 200-6852; e-mail: barbersbloomers@hotmail.com; Web site: http://withlacoocheerockhounds.com

**3-4—YORK, PENNSYLVANIA:** Show; Intergalactic Bead & Jewelry Shows; York Expo Center-Horticultural Hall, 334 Carlisle Ave.; Sat. 10-5, Sun. 10-5; dealers, precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals, demonstrations, jewelry classes; contact Angela, (888) 729-6904; e-mail: angela.couch@beadshows.com; Web site: www.beadshows.com

**9-11—COSTA MESA, CALIFORNIA:** Wholesale and retail show; Gem Faire Inc.; OC Fair & Event Center, 88 Fair Dr.; Fri. 12-6, Sat. 10-6, Sun. 10-5; adults \$7 weekend pass, children 11 and under free; jewelry, gems, beads, crystals, silver, rocks, minerals; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

**9-11—LONGMONT, COLORADO:** Annual show; Flatirons Mineral Club; Boulder County Fairgrounds Exhibit Bldg., 9595 Nelson Rd. (at Hover); Fri. 10-6, Sat. 9-6, Sun. 10-5; \$3 Fri., \$5 Sat. or Sun., children under 13 free with adult; 16 dealers, gems, rocks, minerals, jewelry, lapidary equipment, exhibits, demonstrations, kids' gold panning,



scavenger hunt, mineral identification game, dig site; contact Ray Gilbert, Flatirons Mineral Club, PO Box 3331, Boulder, CO 80307, (303) 774-8468; e-mail: HOSS1ONE@cs.com; Web site: <http://bcn.boulder.co.us/community/fmc/fmcshow.htm>

**9-11—NORCROSS, GEORGIA:** Annual show; Mammoth Rock Shows LLC; North Atlanta Trade Center, 1700 Jeurgens Court; Fri. 10-6, Sat. 10-6, Sun. 10-5; adults \$4 for 3 days, children under 16 free; 50 dealers, minerals, fossils, rough rock, gold and silver findings, tools, lapidary equipment, beads, jewelry, loose and mounted precious stones, jewelry repair, drawings, grand prize; contact Richard Hightower, 7334 Quail Run Rd., Lizella, GA 31052, (478) 935-9345; e-mail: [staff@mammothrock.com](mailto:staff@mammothrock.com); Web site: [www.mammothrock.com](http://www.mammothrock.com)

**9-11—SHARONVILLE, OHIO:** Show and sale; GemStreet USA; Sharonville Convention Center, 11355 Chester Rd.; Fri. 10-6, Sat. 10-6, Sun. 11-5; adults \$7, seniors (60+) and students (12-17) \$5, children under 12 free; gems, jewelry, beads, fossils, minerals; contact Jane Strieter Smith, (216) 521-4367; Web site: [www.gemstreetusa.com](http://www.gemstreetusa.com)

**10-11—FRANKLIN, TENNESSEE:** Annual show; Mid-Tennessee Gem & Mineral Society; Williamson County AgExpoPark, 4215 Long Ln., I-65 exit 61; Sat. 9-6, Sun. 10-5; adults \$4 (2-day pass \$6), students (13-18) \$1, children under 12 free with adult; Faceters' Frolic, demonstrations, exhibits, silent auction, door prizes, grand prize, more than 30 dealers, beads, crystals, geodes, rough, cabochons, gemstones, finished jewelry, tools, supplies, minerals, fossils, stone carvings; contact John Stanley, 2828 Donna Hill Dr., Nashville, TN 37214, (615) 885-5704; e-mail: [show@mtgms.org](mailto:show@mtgms.org); Web site: [www.MTGMS.org](http://www.MTGMS.org)

**10-11—RICHMOND, VIRGINIA:** Show; Intergalactic Bead & Jewelry Shows; Richmond Raceway Complex-Colonial Bldg., 600 E. Laburnum Ave.; Sat. 10-5, Sun. 10-5; dealers, precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals, demonstrations, jewelry classes; contact Angela, (888) 729-6904; e-mail: [angela.couch@beadshows.com](mailto:angela.couch@beadshows.com); Web site: [www.beadshows.com](http://www.beadshows.com)

**16-18—SAN DIEGO, CALIFORNIA:** Wholesale and retail show; Gem Faire Inc.; Scottish Rite Center, 1896 Camino del Rio S; Fri. 12-6, Sat. 10-6, Sun. 10-5; adults \$7 weekend pass, children 11 and under free; jewelry, gems, beads, crystals, silver, rocks, minerals; contact Yoo Nelson, (503) 252-8300; e-mail: [info@gemfaire.com](mailto:info@gemfaire.com); Web site: [www.gemfaire.com](http://www.gemfaire.com)

## JANUARY 2012

**1-31—QUARTZSITE, ARIZONA:** Wholesale and retail show; Desert Gardens RV Park; 1055 Kuehn St. (I-10 Exit 17); 9-6 daily; free admission; crystals, minerals, rough, polished, jewelry, lapidary equipment; contact Sharon or Sandy, 1055 Kuehn St., Quartzsite, AZ 85346, (928) 927-6361; e-mail: [dggemshow@ureach.com](mailto:dggemshow@ureach.com); Web site: [www.desertgardensrvpark.net](http://www.desertgardensrvpark.net)

**6-8—MESA, ARIZONA:** 40th annual show; Flagg Mineral Foundation; Mesa Community College, US 60 at Dobson, southwest parking lot; Fri. 9-5, Sat. 9-5, Sun. 9-5; free admission; Peralta Stone maps exhibit, fluorescent display, free children's activities, free samples for children and teachers, more than 100 dealers, crystals, minerals, fossils, club and museum booths; contact Dr. Ray Grant, PO Box 41834, Mesa, AZ 85274, (480) 892-0779; e-mail: [Presmyk@cox.net](mailto:Presmyk@cox.net); Web site: [www.AZMinFun.com](http://www.AZMinFun.com)

**6-15—QUARTZSITE, ARIZONA:** Annual show; Tyson Wells Enterprises Inc.; Tyson Wells Show Grounds, 100 W. Kuehn St.; 9-5 daily; free admission; rocks, gems, minerals, jewelry, silver and gold smithing, faceting, precious metals, lapidary tools, equipment, supplies; contact Kym Scott, P.O. Box 60, Quartzsite, AZ 85346, (928) 927-6364; e-mail: [tysonwells@tds.net](mailto:tysonwells@tds.net); Web site: [www.tysonwells.com](http://www.tysonwells.com)

**13-15—LARGO, FLORIDA:** 36th annual show and sale; Pinellas Geological Society; Largo Cultural Center, Parkside Room, 105 Central Park Dr.; free admission; contact Hugh Sheffield, (727) 894-2440 or (727) 707-3236

**20-29—QUARTZSITE, ARIZONA:** Annual show; Tyson Wells Enterprises Inc.; Tyson Wells Show Grounds, 100 W. Kuehn St.; 9-5 daily; free admission; rocks, gems, minerals, jewelry, lapidary tools, equipment, supplies, arts and crafts; contact Kym Scott, PO Box 60, Quartzsite, AZ 85346, (928) 927-6364; e-mail: [tysonwells@tds.net](mailto:tysonwells@tds.net); Web site: [www.tysonwells.com](http://www.tysonwells.com)

*continued on page 62*

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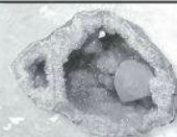


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# FF THE DOP

by Jim Perkins

## New Quick Polish Lap

I recently spoke to Dean LaMont from Sunrise Gems & Jewelry on the telephone and he told me that the company had recently released its new Quick Polish Lap in an 8-inch-diameter size. A 6-inch lap and mandrels for concave and fantasy faceting will also be offered. I had an opportunity to test a prototype Quick Polish Lap a few months ago and I found that it worked well for polishing quartz and other gems with only a slow water drip.



I also experimented with various oxide polishes and water applied with a brush in place of the water drip. I found polishing was even faster than with a water drip alone. The lap is permanently mounted to a master lap and has a generous layer (about 1/8 inch thick) of a proprietary polishing formula that makes this lap keep its charge throughout its lifetime. Dean told me that more than 2,000 stones had been polished on the prototype lap by the time I tested it and it showed no signs of wear, so I'm reasonably confident that one lap would last most faceters a lifetime. Over time, these types of laps will become shiny or glazed in appearance compared to the flat, dull-looking surface of a new lap. The more they are used, the better they perform.

People with more patience than I have can use only a slow water drip. While polishing will take a little longer using this **method, it is not as messy as using slurries.** With the price of cerium oxide skyrocketing and the possibility that it will vanish off the lapidary market completely, the introduction of the Quick Polish Lap may be very timely.

Recently, an elderly person took my faceting class and found that he had problems applying slurry with his left hand while polishing the stone with his right hand. I suggested a permanently charged lap might be a good solution, since only a water drip was needed and he could concentrate entirely on sweeping the stone across the lap.

I am especially excited to see the introduction of the Quick Polish Mandrels for concave and fantasy faceting/carving. Historians typically note the types of significant works of art and jewelry that are popular and noteworthy for the time. With the Polymetric OMF machine (www.polymetricinc.com) and Ultra-Tec's new machines (www.

ultratec-facet.com), I believe it is possible that the 21st century may be noted in part for the innovative free-form creations in gems and jewelry produced by many creative lapidaries on these machines. Fantasy cut stones are wildly popular with many jewelry consumers. As an owner of a Polymetric OMF machine, I am pleased to have mandrels that only require a little water or thin slurry to polish the concave surfaces of my gems.

I found that the Quick Polish Lap worked well at speeds of less than 900 rpm using firm hand pressure and a thin slurry. I would say the polished surface on quartz was equal to or better than either of the competition gems I entered and certified with. Faceters using concave and fantasy-type machines need only describe the size and shape of mandrel required to the folks at Sunrise, who will provide pricing.

Like most faceters, I have the basic grinding laps and an arsenal of polishing laps because grinding is easy, but polishing can sometimes be difficult. Therefore, it is good to have alternative polishing laps when your stand-by polishing lap won't work. I wasn't easily persuaded that I needed another polishing lap, but it appears that the Quick Polish products will be welcome additions to my shop.

Sunrise Gems & Jewelry can be contacted at 109 E. Main St., P.O. Box 206, Buena Vista, CO 81211-0206 or at (719) 966-6008. ♦

Send your comments and questions about any of my columns to Off the Dop, P.O. Box 1041, Medina, OH 44258, or e-mail me at jimperkins@zoominternet.net.





