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JULY 2012

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# Rock & Gem

Volume 42, Number 07

July 2012

## ON THE COVER

Only huge stars generate the heat and pressure necessary to create the heavy elements, including gold. This 8.4cm-high gold on quartz specimen is from the Colorado Quartz mine in Mariposa County, California. (Jeff Scovil photo/Bill Larson collection)

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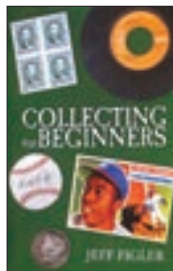
## Collecting for Beginners

by Jeff Figler

This 163-page softcover book is a general treatise on collecting rather than a manual on mineral collecting. Yet, it contains information that may be useful in organizing such a collection. The book starts with a discussion of the psychology of collecting and gives a list of popular collectibles. Minerals are not included. In spite of that, the chapter discussions contain much pertinent information about items that can be collected and gives insights, cautions, and useful tips that apply to any collectible item.

The book lists Web sites that offer collectibles and has an excellent chapter on the use of the Internet in collecting. There is a good discussion of the value of collectibles and good information on how to judge the worth of something, along with cautions involving the valuation of collectibles. Seventeen color renditions illustrate the volume.

As the title suggests, this book is for beginners and it offers quite useful advice no matter what you collect, including minerals. ([www.collectingwithjeff.com/books\\_by\\_jeff\\_figler.html](http://www.collectingwithjeff.com/books_by_jeff_figler.html), 2011)



—Bob Jones

## Auction of 70-ounce Natural Gold Nugget

The mineral and gemstone offerings at Heritage Auctions' May 20 auction in New York City included a massive gold nugget, found by amateur collector Bud Guthrie in Arizona in 1989. Guthrie uncovered the nugget 16 inches below the surface while searching mine dumps with a metal detector. Though it was not actually purchased at the auction, the nugget's estimated value is between \$300,000 and \$350,000. Azurite on malachite from Chessy, France, formerly in the renowned collection of Archduke Stephan, of the House of Habsburg-Lothringen, was also offered.

Heritage, which deals in collectibles of all kinds, has recently expanded its Fine Minerals category into a separate catalog and future auctions will offer gems and minerals exclusively. Long-time and well-known gem and mineral experts Jim Walker and Mary Fong/Walker will serve as directors of the newly formed department, assisted by specialist Craig Kissick. ([www.ha.com](http://www.ha.com))



## The-Vug.com: Director's Cut

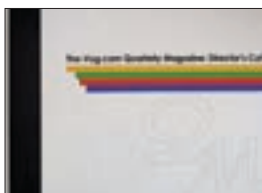
The-Vug.com is a quarterly, full-color print magazine written and produced by Justin Zzyzx, with assistance by Brandy Zzyzx and contributions from other writers. The Director's Cut is a 9-inch by 12-inch, 321-page compilation of the 16 issues published between 2008 and 2011 in a hard-cover format.

Each issue is divided into sections or chapters dealing with a wide range of mineral and gem subjects, including mineral localities, recent finds, mineral oddities, fake specimens, and specific mineral discoveries. Each chapter is excellent, as it gives details of many of the minerals we collect and the localities in which they were mined.

The photography is very well done. Every page has a selection of mineral or locality photos. The final section of the book is over 60 pages long, and each advertisement features fine mineral photographs, including much of what has been available to collectors in the last several years.

If there is a drawback to this text, it is the size and weight of the volume; you definitely have to rest it on a table to read it. But that is a small price to pay for the valuable information contained therein. ([fortysevenpress.com](http://fortysevenpress.com), 2012)

—Bob Jones



Look for publisher information on our Web site, [www.rockngem.com](http://www.rockngem.com).



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# LAPIDARY OF THE MONTH

As the owner of the lapidary company D and B Rockworks," says July Lapidary of the Month Daniel R. Kelly, "I thought, 'Why not try to make a knife, made completely from gemstones?' I looked around on the Internet for examples, and didn't find too many, so I figured that I would pretty much have to wing it. I did get some ideas online, but the examples were not quite the type of thing I was looking for.

"The first thing I needed to do was find a slab long enough for the blade and the tang. I saw some knives that were attached blade to handle, but I thought making the blade run through the handle would make a stronger knife. I found a nice, long slab of Chinchilla Petrified wood from Queensland, Australia, that looked as though it would do nicely for a blade. I used a trim saw and 8-inch grinding wheels to rough out the shape of the blade. I only used the two roughest grits (80 and 100) at this point.