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# MINERAL ENVIRONMENTS,

## MINERAL DIVERSITY

How Nature  
Determines  
the Habits of  
Mineral Crystals

Story and Photos by Bob Jones

If you are curious about how the mineral in your hand formed, you are delving into a very interesting and useful area of mineral study. That mineral, be it a beryl crystal or a needle-like stibnite, is what it is because of the solution from which it formed. This mineral “soup” contains a variety of molecules and atoms it dissolved from the rocks through which it moved. This content sets the stage for the minerals that result. The conditions—think environment—the solution encounters are what determine the final resulting mineral crystals.

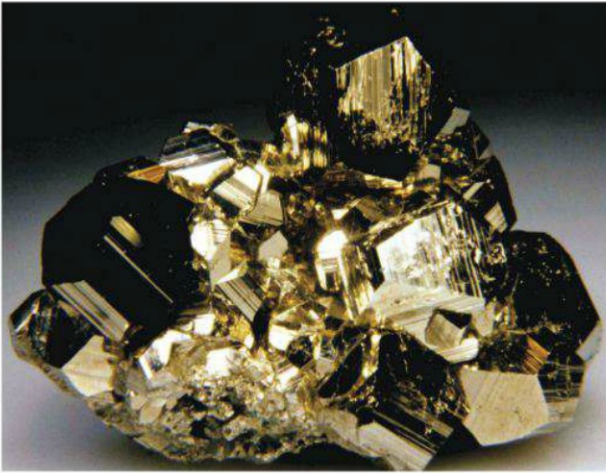


Simple calcite rhombs develop when the temperature of the mineral-rich solution is moderately low.

In the mineral world, when we talk about environment, we talk about all sorts of factors that can influence what the mineral is, when it formed, and even the crystal shape it has! Take a fluorite-rich solution, for instance. It forms a common mineral that is fairly simple chemically. One calcium atom and two fluorine atoms combine to form a molecule of fluorite. Yet, your fluorite crystal may be a perfect six-sided cube, while another fluorite crystal with the same chemistry may have eight sides or as many as 48 crystal faces!

Why is this? Assuming the solution from which these differing fluorites formed has the same concentration of calcium and fluorine atoms, how can fluorite become a cube, an octahedron, or a complex combination of several crystal forms? The simple answer is “temperature”.





This example of pyritohedral pyrite shows the common five-sided crystal faces.

Granted, there are other more complicated factors that influence crystal development, but simply put, the temperature of a fluorite-rich solution has a strong influence on the resulting crystal form. Simple cubes form best from a solution with a low temperature. Folks in the Midwest can attest that the fluorites from the local limestone quarries are always cubes, not octahedrons or something more complex. This is because the solution was only warm, not super hot, when the crystal started to form.

Minerals are categorized by the temperatures at which they form and are referred to as high-temperature, medium-temperature or low-temperature formations. This means the temperature of the solution is critical in determining when each mineral species crystallizes out of solution and what the final crystal form will be.

One of the ways to understand how temperature changes can affect a mineral province is to take a look at a mineral-rich area like Cornwall. There you find a broad sequence of mineral species that range from high-temperature minerals like cassiterite to medium-temperature minerals like bornite and low-temperature secondary minerals like olivenite. They all formed from the same complex solutions that invaded the countryside again and again, but the minerals formed sequentially in different environments.

Not all the mineral species contained in the original solution will crystallize simultaneously. The location within the province in which these minerals crystallized and solidified forms a pattern. Naturally, any explanation has to describe an ideal situation, since there are so many outside influences that affect the pattern or sequence of deposition.

The mineral-rich solutions that invaded Cornwall from deep within the earth must have been very hot. It seems obvious that they came into the region along with the intruding granites and slowly pushed their way toward the surface. This super-hot solution invaded the host rock, in this case mainly ancient metamorphic rock. The solution spread out in all directions, following whatever cracks, faults and seams it could find.

As any super-hot solution moves through rock openings, it begins to lose heat. At some point the temperature drops enough that some of the dissolved elements and minerals can no longer remain in solution and began to crystallize on the walls of the open veins. If you know the mineral content of the solution, you can predict with some confidence which minerals will crystallize.

In Cornwall, the solutions were rich in tin, tungsten, copper, uranium, and lesser amounts of arsenic and antimony. Tin and tungsten are listed in mineral books as high-temperature minerals, so they would have begun to precipitate out and develop crystals from the still-hot solution while it was close to its source.

As the solution continued through the fractured rock, it continued to lose heat and the next sequence of minerals began to crystallize out. Uranium, in the form of uraninite, and copper sulfides, which we call medium-temperature minerals, formed next.



These calcites developed from fairly warm solutions and show the hexagonal form with rhombohedral faces on the terminations.

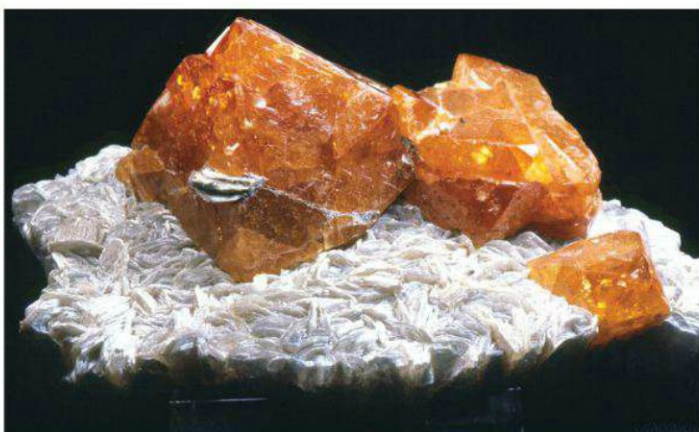


Collectors in the Midwest enjoy collecting cubic fluorites like this zoned crystal on celestine. Both minerals are products of cool mineral solutions.





One of fluorite's crystal forms is the octahedron, which develops from relatively warm solutions.



Fine scheelites crystallize out of high-temperature solutions. China is the most recent source of this calcium tungstate mineral.



Dog-tooth crystals, one of the more common forms of calcite, require a relatively cool solution to develop.

As the solution continues to cool, it steadily loses its mineral content as crystals form in pockets or as vein fillings. This is where we usually find quartz, calcite, and other low-temperature minerals. As indicated, this discussion presumes ideal conditions, which really don't exist in nature.

As this deposition is taking place, other factors get involved: Relatively cool, descending waters rich in oxygen mix with the original solution; the solutions pick up impurities dissolved from the host rock as they move through it; and solutions may become trapped and gradually cool. This forms layers of different minerals in a sort of temperature sequence, with the low-temperature minerals forming last. This explains why you find stilbite, a very low-temperature mineral, sitting on the high-temperature mineral beryl in a closed pegmatite pocket.

Octahedrons and more complex fluorite crystals are simply not found in most Midwestern limestone quarries. That 48-faced fluorite developed when the solution tem-

perature was very high, as it was in the deep sulfide mines of Germany and Cornwall.

Calcite is another mineral with varied crystal shapes. A solution of calcium and the carbonate radical is necessary for calcite to form. Anyone who has an interest in calcite knows it can form in various common shapes: hexagonal plates and prisms, scalenohedrons, hexagonal crystals with trigonal terminations, and finally, simple rhombs. This does not take into account variations on these basic crystal forms, nor does it include twins. At last count, there were something like 700 different crystal forms of calcite—and we're still counting! They are all based on those initial crystal forms. Calcite crystals can have more "faces" than a crowd of people.

The reason for all these variations is found within the mineral itself. As the units of calcium carbonate connect during crystal growth, they form what are called "reticular networks". These are simply calcite molecules that band together to form the crystal, and they are strongly influenced by the temperature of the solution in which the calcite is forming. Simply put, the crystal habit that develops is influenced most by temperature changes in the supersaturated crystal-forming solution.

When the solution is hot and loaded with calcium carbonate, calcite tends to form reticular networks that are expressed externally by hexagonal plates or disks, like those famous poker-chip calcites from Germany and San Luis Potosi, Mexico.

During crystal growth, the solution cools, and less and less calcium carbonate can be held in the solution. The internal development changes to form tabular crystals because these take less energy to stay together. At an even lower temperature, the simple hexagonal prism with trigonal terminations emerges. Farther down the temperature scale, the calcites tend to form tapered hexagonal crystals that we call dog-tooth crystals! Finally, simple rhombs can form at the low point in the density and temperature

scale. Don't expect to open a calcite deposit and find this lovely sequence of crystal forms stacked one on the other. Still, we may find examples of two different crystal forms in the same pocket.

Another popular mineral, pyrite, shows more crystal forms and occurrences than fluorite does. Again, these variations in crystal form are influenced—actually determined—by the growth environment.

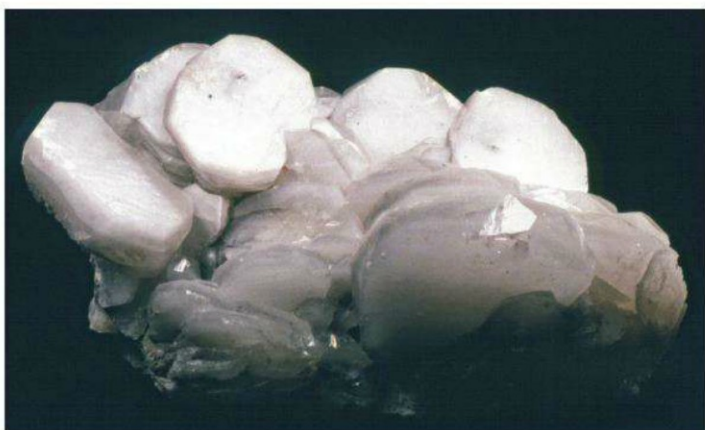
Pyrite is isotropic, which simply means the three axes that form its shape are the same length, so a cube is the result. But pyrite is an ornery mineral and, under the right circumstances, can be anisotropic or have axes that are not quite the same length. This results in oddly shaped crystals. Because of this, pyrite's crystal forms can range from simple cubes to crystals with so many faces the crystal looks like a ball and you have trouble counting them!

The basic crystal forms of pyrite are cubes, octahedrons and dodecahedrons with six, eight and 12 faces respectively. But pyrite has a remarkable habit of involving all three basic forms, plus an odd face called a "diploid modification". This gives the crystal such a mix of faces you need a program guide to figure them all out.

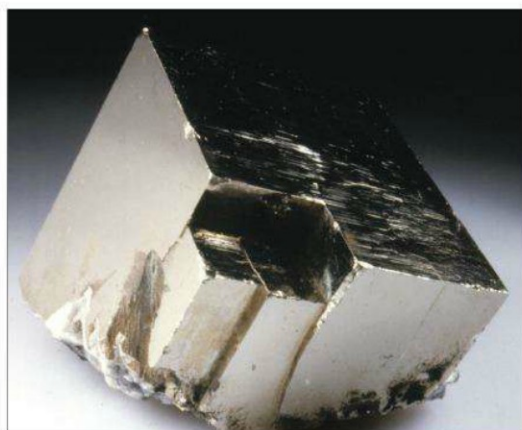
So where do you find these crystal forms of pyrite? In low-temperature sedimentary deposits, you'll usually find cubes, such as the perfect cubes we now see on white carbonate rock from Spain. From high-temperature ore veins, as in Germany, you are most apt to find multifaced crystals that can have 48 or more faces. Temperatures in between produce octahedrons, dodecahedrons and others.

My favorite pyrite crystals are a unique form called pyritohedrons. The actual technical name for these pyrites is "pentagonal dodecahedra" because the resulting faces each have five sides! This is a very common crystal form for pyrite, and pyritohedrons are found in any number of deposits. Perhaps the most prolific source for these easily identified pyrites was the skarns at Rio





**"Poker chip" calcite, so named because of the flat hexagonal shape of the crystals, is a very popular form that results from fairly high-temperature solutions.**



**Simple pyrite cubes are not as common as other crystal forms of the mineral. Note the light striations on the upper crystal face.**

Marina in Elba, Italy. These deposits yielded thousands of crystal specimens that were intimately associated with bladed hematite, which was often found penetrating the pyrite. When two species form together, even penetrating each other, it is evidence of simultaneous crystal formation.

Naturally, the environment, which includes temperature, pressure, and the concentration of the solution, varies during crystal growth. This can result in visible vertical striations on pyrite's crystal faces. Striated pyrite crystals are more common than smooth-faced crystals.

Sometimes, the striations are the result of alternating cubic and dodecahedral crystallization growth. The most attractive facial patterns I've seen on pyrite are in those we call "cathedral pyrites" because the growth patterns resemble gothic windows. These are best seen on crystals from the old silver district of Leadville, Colorado.

Pyrite not only has many crystal forms, it is also found in granular form or as radiating disks, such as the pyrite suns from Illinois. Spheroidal pyrite crystals have so many faces the resulting crystal appears round. Pyrite can be reniform (bubbly-looking solid masses with no visible crystal faces) or it can form in what look like stalactites and bars, in which cubes stack repeatedly, like those from the Viburnum Trend mines of Missouri. Under a microscope, I've even seen pyrites that form loops and curls. Explain that! Pyrite is a great collector mineral because it is very attractive, and easy to identify, and it has a fascinating variety of forms and shapes.

It would be arrogant of me to think I could explain all the possible mineral environments in a short article like this. The best that can be done is to mention some of the more common species, as I have already, and give some idea of where and how they formed.

Surely, one easily recognized and very popular mineral group is the garnet group. In almost all cases, garnets form as simple

dodecahedrons (12-sided crystals). Single garnets, usually almandines, are used in crystal identification sets. In fact, the vast majority of these kit specimens are the almandines found along the Stikine River near Wrangell, Alaska. The Alaska garnets form in micaceous schist that results from heavy metamorphic action.

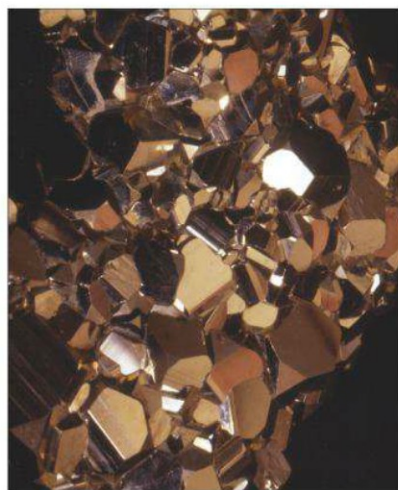
What's really interesting about garnets is that the dodecahedron is its most common crystal form. You'll never find cubic or octahedral garnets, but you will find garnets that have more than 12 faces. There are also garnets that have up to 24 faces because of impurities.

The normal composition of a dodecahedral garnet is based on calcium, but as that element is replaced by manganese, iron or magnesium, the crystal develops more faces. The combination of calcium and iron can develop crystals with even more faces. So in these cases, the crystal form of garnets is influenced by chemistry as well as the environment.

Rockhounds are seldom able to collect in metal mines where examples of high- to medium-temperature minerals are found. We are more likely to collect in deposits of near-surface, low-temperature minerals. The crystals resulting from the dissolution of minerals that are re-deposited at near-surface temperatures are low-temperature simple structures.

This is the case of the minerals in the Midwest, our country's huge sedimentary deposit region. Calcite, aragonite, gypsum, celestine, fluorite, dolomite, pyrite and quartz are among the common species rockhounds can collect there, usually in caves and open limestone quarries.

As weathering—including rain, snow and ice—penetrates the limestone formations, the resulting water dissolves whatever minerals it encounters. Water, even when cool, is a great dissolver and capable of taking on a mineral load. When that water settles in openings or cracks in the limestone, it gradually unloads its mineral content, form-



**The technical name for these pyrites is "pentagonal dodecahedra" because the faces each have five sides.**

ing simple crystals. Calcites tend to be scalenohedrons, fluorites and pyrites tend to be simple cubes, and celestine forms simple orthorhombic blades without any crystal modifications. Again, the environment has influenced the shape of the final crystal.

As you read your mineral book, pay particular attention to the entry labeled "environment" or "occurrence". This tells you about the circumstances under which that mineral forms and the rock types in which you might find it. You will gradually learn what to expect when you go out to collect based on the rock types you see. Metamorphic rocks can yield kyanite, epidote, garnet, staurolite, and the like. Sedimentary rocks will yield calcite, fluorite, and other low-temperature minerals. If you dig in old mine dumps, try to find out what ores were mined there and whether they were high-, medium- or low-temperature minerals. Such information will also help you identify any unknown minerals you might find. Good mineral books are an invaluable tool. Use them! 💎



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**21-22—FREDERICKSBURG, TEXAS:** 43rd Annual Hill Country Gem & Mineral Show; Fredericksburg Rockhounds; Pioneer Pavilion, Lady Bird Johnson Municipal Park, state Hwy. 16, 2 miles south of downtown; Sat. 9-6, Sun. 10-5; free admission; hourly door prizes, raffle, fossils, minerals, geodes, crystals, petrified wood, gems, jewelry, jewelry-making and lapidary supplies, exhibits, demonstrations, wire wrapping; contact Jeff Smith, 208 Castle Pines Dr., Kerrville, TX 78028; e-mail: jeffbrenda@windstream.net; Web site: [www.fredericksburgrockhounds.org](http://www.fredericksburgrockhounds.org)

**27-29—REDLANDS, CALIFORNIA:** Annual symposium; MSSC Micro Mounters; San Bernardino County Museum, 2024 Orange Tree Dr.; mineral giveaway tables, sales tables, silent and verbal auctions, speakers, field trip; contact Dr. Robert Housley, (626) 449-6454; e-mail: [housley@its.caltech.edu](mailto:housley@its.caltech.edu); or Gene Reynolds; e-mail: [quartzhunter1@hotmail.com](mailto:quartzhunter1@hotmail.com)

**27-29—TYLER, TEXAS:** Annual show, "Gem and Jewelry Showcase"; East Texas Gem & Mineral Society; Tyler Rose Garden Center, 420 Rose Park Dr.; Fri. 9-5, Sat. 10-6, Sun. 10-5; adults \$3, students \$1, Scouts in uniform free; Grand Prize drawings, silent auction, Wheel of Fortune, show cases, 11 dealers, gemstones, jewelry, fossils, minerals, geodes, lapidary demonstrations; contact Keith Harmon, (903) 581-4068; e-mail: [keithharmon19@yahoo.com](mailto:keithharmon19@yahoo.com)

**28-29—PANAMA CITY, FLORIDA:** 21st annual show; Panama City Gem & Mineral Society; Bay County Fairgrounds, 2230 E. 15th St.; Sat. 9-5, Sun. 9-4; free admission; exhibits, door prizes, gems, minerals, fossils, jewelry, beads, lapidary art, wire wrapping, silversmithing; contact Joseph Schings, 224 Collinfurst Square, Panama City, FL 32404-8530, (850) 871-1846; e-mail: [mojo3002@comcast.net](mailto:mojo3002@comcast.net)

## JANUARY-FEBRUARY 2012

**26-28—TUCSON, ARIZONA:** Wholesale and retail show; Eons Expos RLLLP; 22nd St. at I10; 9-6 daily; free admission; minerals, fossils, dinosaurs, crystals, gems, jewelry, meteorites; contact Christine Coyle, 38 Fox Ridge Rd., Sparta, NJ 07871, (516) 818-1228; e-mail: [lowellcarhart@yahoo.com](mailto:lowellcarhart@yahoo.com); Web site: [www.22ndstreetshow.com](http://www.22ndstreetshow.com)

**28-11—TUCSON, ARIZONA:** Arizona Mineral & Fossil Show; Martin Zinn Expositions; Ramada Ltd., 665 N. Freeway; Thu. 10-6 daily; free admission; more than 400 dealers, free shuttle among locations, Artists' Gallery at the Hotel Tucson City Center; contact Martin Zinn Expositions, PO Box 665, Bernalillo, NM 87004-0665; e-mail: [mzexpox@gmail.com](mailto:mzexpox@gmail.com); Web site: [www.mzexpox.com](http://www.mzexpox.com)

**28-11—TUCSON, ARIZONA:** Arizona Mineral & Fossil Show; Martin Zinn Expositions; Quality Inn-Benson Hwy., 1025 E. Benson Hwy.; Thu. 10-6 daily; free admission; more than 400 dealers, free shuttle among locations, Artists' Gallery at the Hotel Tucson City Center; contact Martin Zinn Expositions, PO Box 665, Bernalillo, NM 87004-0665; e-mail: [mzexpox@gmail.com](mailto:mzexpox@gmail.com); Web site: [www.mzexpox.com](http://www.mzexpox.com)

**28-11—TUCSON, ARIZONA:** Arizona Mineral & Fossil Show; Martin Zinn Expositions; The Hotel Tucson City Center, 475 N. Granada; Sat. 10-6 daily; free admission; more than 400 dealers, free shuttle among locations, Artists' Gallery at the Hotel Tucson City Center; contact Martin Zinn Expositions, PO Box 665, Bernalillo, NM 87004-0665; e-mail: [mzexpox@gmail.com](mailto:mzexpox@gmail.com); Web site: [www.mzexpox.com](http://www.mzexpox.com)