"Once I got a general knife blade shape, I started looking for material to use in making the handle parts. I settled on Midnight Lace obsidian from Glass Buttes, Oregon, and Black Skin agate from India. I trimmed the handle pieces so they fit roughly on both side of the blade. Each piece of the handle was lightly ground to ensure as tight a fit as I could get between the handles and the blade, and between the two handle pieces. Once everything was fitted, I washed all the pieces several times in soapy



water, rinsed them well, then let them dry completely.

"Next, I applied epoxy 330 to everything and put the pieces together. I wrapped lightweight cardboard around the knife to act as a clamp while the epoxy dried overnight.

"The next day, I went back out to the diamond grinding wheels and took off all the excess material and made all the slab pieces flush with each other on the 60-grit wheel. Once I got the shape I was looking for, I moved to 220 grit and sanded everything completely. I washed the knife again, let it dry, and then went over any gaps with another coat of epoxy. I let it dry overnight and went back to the grinding wheels. I re-sanded everything with the 220-grit wheel, taking off any excess epoxy.

"Once everything was sanded, I moved down the line of grinding wheels: 600, 1200 and 50,000 grit. It can be tricky to maneuver the knife around the grinding wheels and find an angle that will let you get the nooks and crannies, but through trial and error, I found ways to get all the angles sanded and polished. I then polished the knife with Cerium oxide.

"The total time required for this project (not including epoxy dry time) was 12 hours. The knife feels well balanced in the hand and the grip feels good. I left the knife letter-opener sharp because getting it sharper would cause the stone to chip easily, but a very sharp edge can be made on the blade." 🍷



## Would you like to be named Lapidary 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 Lapidary 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.

Lapidary 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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*Aquamarine-Pakistan  
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- Minneapolis, MN.....Sept. 30-Oct. 1
- Detroit, MI.....October 5-6-7
- West Springfield, MA.....Oct. 12-13
- Asheville, NC.....October 23-24
- Orlando, FL.....October 26-27-28

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- Asheville, NC.....January 8-9
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Dates Subject to Change

**S**HOW DATES

Mark Your Calendar!

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; or use the electronic form at www.rockngem.com.

**JULY 2012**

**4-8—SISTERS, OREGON:** Annual show; Wayne & Jean Miller; Sisters Elementary School, 611 E. Cascade; Daily 9-6, Sun. 9-4; free admission; contact Jean Miller, PO Box 136, 702 E. 5th, Molalla, OR 97038, (503) 829-2680; e-mail: shadow92337@molalla.net; Web site: ogmshows.com

**6-8—DURANGO, COLORADO:** 59th annual show; Four Corners Gem & Mineral Club; La Plata County Fairgrounds, 2500 Main Ave.; Fri. 11-6, Sat. 10-6, Sun. 10-5; free admission; crystals, minerals, gemstones, jewelry, exhibits, displays, dealers; contact Toby Mourning, PO Box 955, Durango, CO 81302-0955; e-mail: info@durangorocks.org; Web site: www.durangorocks.org

**6-8—LIVE OAK, TEXAS:** Wholesale and retail show; E.G.I. Shows; Live Oak Civil Center, 8001 Shin Oak Dr.; Fri. 11-6, Sat. 10-6, Sun. 11-5; free admission; beads, silver jewelry, fine jewelry; contact Molly Moe, 13337 South St., #633, CERRITOS, CA 90703, (714) 388-8339; e-mail: EGI168@hotmail.com; Web site: www.egishows.com

**6-8—MARIETTA (ATLANTA), GEORGIA:** Show and sale; Frank Cox Productions; Cobb County Civic Center, 548 S. Marietta Pkwy.; Fri. 1-5, Sat. 10-5, Sun. 10-5; free admission; gems, jewelry, crystals, minerals, beads; contact Frank Cox, 755 S. Palm Ave., Sarasota, FL 34236, (941) 954-0202; e-mail: frankcox@comcast.net; Web site: www.frankcoxproductions.com

**6-8—PORTLAND, OREGON:** Wholesale and retail show; Gem Faire Inc.; Oregon Convention Center, 777 N.E. 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, exhibitors, on-site jewelry repair; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

**7-8—CINCINNATI, OHIO:** Wholesale and retail show; Intergalactic Bead & Jewelry Shows Inc.; Sharonville Convention Center, West Hall, 11355 Chester Rd.; Sat. 10-5, Sun. 10-5; adults \$5 Sat., \$4 Sun., \$2 coupon on Web site, children (12 and under) free; dealers, precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals; contact Tonya Nicholson, 3865 Lawrenceville Hwy., Ste. 107, Lawrenceville, GA 30044, (888) 729-6904; e-mail: tonya.nicholson@beadshows.com; Web site: www.beadshows.com