**28-11—TUCSON, ARIZONA:** Arizona Mineral & Fossil Show; Martin Zinn Expositions; The Mineral & Fossil Marketplace, 1333 N. Oracle Rd.; Thu. 10-6 daily; free admission; more than 400 dealers, free shuttle among locations, Artists' Gallery at the Hotel Tucson City Center; contact Martin Zinn Expositions, PO Box 665, Bernalillo, NM 87004-0665; e-mail: [mzexpox@gmail.com](mailto:mzexpox@gmail.com); Web site: [www.mzexpox.com](http://www.mzexpox.com)

## FEBRUARY 2012

**1-29—QUARTZSITE, ARIZONA:** Wholesale and retail show; Desert Gardens RV Park; 1064 Kuehn St. (I-10 Exit 17); 9-6 daily; free admission; crystals, minerals, rough, polished, jewelry, lapidary equipment; contact Sharon or Sandy, 1064 Kuehn St., Quartzsite, AZ 85346, (928) 927-6361; e-mail: [info@desertgardensrvpark.net](mailto:info@desertgardensrvpark.net); Web site: [www.desertgardensrvpark.net](http://www.desertgardensrvpark.net)

**9-12—TUCSON, ARIZONA:** Annual show; Tucson Gem & Mineral Society; Tucson Convention Center, 260 S. Church Ave.; Thu. 10-6, Fri. 10-6, Sat. 10-6, Sun. 10-6; adults \$10, seniors and active military \$8 on Fri., children (14 and under) free with adult; 2-day tickets \$17; contact Show Chairman, PO Box 42588, Tucson, AZ 85733, (520) 322-5773; e-mail: [tgms@tgms.org](mailto:tgms@tgms.org); Web site: [www.tgms.org](http://www.tgms.org)

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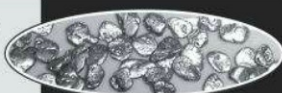
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**11-12—MERRITT ISLAND, FLORIDA:** Annual show; Central Brevard Rock & Gem Club; Kiwanis Island Park, 950 Kiwanis Park Rd.; Sat. 10-5, Sun. 10-5; adults \$3, children 12 and under free with adult; rough and cut gems, minerals, fine jewelry, equipment, lapidary supplies, books, beads, exhibits, demonstrations; contact Erleen Estes, (321) 632-3201

**11-12—OAK HARBOR, WASHINGTON:** 47th annual show, "Sweetheart of Gems"; Whidbey Island Gem Club; Oak Harbor Senior Center, 51 SE Jerome St.; Sat. 9-5, Sun. 9-4; free admission; member exhibits, demonstrations, dealers, rough and finished rock and gems, slabs, silent auction, door prizes, raffle, spinning wheel; contact Keith Ludemann, (360) 675-1837; e-mail: rock9@whidbey.net

**17-26—INDIO, CALIFORNIA:** Annual show; San Geronimo Mineral & Gem Society; Riverside County Fair & National Date Festival, Gem & Mineral Bldg, Bldg. #1, 46-350 Arabia St.; Fri. 10-10, Sat. 10-10, Sun. 10-10, Mon. 10-10; adults \$8, seniors \$7, students \$6, children (under 5) free; contact Bert Grisham, 1029 N. 8th St., Banning, CA 92220, (951) 849-1674; e-mail: bert67@verizon.net

**18-19—MESA, ARIZONA:** 46th annual show; Apache Junction Rock & Gem Club; Skyline High School, 845 South Crismon Rd.; Sat. 9-5, Sun. 10-4; adults \$3, students (with ID) \$1, children under 12 free; dealers, jewelry, gems, cabochons, beads, rock, specimens, slabs, fossils, lapidary equipment and supplies, silent auction, door prizes, grand raffle, gem tree-making activity, Wheel of Rocks; contact Kelly Iverson, (480) 325-2705; Web site: www.ajrockclub.com

**25-26—BOISE, IDAHO:** Annual show; Idaho Gem & Mineral Club; Expo Idaho, 5610 Glenwood, corner of Glenwood and Hwy. 20; Sat. 10-6, Sun. 10-5; free admission; contact Charlie Smith, PO Box 1264, Riggins, ID 83549, (208) 628-4002; e-mail: telongems@frontier.com

**25-26—JACKSON, MISSISSIPPI:** Annual show; Mississippi Gem & Mineral Society; Trade Mart, High St.; Sat. 9-6, Sun. 10-5; adults \$5, students \$3; contact Janie Hand, (601) 706-4629; e-mail: rocknGranny49@aol.com; Web site: Missgem.org

**25-26—SAN FRANCISCO, CALIFORNIA:** Show, "San Francisco Crystal Fair"; Pacific Crystal Guild; Fort Mason Center, 99 Marina Blvd.; Sat. 10-6, Sun. 10-6; adults \$6, children (12 and under) free; 30 dealers, minerals, gems, crystals, beads, metaphysical healing tools; contact Jerry Tomlinson, PO Box 1371, Sausalito, CA 94966, (415) 383-7837; e-mail: jerry@crystalfair.com; Web site: www.crystalfair.com

## MARCH 2012

**2-4—NEWARK, CALIFORNIA:** Annual show; Mineral & Gem Society of Castro Valley; Newark Pavilion, 6430 Thornton Ave.; Fri. 10-6, Sat. 10-6, Sun. 10-5; adults \$6 (3-day pass), children (under 12) free with adult; fluorescent rock display and sale, more than 35 dealers, live demonstrations, display cases, jewelry, gemstones, beads, fossils, equipment, supplies, auction, door prizes, kids' Spinning Wheel; contact Cathy Miller, PO Box 2145, Castro Valley, CA 94546, (510) 887-9007; e-mail: info@mgscv.org; Web site: www.mgscv.org

**2-4—RICHMOND INDIANA:** 39th annual show; Eastern Indiana Gem & Geological Society; Wayne County Fairgrounds, 861 N. Salisbury Rd.; adults \$5 (3-day pass), seniors \$3, ages 18 and under 7 free; Fri. 10-6, Sat. 10-6, Sun. 11-4; jewelry, minerals, crystals, fossils, displays, dealer demonstrations, silent auctions; contact John LaMont, (765) 647-4894

**3-4—ARCADIA, CALIFORNIA:** Annual show; Monrovia Rockhounds; County Arboretum and Botanic Garden, Ayres Hall, 301 S. Baldwin Ave.; Sat. 9-4-30, Sun. 9-4-30; free admission; more than 15 vendors, gems, jewelry, minerals, fossils, beads, findings, geode cracking, Grab Bags, Treasure Wheel, Dino Dig, Fossil Find, Grand Prize raffle, hourly drawings; contact Jo Anna Ritchey, 224 Oaks Ave., Monrovia, CA 91016, (626) 389-624; e-mail: joannaritchey@gmail.com; Web site: www.morocks.com

**3-4—CALDWELL, IDAHO:** 58th annual show; Owyhee Gem & Mineral Society; O'Conner Field House, 2200 Blaine; Sat. 9-6, Sun. 9-5; adults \$3, children (11 and under) free with adult; contact Carolyn Roberts, (208) 466-6191; e-mail: ncroberts@msn.com; Web site: www.owyheerocks.com

**3-4—ISSAQUAH, WASHINGTON:** Annual show; East KingCo Rock Club; Pickering Barn, 1730 10th Ave. NW, across from Costco; Sat. 10-6, Sun. 10-5; free admission; dealers, gems, jewelry, minerals, silent auctions, raffles, door prizes, hands-on activities, crafts, games, member display

cases; contact Norma McDonald, c/o EKCRC, PO Box 2203, Redmond, WA 98073-2203, (206) 612-3113; e-mail: eastkingco@gmail.com; Web site: www.eastkingco.org

**3-4—NEWARK (STANTON), DELAWARE:** 49th annual show; Delaware Mineralogical Society; Delaware Technical and Community College, I-95 Exit 48, Churchmans Rd. (Rte. 58); Sat. 10-6, Sun. 11-5; adults \$6, seniors \$5, ages 12-16 \$4, children (under 12) free with adult; educational exhibits, minerals, lapidary, fossils, museum displays, dealers, minerals, fossils, gems, jewelry, lapidary supplies, door prizes, demonstrations, gem cutting and polishing, children's table; contact Wayne Urion, (302) 998-0686; e-mail: gene@fosilnut.com; Web site: www.delmineralsociety.net

**3-4—ROBSTOWN, TEXAS:** 50th annual show; Gulf Coast Gem & Mineral Society; Richard Borchard Regional Fairgrounds, 1213 Terry Shamsie Blvd., US 77 and Hwy. 44; Sat. 10-6, Sun. 10-5; adults \$5 (2-day pass), children (12 and under) free, Scouts in uniform free; kids' wheel, silent auction, beads, findings, jewelry, minerals, fossils, meteorites, displays, Rock Food Table, hourly door prizes, grand prize; contact Jerrold Simpson, P.O. Box 7786, Corpus Christi, TX 78467-7786, (361) 877-3073; e-mail: jsimpson1@stx.rr.com; Web site: www.gcgms.org

**3-4—VENTURA, CALIFORNIA:** 50th Anniversary Show; Ventura Gem & Mineral Society; Ventura County Fairgrounds, 10 W. Harbor Blvd.; Sat. 10-5, Sun. 10-4; free admission; club member and other exhibits, more than 15 dealers, demonstrators, raffles, hourly silent auctions, Country Store, kids' activities; contact Rob Sankovich, 1961 Havenwood Dr., Thousand Oaks, CA 91362, (805) 494-7734; e-mail: rmsorca@adelphia.net; Web site: www.vgms.org

**8-11—VICTORVILLE, CALIFORNIA:** 35th annual tailgate; Victorville Gem & Mineral Club; Stoddard Wells, Stoddard Wells Rd., 7 miles east of I-15; Thu. 8-dusk, Fri. 8-dusk, Sat. 8-dusk, Sun. 9-4; free admission; more than 60 dealers, crystals, rocks, minerals, fossils, gems, silent auctions; contact Brett Ward, 15056 - B, 7th St., Victorville, CA 92395, (760) 243-2330; e-mail: info@vvgmc.org; Web site: www.vvgmc.org

**10—SKOKIE, ILLINOIS:** Silent auction; Chicago Rocks & Minerals Society; St. Peter's United Church of Christ Gymnasium, 8013 Laramie Ave.; Sat. 6-9; free admission; rocks, crystals, handmade jewelry, lapidary treasures, books, equipment, bargain table, rock and mineral identification, children must be accompanied by an adult; contact Jeanine N. Mielecki, (773) 774-2054; e-mail: jaynine9@aol.com; Web site: www.chicagorocks.org