**12-15—CASCADE LOCKS, OREGON:** Annual show; Rock Rustlers; Marina Park, Columbia River Gorge, Marina Dr.; Daily 10-6; free admission; crystals, minerals, rough, beads; contact Cindy Allison, 87987 9th, Veneta, OR 97487, (541) 554-2863; e-mail: gemsareus2@yahoo.com

**13-15—RIVERSIDE, CALIFORNIA:** Annual show, CFMS show; CFMS, Valley Prospectors; Riverside Municipal Auditorium, 3485 Mission Inn Ave.; Fri. 10-5, Sat. 10-5, Sun. 10-4; adults \$5, seniors \$4, students (12-17) \$3, children (under 12) free; dealers, demonstrators, gold panning, exhibits; contact Pat LaRue, PO Box 1657, Rialto, CA 92377, (909) 874-5664; e-mail: bplarue@earthlink.net; Web site: www.cfmsinc.org

**13-15—SAN RAFAEL, CALIFORNIA:** Wholesale and retail show; Gem Faire Inc.; Marin Center, 10 Avenue of the Flags; Fri. 12-6, Sat. 10-6, Sun. 10-5; adults \$7 (weekend pass), \$7, children (11 and under) free; jewelry, gems, beads, crystals, silver, rocks, minerals, exhibitors, on-site jewelry repair; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

**14-15—BETHEL, MAINE:** 51st annual show; Oxford County Mineral & Gem Association; Telstar High School, Rte. 26; Sat. 9-5, Sun. 10-4; admission \$2, children free; 16 dealers, field trips, displays, children's activities, silent auction, door prizes, cabbing demonstrations; contact Randall Withee, 34 Morse Rd., Norway, ME 04268, (207) 595-8346; e-mail: witherandall@yahoo.com

**14-15—CHARLOTTE, NORTH CAROLINA:** Wholesale and retail show; Intergalactic Bead & Jewelry Show; Metrolina Tradeshow Expo, Bldg. B, 7100 Statesville Rd.; Sat. 10-5, Sun. 10-5; adults \$5 (discount coupon on Web site), children (12 and under) free; precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads; contact Tonya Nicholson, 3865 Lawrenceville Hwy., Ste. 107, Lawrenceville, GA 30044, (888) 729-6904; e-mail: tonya.nicholson@beadshows.com; Web site: www.beadshows.com

**14-15—TULSA, OKLAHOMA:** Annual show; Tulsa Rock & Mineral Society; Central Park Hall Bldg., Tulsa State Fairgrounds; Sat. 9-6, Sun. 10-5; free admission; crystals, minerals, jewelry, displays, exhibits, silent auction, raffles; contact Leon Reeder, PO Box 2292, Tulsa, OK 74101, (918) 346-7299; e-mail: okyrocks@peoplepc.com; Web site: www.ttownrockhound.org

**15—PICTON, ONTARIO, CANADA:** Annual show; Prince Edward County Rock, Gem & Mineral Club; Crystal Palace, 375 Main St., Picton Fairgrounds, Canada; Sun. 10-5; adults \$3, children (under 12) free; guest speakers, hourly door prizes, kids' mine, dinosaur exhibit, fossils, gems, minerals, lapidary arts; contact John Zandarin, 537 County Road 35, RR2, Picton, ON, Canada K0K 2T0, (613) 476-5510; e-mail: howhardcanitbe@sympatico.ca

**20-21—MINOCQUA, WISCONSIN:** Annual show, "Amazing Agates"; Lakeland Gem Club; Lakeland Union High School, 9573 State Hwy. 70; Fri. 10-6, Fri. 9-5; free admission; presentation by Wayne Sukow, kids' store, gems, beads, minerals, fossils, jewelry, speakers, silent auction, door prizes, demonstrations; contact Pattie Hartmann, PO Box 125, Eagle River, WI 54521, (715) 477-2519; e-mail: gypsyn1120@coslink.net

**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 - Show Director, 5273 Bradshaw Rd., Salem, VA 24153, (540) 384-6047; e-mail: van@toteshows.com; Web site: www.toteshows.com

**20-22—CENTERVILLE, TENNESSEE:** 39th Annual Middle Tennessee Gem & Mineral Show, "Wonders of the Earth"; Hickman County Ag Pavilion & Fairgrounds; 979 Grinder's Switch Rd.; Fri. 10-6, Sat. 10-6, Sun. 10-5; admission \$3; dealers, gemstones, minerals, fossils, jewelry, beads, gem and jewelry making equipment and supplies, rough and uncut gems; contact David Dansby, (931) 994-7884; e-mail: davidhclib@bellsouth.net

**20-22—LYNDEN, WASHINGTON:** Annual show; Gem Faire Inc.; NW Washington Fair & Events Center, 1775 Front 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, exhibitors, on-site jewelry repair; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

**20-22—REEDSPORT, OREGON:** Annual show; Lower Umpqua Gem & Lapidary; Reedsport Community Bldg., 451 Winchester Ave.; Fri. 10-5, Sat. 10-5, Sun. 10-4; free admission; "Treasures from the Earth"; dealers, jewelry, gems, minerals, demonstrators, cabochoning, wire wrapping, glass bead making, gem and mineral displays, door prizes, silent auctions, raffle, kids' activities, "turn me over rocks", ball toss, thunder egg cutting; contact Bill or Virginia Hendrickson, (541) 271-6816

**21-22—CORDOVA, TENNESSEE:** Wholesale and retail show; Intergalactic Bead & Jewelry Show; Woodland Hills-Grand Ballroom, 10000 Woodland Hills Dr.; Sat. 10-5, Sun. 10-5; adults \$5 (discount coupon on Web site), children (12 and under) free; precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-

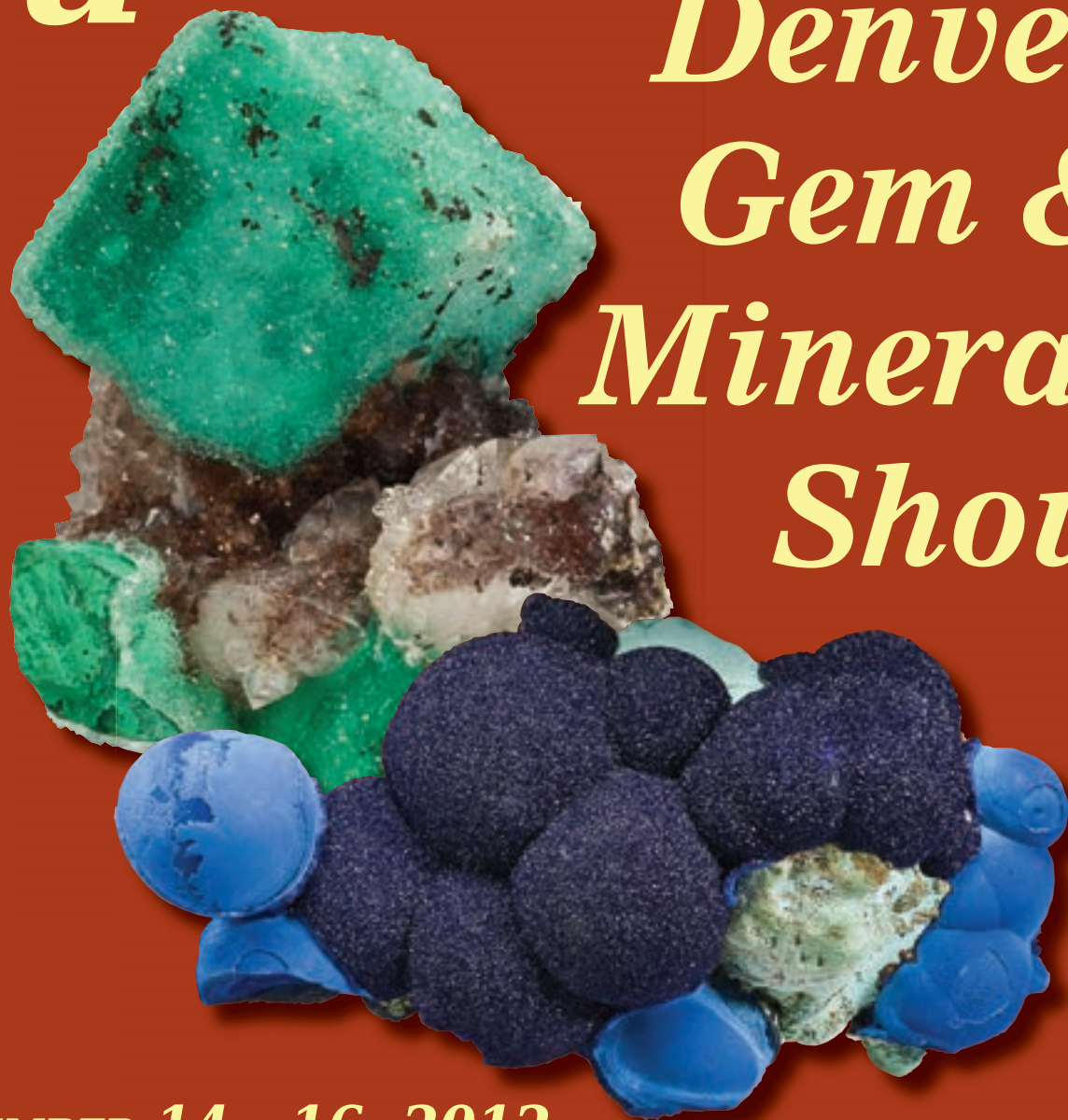
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# Cu