**10-11—FILER, IDAHO:** 61st annual show; Magic Valley Gem Club; Twin Falls County Fairgrounds, 215 Fair Ave.; Sat. 9-6, Sun. 10-5; adults \$2, children (under 12) free with adult; contact Shirley Metts, (208) 423-4827; e-mail: rmetts@cableone.net

**10-11—SPRECKELS, CALIFORNIA:** Annual show; Salinas Valley Rock & Gem Club; Vet's Memorial Hall, 5th St. and Llano St.; Sat. 10-5, Sun. 10-5; free admission; beads, minerals, rocks, silent auction, free drawings, member donated raffle prizes, display cases, demonstrators; contact Karin Salomon, (831) 375-5233; e-mail: kcbakes27@yahoo.com; Web site: salinasrockandgem.com

**16-18—ALBUQUERQUE, NEW MEXICO:** Annual show; Albuquerque Gem & Mineral Club; New Mexico State Fairgrounds, CAC Bldg., San Pedro Ave. entrance; Fri. 10-6, Sat. 10-6, Sun. 10-5; adults \$3; more than 40 dealers, crystals, jewelry, fossils, rocks, minerals, decorator items, jewelry, books, supplies, beads, mineral ID booth, visits by a well-behaved and socialized wolf, NM Bureau of Geology and Mineral Resources educational booth, kids' grab bags, silent auctions, about 20 displays; contact Paul Hlava, PO Box 13718, Albuquerque, NM 87192, (505) 255-5478; e-mail: paulhlava@q.com; Web site: www.agmc.info

**16-18—JACKSON, MICHIGAN:** 50th annual show; Michigan Gem & Mineral Society; Jackson County Fair Grounds, American 1 Event Center, 200 W. Ganson; Fri. 10-7, Sat. 10-7, Sun. 10-5; adults \$3, seniors \$2, students 50 cents, children under 5 free; free admission for military, public service, and Scouts; more than 20 dealers and demonstrators, displays, silent auction, raffle, rocks, minerals, fossils, jewelry, carvings, findings, beads, tools; contact Sally Hoskin, 10990 Phal Rd., Grass Lake, MI 49240, (517) 522-3396; e-mail: saltoosal2@yahoo.com; Web site: www.mgmsrockclub.com

**16-18—ROME, GEORGIA:** Annual show; Rome Georgia Mineral Society; The Forum Civic Center, 2 Government Plaza; Fri. 10-6, Sat. 10-6, Sun. 11-5; free admission; minerals, gems, fossils, jewelry, crystals, demonstrations, door prizes, exhibits; contact Jose Santamaria, (770) 606-5700 ext. 401; e-mail: rogams.show@gmail.com

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## Show Dates from page 63

com; Web site: <http://rogams.wordpress.com/gem-and-mineral-show/>

**16-18—SPANISH FORK, UTAH:** Show and sale; Timpanogos Gem & Mineral Society; Spanish Fork Fair Grounds, 475 S. Main St.; Fri. 10-7, Sat. 10-7, Sun. 10-5; free admission; Wheel of Fortune, rock Grab Bags, rock display table, auction, Dinosaur Man; contact Vickie Hathaway, 693 E 1 South, Spanishfork, UT 84660, (435) 820-2672; e-mail: [jarnjelleze@gmail.com](mailto:jarnjelleze@gmail.com)

**23-25—INDIANAPOLIS, INDIANA:** 14th Annual Indianapolis Spring Gem, Mineral & Jewelry Show; Treasures of the Earth Gem & Jewelry Shows, Indiana State Fairgrounds - Agriculture/Horticulture Bldg., 1202 E. 38th St.; Fri. 10-6, Sat. 10-6, Sun. 11-5; adults \$3 (3-day ticket), children (under 16) free; beads, pearls, gemstones, wire wrapping, wire sculpture, silver- and goldsmiths, custom work and repairs while you wait; contact Van Wimmer, 5273 Bradshaw Rd., Salem, VA 24153, (540) 384-6047; e-mail: [van@toteshows.com](mailto:van@toteshows.com); Web site: [www.toteshows.com](http://www.toteshows.com)

**24-25—ANGELS CAMP, CALIFORNIA:** Show and sale; Calaveras Gem & Mineral Society; Calaveras County Fairground, 101 Frogtown Rd.; Sat. 10-5, Sun. 10-4; adults \$4, children (12 and under) free with adult; exhibits, demonstrations, kids' activities, silent auction, sales, raffle, door prizes, dealers, fossils, jewelry, meteorites, books, lapidary supplies, slabs, gems, beads; contact Tak Iwata, 18310 Coyote Meadow Rd., Sonoma, CA 95370, (209) 928-5579; e-mail: [tak2me@msn.com](mailto:tak2me@msn.com); Web site: [www.calaverasgemandmineral.org](http://www.calaverasgemandmineral.org)

**24-25—HOLYOKE, MASSACHUSETTS:** Western Mass Mineral, Jewelry & Fossil Show; Connecticut Valley Mineral Club; Holyoke Hotel & Conference Center, I-91 Exit 15; Sat. 9:30-5, Sun. 10-4; adults \$4, children (12 and under) and Scouts in uniform free with adult; minerals, gemstones, jewelry, crystals, beads, fossils, lapidary and mineral art, demonstrations, exhibits; contact Helen Rodak, (413) 586-6691; e-mail: [info@naturesfinestcreations.com](mailto:info@naturesfinestcreations.com)

**24-25—SAYRE, PENNSYLVANIA:** 43rd annual show; Che-Hanna Rock & Mineral Club; Athens Township Volunteer Fire Hall, 211 Herrick Ave.; Sat. 9-5, Sun. 10-5; adults \$3, students \$1, children (under 8) free; special 50th anniversary events, club member demonstrations and displays, junior activities, mini-mine, geode cutting, Carnegie Museum and Paleontological Research Institute displays, dealers, minerals, fossils, gems, jewelry; contact Bob McGuire, PO Box 224, Lopez, PA 18628, (570) 928-9238; e-mail: [uvbob@epix.net](mailto:uvbob@epix.net); Web site: [www.chehannarocks.com](http://www.chehannarocks.com)

**24-25—YUMA, ARIZONA:** Annual show; Sharon Szymanski and Val Latham; Yuma Civic Center, 1440 Desert Hills Dr.; Sat. 10-5, Sun. 10-4; adults \$3, children under 12 free with paying adult; out-of-state dealers, jewelry (fine and costume), gems, beads, slabs, fossils, cabochons, lapidary supplies, machinery, wire wrapping demonstration; contact Sharon Szymanski, 1792 E. Laddos Ave., San Tan Valley, AZ 85140, (480) 215-9101; e-mail: [goldcanyon2@yahoo.com](mailto:goldcanyon2@yahoo.com)

## MARCH-APRIL 2012

**29-1—ADA, OKLAHOMA:** Annual show; Ada Gem, Mineral & Fossil Club; Pontotoc County Agri-Plex, Main Bldg. #1, northeast corner of state Rte. 99 (U.S. 377) and the Richardson Bypass (state Rte. 1 & 3); Fri. 8-5, Sat. 9-5, Sun. 10-4; free admission; demonstrations, displays of fluorescent rocks, minerals, fossils, lapidary, jewelry, silent auctions, raffle, kids' Fossil Dig, Petting Zoo, fluorescent demonstration; contact Ed Vermillion, PO Box 782, Purcell, OK 73080, (405) 527-6431; e-mail: [okieed42@windstream.net](mailto:okieed42@windstream.net); Web site: [www.freewebs.com/agmfc](http://www.freewebs.com/agmfc)

**31-1—BELLINGHAM, WASHINGTON:** Annual show; Mount Baker Rock & Gem Club; Bloedel-Donovan Park, 2214 Electric Ave.; Sat. 10-6, Sun. 10-5; free admission; rocks, fossils, gems, jewelry, dealers, door prizes, club sales, ongoing silent auction, scholarship raffle, demonstrations (lapidary, gold panning), kids' activities; contact Daniel Hayes, (360) 312-8380; e-mail: [hayes0406@gmail.com](mailto:hayes0406@gmail.com); Web site: [www.mtbakerrockclub.org](http://www.mtbakerrockclub.org)

**31-1—LEMOORE, CALIFORNIA:** Annual show; Lemoore Gem & Mineral Club; Trinity Hall, 470 Champion St.; Sat. 10-6, Sun. 10-6; free admission; featuring California jade; contact John Pereira, 335 W. D St., Lemoore, CA 93245, (559) 924-4052

**31-1—POCATELLO, IDAHO:** Annual show; Southeast Idaho Gem & Mineral Society; Bannock County Fair Grounds, 10588 11th Rd.; Sat. 10-6, Sun. 10-5; adults \$2, children (under 12) free; contact Kevin Taylor, PO Box

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## APRIL 2012

**20-22—ALPINE, TEXAS:** Annual show, "Alpine Agate Festival"; Chihuahuan Desert Gem & Mineral Club; Alpine Civic Center, Hwy. 90 West; Fri. 9-6, Sat. 9-6, Sun. 10-5; free admission; agates from the Big Bend, dealers, demonstrations, grand prize, silent auction, door prizes, Kids' Corner, special exhibits, Kids' Day Fri.; contact Mary Brogan, PO Box 1111, Alpine, TX 79831, (432) 386-2340; e-mail: mary.brogan@rocketmail.com

**20-22—DENVER, COLORADO:** Spring show, "Colorado Mineral & Fossil Show"; Martin Zinn Expositions; Holiday Inn - Denver Central, 4849 Bannock St.; free admission; Fri. 10-6, Sat. 10-6, Sun. 10-5; 80 wholesale and retail dealers, minerals, fossils, gems, jewelry; contact Martin Zinn Expositions, PO Box 665, Bernalillo, NM 87004-0665, fax: (303) 223-3478; e-mail: mzexpos@gmail.com; Web site: www.mzexpos.com

**20-22—RICKREALL, OREGON:** 57th annual show; Willamette Agate & Mineral Society; Polk County Fairgrounds, 520 S. Pacific Hwy. W; Fri. 9-6, Sat. 10-6, Sun. 10-4:30; adults \$2, children (under 12) free; contact Etheleen Filppo, (503) 623-4247; e-mail: refileppo@hotmail.com

**21-22—WALNUT CREEK, CALIFORNIA:** Show, "Contra Costa Crystal Fair"; Pacific Crystal Guild; Civic Park Community Center, 1375 Civic Dr.; Sat. 10-6, Sun. 10-4; adults \$6, children (12 and under) free; 30 dealers, minerals, gems, crystals, beads, metaphysical healing tools; contact Jerry Tomlinson, PO Box 1371, Sausalito, CA 94966, (415) 383-7837; e-mail: jerry@crystallfair.com; Web site: www.crystallfair.com