at the

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$\text{Cu}_2(\text{CO}_3)(\text{OH})_2$  - Malachite ps azurite with quartz, 4.5 cm, Piedmont Mine, AZ, Evan Jones collection  
 $\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$  - Azurite with malachite, 8/4 cm, Bisbee, AZ, Paul Harter collection

# The Celestial Origins of GOLD

This Earthly  
Treasure Was  
Born in the Stars

Story and Photos by Bob Jones

With the economy a bit shaky these days, folks are hedging their savings

with gold. The general consensus among mineral dealers and rockhounds is that you are better off holding specimen gold than gold coins. The specimen gold market has rocketed skyward. And that's where the gold on earth originated!

Scientists have pretty much solved the riddle of earth's origins. Like the rest of the planets in our solar system, earth developed from vast quantities of gases that originated when old stars exploded, scattering their contents throughout the near universe. It's those contents that we're interested in.

Ordinary stars manage to create a nice assortment of elements in their cores, where the heat and pressure are immense. Our sun, for example, has been able to change simple hydrogen and helium atoms into the first 66 native elements listed on the periodic table. Scientific instruments have identified the gases of these elements in the sun's atmosphere, but the sun is not large enough to generate the heat and pressure necessary to produce the heavier elements, including gold (atomic number 79), lead (82), and uranium (92). It took stars far larger than our sun to accomplish that.



UNIVERSITY OF ARIZONA COLLECTION

This and other, larger gold pieces set off the metal alarm at the Jamestown mine in the 1990s.

**TOP:** Gold used by the Etruscan civilization of ancient Italy probably came from the Transylvanian region of Romania.

**CENTER:** California gold from the Eagle's Nest mine is some of the finest crystallized gold that was ever found and saved.

**BOTTOM:** This handsome nugget, displayed in the L.A. County Museum, was found in the Mojave Desert using a metal detector.



The natives of South America, particularly the Aztecs, knew of and mined gold long before Europeans arrived on the continent. They formed the metal into all sorts of decorations for their emperors and kings. All that ostentatious wealth contributed to the downfall of their societies, most notably the Incan empire, when the Spanish conquistadors arrived. Though the Spaniards swept the Aztec empire for gold ornaments, some of the treasure survived to this day. The Museo del Oro in Bogotá, Colombia, boasts an amazing display of gold ornaments. There is even a gold raft that represents the craft that was floated onto Lake Titicaca by chiefs of the Musica tribe in order to cast tributes of gold into the water to placate their gods. The ritual was initiated by chief El Dorado, whose name became synonymous with the myth of a Lost City of Gold.

You might think England an unlikely place for gold to occur, but there is at least one small deposit at Hope's Nose, on the South Coast, that has produced fine wire gold in the last few decades. Another small gold mine near Dolgellau, Wales, is owned by the Crown. It is only worked to retrieve enough gold to make the wedding bands for royal couples.

Oddly, the vast lands of China have not been productive of gold. I can't find any references that describe gold of any consequence from that mineral-rich country. However, on a trip to China, I was able to watch two couples working a placer operation in Hunan Province. They had a Blake jaw crusher, a Wilfley® concentrating table, shovels and wheelbarrows, and were working the boulders and sands from a nearby river. Their take had to have been modest, as they only took the slimes from below the Wilfley table to the local refinery once a year, but it was profitable enough for the two families to subsist!

There is an abundance of examples of gold mines in California. The state is the source of more crystallized gold than any other location. Several California mines have produced fine specimens in the last couple of decades, including the Colorado Quartz mine, Eagle's Nest mine, Diltz mine, Jamestown mine, Sixteen to One mine, and Red Ledge mine. Some of these mines, such as the Jamestown, are actually being worked for gold ore. Most, however, are being operated by small crews looking for specimen gold. They scan the walls of old tunnels with metal detectors and enjoy some success.

In the Colorado Quartz mine, at the southern end of California's gold belt, fine crystallized gold has been recovered using metal detectors. Of all the specimens found in this old mine, the one that has gained notoriety is "The Dragon", a nice clump of beautifully crystallized gold in the shape of that mythical creature. You can see it on display in the Houston Museum of Nature and Science.

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Origins of **GOLD** from page 14



The Hope's Nose deposit on England's South Coast produced some nice wire gold specimens for collectors.

At the Sixteen to One mine, on the northern end of the California gold belt, is another metal detector mining operation. It has produced "The Whopper", a 44-ounce crystalline mass of bright-yellow gold, but the mine is probably better known for its jewelry gold. The quartz vein carrying the gold is at least 10 feet high and equally as wide. The quartz is snow-white in many places and, with streaks, bits, and small crystalline masses of gold locked inside it, makes a perfect material from which to make quartz-gold jewelry and carvings.

In the 1990s, the Jamestown mine was in full swing. Underground crews were blasting way at the gold veins, and the ore was hauled to the surface on a conveyor. The conveyor was equipped with a metal detector to detect possible gold specimens and iron tools or anything else that might mess up the crusher. When metal passed by, an alarm sounded. One night, workers responded to an alarm and were stunned to see huge chunks of crystallized native gold on the belt. Plenty of specimens resulted from that discovery.

You would think that, after centuries of persistent hunting, all the world's gold would have been found by now, but that is not so. Metal detectors have found large chunks of the yellow stuff in Mexico, of which the "Boot of Cortez" is a good example. Shaped like a cowboy boot, this 386-ounce beauty was found in the 1980s and was displayed at Tucson a few years ago.

In Australia, two guys with a detector found a 55-pound mass of gold about 3 feet beneath the desert floor near Kalgoorlie, an old gold camp. It *Rock & Gem* featured the mass, dubbed the Ausrox nugget, on its January 2011 cover, and it was displayed at the 2011 Tucson Show.

In the 1980s, one fellow drove a jeep across a California section of the Mojave Desert with a detector attached to his front bumper and found a 134-pound nugget! Finds like these send rockhounds scurrying across the desert with metal detector and gold pan in hand. So get out your electronic gold scanner and head out into the field. You just might find the Big One! 🍀

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# SHOP TALK

by William A. Kappelle

## Display Options

Probably all of us—from the casual collector who has picked up a specimen or two while on vacation in the mountains or the desert or at the beach (shore for those of you on the other side of the country) to old mossbacks like yours truly who still haul home tons of semi-useful stuff—have tossed these specimens into a corner, a box, or some other place where we could tell ourselves that our treasures would be safe until we got around to doing something with them. Sadly, with too many of us, the pile keeps growing, like that expanding foam insulation, until it threatens to take over the basement, the garage, or the backyard. Well, comrades, let's make a vow that we will start attacking at least the fringes of the pile and see if we can come up with some interesting ways to use the useless.

The pretty piece of chalcedony in the photo above has been working its way from pile to pile around my home for quite some time. Every once in a while, I would come across it and set it somewhere with the intention of doing something with it someday. Most recently, it was lying on the stand that holds my trim saw in my garage.

I was in the process of rearranging the mess that I call my garage and had piled a lot of stuff on the driveway while sorting it out. My next-door neighbor stopped by to see if there had been an explosion, and while I was in the process of explaining that this was a planned disaster, she noticed the chunk of chalcedony on the saw stand. She was really taken by it, and I was ready to give it to her right there, but I realized that, as a chunk, it would probably end up just as it was with me: shifted here and there around her house and eventually forgotten. So, after I cleaned up the explosion on the driveway, I scouted up a chunk of wood, chucked it up in the lathe, and turned a little platform for the piece. It now occupies a prominent place in my neighbor's house and doesn't have to share the saw stand with a lot of lesser rocks.

Let's see what other things we can come up with. How about those nice, small chunks of white quartz with bits of pyrite in them? Do you have ceiling fans? Are the pulls ugly little chunks of nondescript wood or brass stamped with the name of the fan manufacturer? How about making a nice pull out of white quartz with pyrite?