**28-29—ELMA, WASHINGTON:** 44th annual show, "Earth's Treasures"; Gray's Harbor Rock & Gem Club; Gray's Harbor County Fairgrounds, 43 Elma-McCleary Rd.; Sat. 10-5, Sun. 10-5; free admission; contact Gary Emberley, (360) 533-6196; e-mail: melissa624@hotmail.com

**28-29—HERMISTON, OREGON:** Show, "Nature's Treasures Under Foot"; Hatrockhounds Gem & Mineral Society; Hermiston Conference Center, 415 S. Hwy. 395; Sat. 10-6, Sun. 10-4; adults \$2, children (15 and under) free with adult; contact Mike Filarski, (541) 922-5091; e-mail: stonemorlin1@netscape.net; Web site: www.hatrockhounds.org

**28-29—LANCASTER, CALIFORNIA:** Annual show; Antelope Valley Gem & Mineral Club; Lancaster High School, 44701 32nd St. W; Sat. 9-5, Sun. 9-5; free admission; tailgaters, gems, minerals, jewelry, touch table, fossils, raffle drawing, dealers, demonstrations, auction table, raffle Sun.; contact Rodney Skillings, PO Box 903044, Palmdale, CA 93590, (661) 400-5198; e-mail: rodneyskillings@ymail.com; Web site: www.avgem.weebly.com

**28-29—TROY, OHIO:** Annual show; Brukner Center Gem & Mineral Club; Miami County Fairgrounds, 650 N. County Road 25-A; Sat. 10-6, Sun. 10-4; adults \$1; mineral identification, specimens, gems, jewelry, rough stone, demonstrations, displays, silent auction, dealers, children's activities, gem sluicing, geode cracking; contact Gene Davis, P. O. Box 64, Tipp City, OH 45371, (937) 667-4160; e-mail: Manningsrockshop@live.com

**28-29—WAUKESHA, WISCONSIN:** 50th annual show; Kettle Moraine Geological Society; Waukesha County Expo Center, 1000 Northview Rd.; Sat. 10-5, Sun. 10-4; adults \$2.50, children 50 cents; demonstrations, wirewrapping, cabbing, flintknapping, fluorescent room, dealers; contact Liz Fuher, (262) 246-6684; e-mail: lfuhers1@yahoo.com; Web site: fromtherockroom.com

## MAY 2012

**5-6—WASHINGTON, PENNSYLVANIA:** 7th annual show; F M Minerals; Washington County Fairgrounds, 2151 N. Main St.; Sat. 10-6, Sun. 10-5; adults \$1, children 12 and under free; dealers, gems, minerals, hand-made jewelry, metaphysical things, door prizes; contact F M Minerals, (304) 657-7089

**10-13—SECAUCUS, NEW JERSEY:** Wholesale and retail show; Eons Expos, RLLP; Meadowlands Exposition Center, 355 Plaza Dr.; Thu. 5-9, Fri. 9-7, Sat. 9-7, Sun. 9-4; free admission; exhibitors, minerals, fossils, dinosaurs, crystals, gems, jewelry, beads, meteorites, wholesale only Thu. evening, open to the public Fri. through Sun., "American Woman"

*continued on page 71*

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10 am - 6 pm**

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FREE PARKING**



# MANY FACETS

by Guest Faceters

Faceters are welcome to submit their original designs for publication. Mail materials to Many Facets Submissions, *Rock & Gem* magazine, 3585 Maple St., Ste. 232, Ventura, CA 93003.

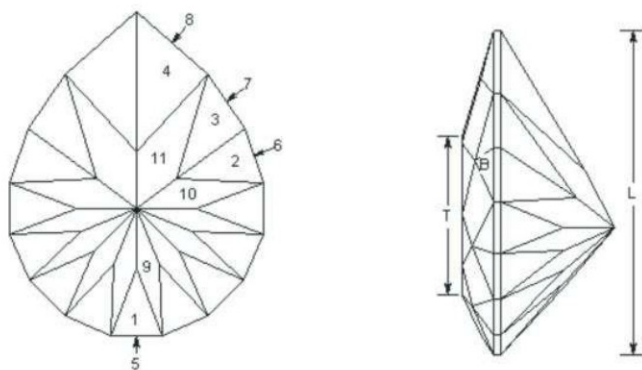
I originally designed this pear for a piece of tsavorite, and the cut gem turned out quite well. I have since used it on a piece of rhodolite, and it should do well for most other varieties of garnet.

This design is fairly easy to cut, as pears go. Pears and hearts can be a bit tedious to cut, as typically have to change your angle and/or height setting after cutting just a facet or two. However, I kept the angles simple to set and I believe you will find the results well worth the effort.

Depending on the size of your stone, be mindful when you cut tiers 9 through 11. They will cut very quickly and, if you aren't paying attention, they can overcut in a hurry.

If you try this design, I would love to hear from you, as I greatly value the feedback. Happy faceting!

—David Groncki  
digroncki@comcast.net



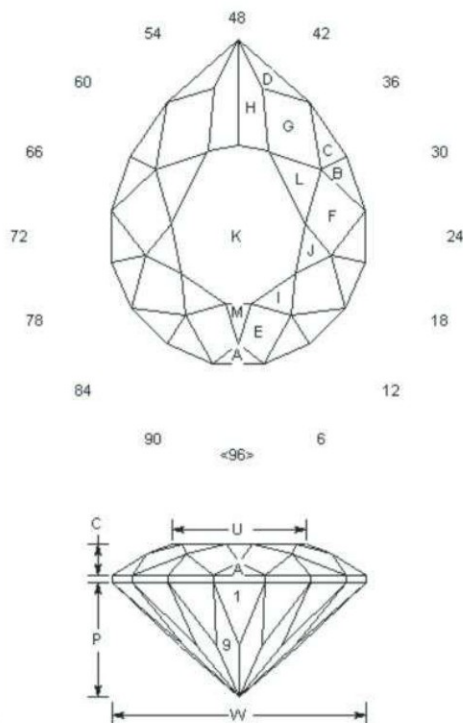
Original Pear (for garnet)  
©David Groncki 2009  
Angles for R.I. = 1.810  
60 + 15 girdles = 75 facets  
1-fold, mirror-image symmetry  
96 index  
L/W = 1.279      T/W = 0.626  
U/W = 0.527  
P/W = 0.451      C/W = 0.127  
Vol./W<sup>3</sup> = 0.242

## PAVILION

1	43.00°	96-06-12-18-24-72-78-84-90	PCP
2	42.70°	29-67	PCP
3	41.35°	33-63	PCP
4	38.55°	37-59	PCP
5	90.00°	96-06-12-18-24-72-78-84-90	Establish width
6	90.00°	29-67	MP @ 1,2
7	90.00°	33-63	MP @ 2,3
8	90.00°	37-59	MP @ 3,4
9	41.50°	03-09-15-21-75-81-87-93	GMP
10	41.50°	27-69	GMP
11	38.70°	35-61	GMP

## CROWN

A	33.00°	96-06-12-18-24-72-78-84-90	Establish girdle height
B	33.00°	29-67	Level girdle
C	33.00°	33-63	Level girdle
D	33.00°	37-59	Level girdle
E	27.70°	03-15-81-93	GMP
F	27.70°	27-69	GMP
G	27.00°	35-61	GMP
H	17.25°	45-51	GMP
I	17.90°	09-87	MP @ A,A
J	17.90°	21-75	MP @ A,A
K	0.00°	Table	MP @ E (at index 15,81)
L	19.70°	31-65	MP @ B,C
M	25.70°	96	MP @ A





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# Rock & Gem

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## Show Dates from page 65

sculpture, Fine Mineral & Gem Gallery; contact Lowell Carhart, (804) 291-6357; e-mail: lowellcarhart@yahoo.com; Web site: www.nycmetroshow.com

**11-13—SANTA ANA, CALIFORNIA:** Spring show, "West Coast Gem & Mineral Show"; Holiday Inn - Orange County Airport, 2726 S. Grand Ave.; Fri. 10-6, Sat. 10-6, Sun. 10-5; free admission; 80 retail and wholesale dealers; contact Martin Zinn Expositions, P.O. Box 665, Bernalillo, NM 87004-0665, fax: (303) 223-3478; e-mail: mzexpos@gmail.com; Web site: www.mzexpos.com

**18-20—KENNEWICK, WASHINGTON:** Annual show; Lakeside Gem & Mineral Club; Benton County Fairgrounds, 1500 S. Oak; Fri. 10-5, Sat. 10-5, Sun. 10-4; free admission; special exhibits, demonstrators, gems, fossils, jewelry, kids' activities, auctions, guest lectures; contact Dom Cataldo, PO Box 6652, Kennewick, WA 99336; e-mail: dac@bioguardtech.com; Web site: www.lakesidegemandmineralclub.com

**25-27—SALEM, VIRGINIA:** 21st Annual Spring Roanoke Valley Gem & Mineral Show; Treasures of the Earth Gem & Jewelry Shows, Salem Civic Center, 1001 Boulevard; Fri. 10-6, Sat. 10-6, Sun. 11-6; adults \$3 (3-day ticket), children (under 16) free; beads, pearls, gemstones, wire wrapping, wire sculpture, silver- and goldsmiths, custom work and repairs while you wait; contact Van Wimmer, 5273 Bradshaw Rd., Salem, VA 24153, (540) 384-6047; e-mail: van@toteshow.com; Web site: www.toteshow.com

### JUNE 2012

**16-17—SAN FRANCISCO, CALIFORNIA:** Show, "San Francisco Crystal Fair"; Pacific Crystal Guild; Fort Mason Center, 99 Marina Blvd.; Sat. 10-6, Sun. 10-4; adults \$6, children (12 and under) free; 30 dealers, minerals, gems, crystals, beads, metaphysical healing tools; contact Jerry Tomlinson, PO Box 1371, Sausalito, CA 94966, (415) 383-7837; e-mail: jerry@crystallfair.com; Web site: www.crystallfair.com

### JUNE-JULY 2012

**29-1—FISHERSVILLE, VIRGINIA:** 25th annual Fishersville/Waynesboro Area Gem, Mineral & Jewelry Show; Treasures of the Earth Gem & Jewelry Shows; Augusta Expo, 277 Expo Rd.; Fri. 10-6, Sat. 10-6, Sun. 11-5; adults \$3 (3-day ticket), children (under 16) free; beads, pearls, gemstones, wire wrapping, wire sculpture, silver- and goldsmiths, custom work and repairs while you wait; contact Van Wimmer, 5273 Bradshaw Rd., Salem, VA 24153, (540) 384-6047; e-mail: van@toteshow.com; Web site: www.toteshow.com