Do you have kids? If they have collected "favorite" rocks at the beach or wherever,



how about using some of them for knobs on their toy boxes or the dresser drawers in their rooms? Home centers have lots of flat or concave metal and wooden knobs to which you can epoxy these rock samples. The kids will be thrilled, and if they come up with new favorites, you can just get another knob or two and replace the old ones.

If, instead of practical uses such as knobs, you would just like to display some nice specimens that have been pining away in a box, don't overlook the good old shadow box. They come in large and small, shallow and deep, fancy and plain, and every style in between. I even saw one on the Internet that was a grid of little pigeonholes. This would be perfect for small specimens. Another advantage of shadow boxes is that they can be hung on the wall or laid flat on a coffee table or side table.

With a little thinking outside the box, you can come up with some creative ways of whittling down that forgotten rock pile and displaying your mineral treasures in a proper manner.

Happy displaying! ♥

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 [quappelle@cox.net](mailto:quappelle@cox.net).



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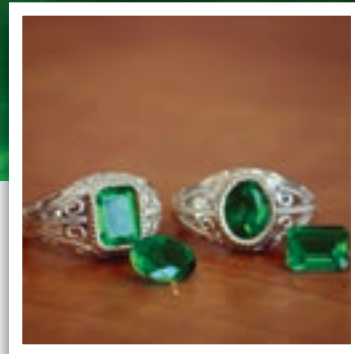
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BOB FARRAR PHOTO



# BRAZIL'S CRUZEIRO MINE

## It's the World's Greatest Tourmaline Mine

Story by Bob Farrar

I feel that I must start this article with an apology to tourmaline miners in Maine, California, Afghanistan, Pakistan, Africa, other localities in Brazil, and many others. There are certainly great tourmaline mines in all of these

places. However, as I recently was able to learn firsthand, there is one tourmaline mine that, in my humble opinion, stands out as the greatest of them all. That is the Cruzeiro mine of Minas Gerais, Brazil.

Anyone who is familiar with tourmaline from Brazil has probably heard of the Cruzeiro mine. I have been traveling to Brazil and visiting gem and mineral localities for over 20 years. During that time, I have visited several tourmaline localities, such as ones near Araçuaí, Minas Gerais ("Araçuaí Pegmatite Minerals", March 2011 *Rock & Gem*). Over the years, I have seen much beautiful material that came from the Cruzeiro mine, and have read about it. As much as all that made me want to see the place for myself, however, I had never had the opportunity to do so. That opportunity finally came in August 2011.

This trip, like all my others, was arranged by Sara Mount, of Silver Spring, Maryland. In Minas Gerais, Sara has worked with local tour guide Harold Walner ever since she first started going to Brazil. It was through Harold's contacts with the Neves family, holders of the lease on the mine, that I was finally able to visit the Cruzeiro.

The Cruzeiro mine is located about six miles from the town of São José da Safira, in

the state of Minas Gerais. São José da Safira, in turn, is about 36 miles north-northwest of Governador Valadares, one of the larger cities in the state. São José da Safira takes part of its name from the Portuguese word for "sapphire". Early explorers found blue stones that they believed to be sapphires, but were actually tourmaline. The deposit is located near the top of a mountain, Serra Resplendente do Cruzeiro, at an elevation of about 4,593 feet. Atop the mountain is the small village of Cruzeiro (from the Portuguese for "cross"), named for a cross at a nearby church. Besides the Cruzeiro mine, there are many other famous tourmaline mines in the area, including the Pederneira and Chiá Mines.

Geologically speaking, the Cruzeiro mine is in a granitic pegmatite, hosted by quartzite. As such, the most abundant minerals are quartz, feldspars, and muscovite mica. However, it is elbaite for which the mine is so famous. Elbaite is the main mineral species of gemological importance in the tourmaline group of minerals. The only other tour-

maline-group mineral found at the Cruzeiro mine is schorl (black tourmaline), which is of little importance. In this article, therefore, "tourmaline" will refer to elbaite.

Other minerals found at the Cruzeiro mine include beryl (aquamarine and morganite), columbite, and weathered spodumene. The Cruzeiro mine is a primary pegmatite deposit, meaning that it is still enclosed in its original host rock, as opposed to weathered-out alluvial deposits. There are five subvertical veins, each up to about 60 feet thick. The veins exhibit well-developed zonation, with the tourmaline being found primarily near the center. In some areas, a quartz core is present. Much of the formation is highly weathered; the feldspars have typically been altered to kaolin and the spodumene to montmorillonite.