### JULY 2012

**20-22—BOONE, NORTH CAROLINA:** 18th Annual High Country Gem, Mineral & Jewelry Show; Treasures of the Earth Gem & Jewelry Shows; Boone National Guard Armory, 274 Hunting Hills Ln.; Fri. 10-6, Sat. 10-6, Sun. 11-5; adults \$2 (3-day ticket), children (under 16) free; beads, pearls, gemstones, wire wrapping, wire sculpture, silver- and goldsmiths, custom work and repairs while you wait; contact Van Wimmer, 5273 Bradshaw Rd., Salem, VA 24153, (540) 384-6047; e-mail: van@toteshow.com; Web site: www.toteshow.com

### JULY-AUGUST 2012

**29-5—SPRUCE PINE, NORTH CAROLINA:** 24th annual show; Parkway Fire and Rescue; Parkway Fire and Rescue Bldg., 12966 Hwy. 226 S.; Sun. 12-6, Mon. 9-6, Sat. 9-7, Sun. 12-5; free admission; raffles, more than 80 dealers, crystals, rocks, minerals, tumbled stones, beads, jewelry, rock hobby-related items; contact Roger Frye, 12966 Hwy. 226 S., Spruce Pine, NC 28777, (828) 766-6136; e-mail: collisdonna@yahoo.com

### AUGUST 2012

**11-12—WALNUT CREEK, CALIFORNIA:** Show, "Contra Costa Crystal Fair"; Pacific Crystal Guild; Civic Park Community Center, 1375 Civic Dr.; Sat. 10-6, Sun. 10-4; adults \$6, children (12 and under) free; 30 dealers, minerals, gems, crystals, beads, metaphysical healing tools; contact Jerry Tomlinson, PO Box 1371, Sausalito, CA 94966, (415) 383-7837; e-mail: jerry@crystallfair.com; Web site: www.crystallfair.com

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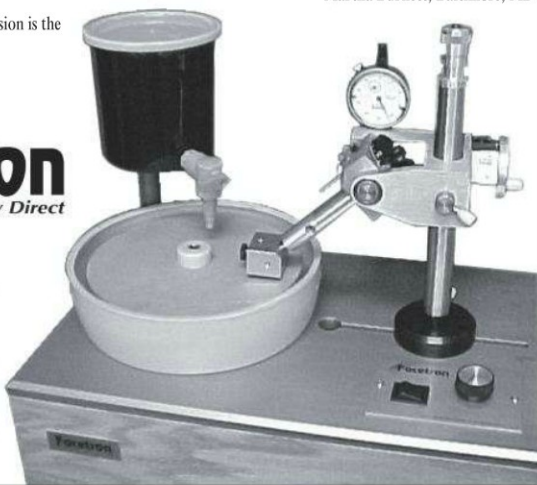
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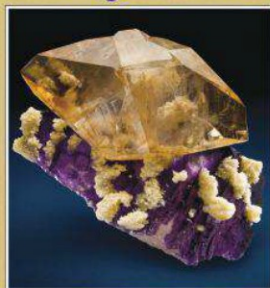


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by Bob Jones, Senior Consulting Editor, Rock & Gem

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# ON THE ROCKS

## Rockhound's Christmas List

Christmas will be here before you know it. This seems like a good time to toot my own horn, meaning that in this column I'll give you some background on my recently published book, *The Frugal Collector, Volume I*. I'll also take you into the world of the upcoming Volume II.

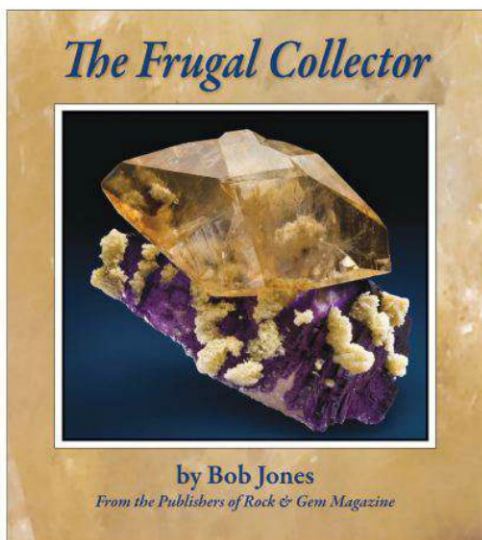
*The Frugal Collector* is more than just a gem and mineral reference. Regular gem and mineral books list all the popular minerals, give their properties, occurrences, chemistry, and crystal information. That's exactly what you need for a reference, but they are hardly entertaining to read.

I have to admit that, for years, I would sit quietly in the evening and read through such books as Frederick Pough's *Field Guide to Rocks and Minerals* and John Sinkankas' *Mineralogy for Amateurs*. That is how I continued my education about minerals after college. But I would not consider such books entertainment. Informative, yes! Fascinating, yes! But not easy reading! So one of my goals in writing *The Frugal Collector* was to combine information with brief tales for entertainment value.

There is plenty of mineral information in my books that serves as the basis for each mineral discussion. But this is supplemented by all sorts of odd facts, interesting history, personal adventures, and other items to make the text more readable—interesting yet informative. What other mineral book in your library delves into the history of how the natural elements were discovered? I do that in some cases, when I found it was relevant to the minerals and made interesting reading.

As for adventures, if you are a regular reader of *Rock & Gem*, you know I've been the luckiest rockhound in the world. The only continent I haven't visited is Antarctica, and that's because I'm considered too old to go there on a mineral hunt! That's nonsense, but I can live with it.

Not all my trips have been full of adventures, but I've had my share. For example, when exiting the underground works at the El Retorno emerald mine near Muzo, Colombia, I had the choice between climbing a slippery galvanized pipe ladder the



The cover of my book, *The Frugal Collector, Volume I*, features a lovely calcite, fluorite specimen from Elmwood, Tennessee.

couple hundred feet to the mine exit—the same ladder I used to enter it—and being hoisted to the surface. That was an easy choice, I thought. All I had to do was sit in a rope loop at the end of a steel wire cable and be hoisted vertically. As we used to say, “Piece of cheese!” While sitting in that rope loop, I was to hold onto the cable with one hand and use my other hand and my feet to fend off the walls of the shaft as I quickly rose to the surface. They didn’t tell me the gears of the hoist were going to jam when I was halfway up the shaft!

On that same trip, the rumor got started that I had a bag full of money with which to buy an emerald. Obviously, they did not know I was a retired school teacher! When my companions, who were both armed, heard the rumor, they hustled me into their truck and we drove several hours through the jungle to be sure we weren’t followed!

As you look through the Table of Contents of Volume I, you may note that your favorite mineral is missing. Be patient! It may show up in Volume II. Obviously, it is not possible to describe or write about every mineral in existence; even gem and mineral reference books don’t do that. After all, there are something in the range of 4,000 known mineral species, many of which are really boring to rockhounds! Why write about such species?

Early on in the process, I made a decision to write about my favorite minerals and gems. I added some classics that you probably won’t run into at most shows. Still, armed with knowledge, you can search mineral dealers’ shelves for these classics. When they are priced too low or incorrectly labeled, you will have found a treasure. In the vernacular, we call them “sleepers”—specimens that are bargains the dealer doesn’t know he is offering!

A lot of gem and mineral books are organized in alphabetical order. The minerals in my book are not in alphabetical order, but the chapters are! What I’ve done is group minerals according to their chemistry, after the typical manner of mineralogy books. The silicates, the sulfides, the carbonates, and other chemical groups are

dealt with in chapters. The exceptions to this listing are species I find particularly interesting, like wulfenite, calcite, pyrite, beryl, and so on. These are minerals that are found in fine collector specimens and occur abundantly! They are minerals that have a strong influence on the mineral market because of their availability, variety and attractiveness. It seemed to me that treating them separately made sense.

Subscribers to *Rock & Gem* will find a lot of familiar material in these books. Much of the material is taken from on a series of articles by the same name that I began running in the magazine back in 1993. As these articles—some 35 of them—evolved, it struck me that if I put them under one cover, I’d finally answer a question I was often asked: “When are you going to write a book?”

I hope you find *The Frugal Collector* informative and entertaining. That will make me happy and, I hope, give you the incentive to keep rock hunting and enjoy the greatest hobby humans have devised!

To order Volume I, send \$48.95 to *The Frugal Collector, Volume I, Rock & Gem* magazine, P.O. Box 6925, Ventura, CA 93006.

### TUCSON DVD

You already know how great the annual Tucson Show is. There are plenty of rockhounds, however, who never get to visit this stunning assemblage of the great-



est minerals in the world. Now you can treat yourself or a friend to a behind-the-scenes look at the best mineral specimens Tucson dealers had to offer this year.

BlueCap Productions puts out an amazing DVD each year that offers unprecedented access to Tucson Show exhibits and the best minerals that are offered for sale at several well-known show locations in Tucson. These DVDs are hosted by Dave Wilber, a noted mineral collector. I play a small part on the DVDs by co-hosting with Dave. We visit many of the major dealers and examine some of the classics and the new minerals being offered. There is no other venue that shows you these important mineral shows in depth. Dave's commentary about the filmed minerals is a real education, as he has been in the business as long as I have. Visit [www.whatshotintucson.com](http://www.whatshotintucson.com) for more information.

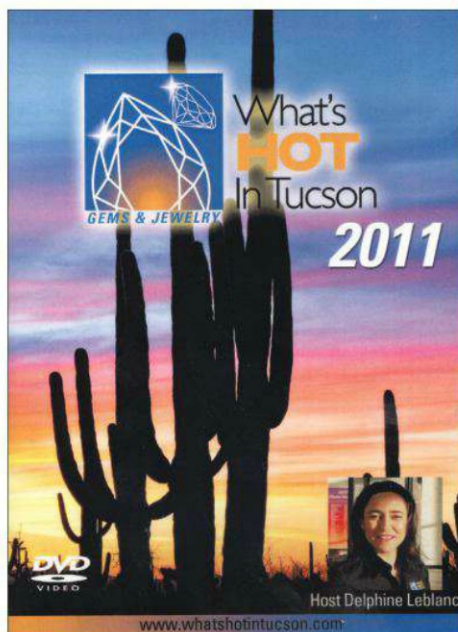
The Munich Show, held at the end of October each year, is probably the best mineral show in Europe. BlueCap Productions also produces a DVD set featuring that great show. Imagine being able to see the very best minerals at the Munich Show while sitting in your own living room! The 2010 version is available at <http://shop.bluecapproductions.com>. They'll be shooting the 2011 show in October.

A very informative and useful small newsletter that would make a nice Christmas gift is "Popular Mineralogy", a four-page monthly publication by Dr. Andrew Sicree. The articles in it are very topical, informative and interesting. One reason I like "Popular Mineralogy" is that camera-ready teaching materials are available to subscribers. Sicree also makes Junior Rockhound Club helps available. These are particularly useful for club bulletin editors and club teachers. Your club can subscribe to these services by contacting Dr. Sicree at P.O. Box 10664, State College, PA 16805.

## AFMS/EFMS SHOW

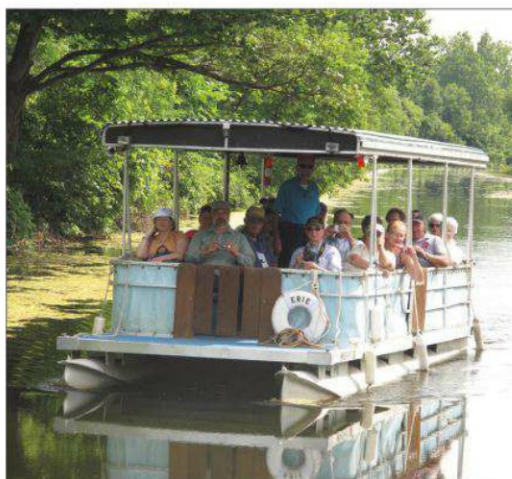
In early July, Carol and I went to the American Federation/Eastern Federation show in Syracuse, New York. I had not been to this show before and was pleasantly surprised. The Syracuse Gem & Mineral Society, hosts of the show, did a wonderful job of organizing and planning.

For me, the highlight of the show activities outside the fairgrounds where the show was held was the "Cracker Barrel". This evening event, which is held at all national shows, is a chance for folks from all over



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the country to socialize and get to know each other a little better. Usually, the Cracker Barrel evening is held at the show facility. The Syracuse folks did it one better: they held a picnic in a local park right alongside the old Erie Canal!



**The highlight of the Cracker Barrel evening at the Syracuse, New York, AFMS/EFMS show was a boat ride on a section of the Erie Canal.**

When the canal was built in the 1800s, it was the most important transportation route to the West. It saved travelers weeks of wagon or horseback travel by connecting the Hudson River with the Great Lakes, an amazing feat of construction.

The highlight of the Cracker Barrel evening, aside from some great picnic food, was a boat ride on a section of the old canal. It was really relaxing and entertaining. We listened to a lecture on the history and importance of the canal while cruising along in the cool of the early evening.

The show itself was well attended. The special exhibits were really choice, with a good variety of displays. I especially liked one really nice display of rhodochrosite, one of my favorite minerals. An excellent case of faceted gems also caught my eye, as did a superb selection of Herkimer diamonds in a couple of cases.

The Herkimer diamonds were displayed by Joe Kapelewski. You may recall an article by Joe in the August 2009 issue of *Rock & Gem* describing how he and his dad, Tom, had spent years digging at Herkimer, New York. Their collection is very well known throughout the East and had been exhibited at the Carnegie Museum in Pittsburgh.

I was really looking forward to seeing Joe and Tom again, but was really shocked when I found out that Tom had passed away a year earlier.

Tom epitomized the rockhound spirit. Because of his love of quartz, he spent 40 years with hammer in hand digging Herkimer quartz crystals. In one of Joe's exhibits at the national show, Tom's patriotism came through loud and clear. He had assembled a marvelous plaque with a shield and eagle made of thousands of Herkimer quartz crystals he had collected through the years. That shield really represents what rockhounding and America are all about. It was a great that Joe shared it with show visitors!

A belated Christmas gift could be a trip to the February 2012 Tucson Show. The year 2012 will be the 100th anniversary of Arizona statehood. The special displays that are being assembled by a large group of dedicated volunteers will feature the best of Arizona's mineral legacy. Every major important mineral locality in Arizona will be represented and mineral specimens will be displayed that you will never get to see anywhere else. We are ferreting out fine specimens from museums and old collections to go with the finest specimens Arizona's rockhounds have unearthed! There has never been a display of state minerals such

as this. To top it off, my book will be for sale at the *Rock & Gem* booth, where I'll be glad to sign your copy. See you there! 🍷

Bob Jones holds the Carnegie Mineralogical Award, is a member of the Rockhound Hall of Fame, and has been writing for *Rock & Gem* since its inception. He lectures about minerals, and has written several books and video scripts.

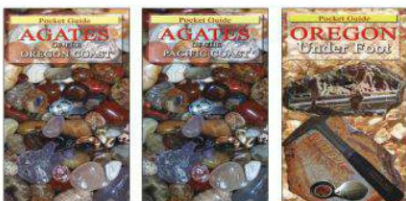




Field Notes submissions are subject to editing. Address questions to "Editor" for a private response or to "Readers" and provide the contact information you'd like published. Send to Field Notes, *Rock & Gem* magazine, 3585 Maple St., Ste. 232, Ventura, CA 93003.

## Correction

The pamphlets "Oregon Underfoot", "Agates of the Pacific Coast", and "Agates of the Oregon Coast", by K.T. Myers and Richard L. Petrovic, which were reviewed in the September 2011 Picks & Pans column, were mistakenly attributed to Harbour Publishing. The correct publisher is the Facets Gem & Mineral Gallery, P.O. Box 714, Newport, OR 97365, (541) 265-2514, [www.4facets.com/books\\_OR.html](http://www.4facets.com/books_OR.html).



Note: Many ovals work best if you transfer them into a V-dop. It just depends on the shape of the pavilion. The best advice I can give any faceter is to take lessons from an experienced instructor, as learning on your own can be a slow, tedious process. Experienced instructors can help you avoid many pitfalls and show you things you won't find in any book or video recording.

—Jim Perkins  
Off the Dop columnist

## September Content

I have just received my September 2011 issue of *Rock & Gem* and want to comment on its great content. I am impressed and delighted by the awesome photographs of the minerals. I like the personal stories from collectors on their journeys.

I've got a stack of *Rock & Gems* to go through, so I apologize if articles of these types have been done, but seeing a report with lots of photos of the Denver Rock & Gem Show would be awesome. I also enjoy each and every column, such as Rock Science and, of course, Bob Jones's fabulous articles. Finally, I enjoyed the crossword in this issue. Can't wait until the next issue!

—Blain Roman  
via e-mail

## Keystone Confusion

Recently our two great-grandsons and one of their little friends came for a week-end visit. It turns out the friend is actually a junior rockhound. When he pulled out the August 2011 copy of *Rock & Gem*, I was initially pretty excited. As a retired jewelry store owner, it had been a number of years since I had seen a copy of your magazine.

Flipping through the articles, it was interesting to see what's happening in the world of rocks these days. But then I got to the description of the term "keystone" (page 27).

The way keystone was described on the last page must be one of the most muddled, convoluted definitions of the term I have ever read. The last two sentences even appear to contradict each other.

I started working for my Uncle Henry in 1937. His business at the time was mostly concerned with watch repairs and fixing some broken jewelry. Of course, this was during the last years of the Great Depression and money was tight! Over time, Uncle Henry added more and more jewelry, and his oldest daughter, my cousin Mary

Anne, came to work with us. In 1953, Mary Anne and I bought the store and we stayed with it until 1978.

We always knew the term keystone meant the prices were doubled. There was no "double key". Everyone we dealt with for over 40 years—from the 1940s through the 1970s—used the term in this manner.

—D.C. Greenwood  
via e-mail

A Google search for the terms "double keystone markup" and several variations all default to the term "keystone markup". A search of the term "double key markup" produced some interesting results. In all of the searches, there isn't a single entry that validates or completely confirms Helen Serras-Herman's definition or common usage of the term. In fact, many of these links actually contradict her.

[www.ansommag.com/print/ANSOM/The-Keystone-Markup-is-Your-Margin-of-Victory-/15485](http://www.ansommag.com/print/ANSOM/The-Keystone-Markup-is-Your-Margin-of-Victory-/15485)

<http://business.yourdictionary.com/key-stone-markup>

<http://retail.about.com/od/glossary/g/key-stone.htm>

<http://write4retail.com/wordpress/initial-markup-your-formula-must-meet-your-goal/>

[www.businesstermsdictionary.com/terms/78348-keystone-markup.html](http://www.businesstermsdictionary.com/terms/78348-keystone-markup.html)

[www.wisegeek.com/what-is-a-markup-formula.htm](http://www.wisegeek.com/what-is-a-markup-formula.htm)

[www.entrepreneur.com/article/193986](http://www.entrepreneur.com/article/193986)

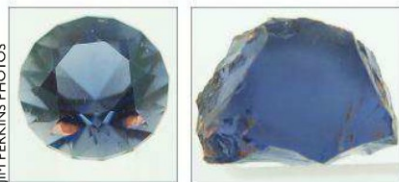
—Richard Kocurek  
via e-mail

This seems to be a question without a simple answer, as evidenced by the variety of definitions of "keystone" that can be found among Internet sources.

—Editor

## Correction

The red gemstone pictured in Jim Perkins' October 2011 Off the Dop column titled "Iolite, aka Water Sapphire" (p. 56) was not iolite. As the name would suggest, iolite is a blue gemstone.



Iolite

## Oval Assistance

I need some help and advice with your Many Facets design Friendship Oval (August 2011). When transferring the stone to cut the crown, what kind of dop and method do you use? I am having an awful time getting the stone transferred. I am using superglue to bond the stones, and it has always worked in the past for me! I have tried "V"-shaped dops, ones with just a simple round recess, and just about everything in between. I can't get a good, tight fit that is strong enough to let me release the first dop. I am relatively new to cutting and have not done an oval before!

—George Deitz  
via e-mail

Since the pavilion on the Friendship Oval comes to a culet point, I used a cone dop and two-part epoxy. I never "jam" the pavilion into the dop; I let the epoxy form a cushion between the dop and the stone. After allowing the epoxy to cure for 24 hours, I complete my transfer by wrapping a wet paper towel around the stone and heating only the flat metal dop. Do not pull the dop, but let it fall off on its own, or else you may move the stone. Allow everything to cool for five to 10 minutes, then align the girdle to the master lap.

When removing the stone from the cone dop, wrap the stone once again in a wet paper towel to keep it cool and only heat the dop stick. Once the stone is cool, soak it in a jar of acetone to loosen the epoxy and clean it completely, then clean the stone with mild soap and water and rinse it with clear water.





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