**ABOVE:** Rubellite, like this 2-inch crystal and 6.7-carat gem, is the most sought-after variety of tourmaline at the Cruzeiro mine.

The mine's five veins are designated 1, 1½, 2, 3 and 4. Interestingly, vein 1½ was found somewhat by accident. A number of years ago, work began on a tunnel that was to be a new entrance to Vein 1. About 20 feet below Vein 1, the miners took a wrong turn, missing that vein, but discovering a new one, which was designated 1½. This particular part of the mine is known as Umbezão, which roughly translates to "The Big One".

The tourmalines found at the Cruzeiro mine occur in a wide range of colors. They may be green (verdelite), blue (indicolite), red (rubellite), or some combination thereof. Combinations include watermelon, which is red inside and green outside, and bicolor, in which the color changes along the length of the crystal (red on one end and green on the other, for example). Most prized, however, is the rubellite, which is considered the finest in the world. Tourmaline crystals occur in a variety of shapes, ranging from short and thick to elongated and needlelike, with flat or pyramidal terminations. They range in size up to several pounds, and vary from opaque to transparent. As the feldspar is usually weathered to kaolin, most tourmaline crystals are free of matrix, though they can be intergrown with quartz.

The deposit in which the Cruzeiro mine is located was reportedly discovered in 1915 and the first lease registered in 1938. In those early years, the mine was worked primarily for mica; it was a major source during World War II, with several thousand tons being produced. Mining for tourmaline began in the 1950s, with countless *bamburros* (big finds) being made over the years. The mining lease passed through several hands, and was acquired by José Neves in 1982. After he died in a plane crash in 1992, the lease passed to Douglas, Diego and Beatriz Neves, who represent the fifth generation of the Neves family to be in the gemstone business. They continue to operate the mine today, currently employing some 80 miners. The Neves' company, Nevestones, is a major wholesale supplier of tourmaline rough. Most of its production is sold immediately, much of it to China and India. However, Nevestones cuts the best material and exhibits it in Tucson and Hong Kong.

My visit to the Cruzeiro mine was one of the most exciting visits I have made to a mine in Brazil. I had been looking forward to it for months, ever since Sara informed me that it would be part of her itinerary. On this particular outing were Sara, our guide Harold, Oklahoma mineral dealers Sebastian and Ambrosia Geffre and their



DOUGLAS NEVES PHOTO

I was able to examine a large quartz pocket at the bottom of the shaft.

son John, Alaska mineral dealers and brothers Larry and Curt Leuenberger, a bus driver, and me. For most of our excursion in Minas Gerais, we traveled around in a well-appointed medium-size bus. For the visit to the mine, however, we switched to another bus that was more suitable for the sometimes rough road.

The main road through eastern Minas Gerais is BR 116, a very busy paved highway that links the cities of Rio de Janeiro and Bahia. To get to the Cruzeiro mine, we left BR 116 about a half hour's drive north of Governador Valadares and headed west. The road was paved for a ways, but soon turned to dirt. August is the middle of the dry season

in Minas Gerais, which is one reason Sara likes to go at that time. The road was in pretty good shape, and we made good time to São José da Safira. Soon afterward, though, we began to ascend the mountain on which the mine is located, and the going became slower. The road was steep in spots, but was still passable for our bus. Had it been the rainy season, we would have needed four-wheel-drive vehicles. The scenery along the way was beautiful, as we passed through some remnant patches of the native Atlantic rainforest, and the view from the top was spectacular. Soon, we began to see old pegmatite dumps, so we knew that we were getting near.



BOB FARRAR PHOTO

Rough tourmaline crystals are washed before they are sent to be sorted and graded.



BOB FARRAR PHOTO

The mine headquarters houses a small museum that features displays of old mining tools.

At the mine headquarters, we were warmly greeted by Douglas, Diego and Beatriz. Before we saw the mining operations, I told the Neveses about some of the articles I had written for *Rock & Gem*, gave them a copy of a recent one, and asked their permission to write about their mine. They graciously agreed. (I never like to write about a privately operated mine without getting permission. Some owners do not want too much information getting out, and to publish such information without permission would hurt Harold's and Sara's relationships

with the owners and jeopardize future visits.) Douglas then proceeded with an explanation of the geology and history of the mine, and of the family business.

The headquarters is a small building with electricity and running water near the top of the mountain. This is no grubby mining camp; the structure is well built and clean. The grounds are beautifully landscaped, with grassy lawns and flower beds, and there is an overlook with a great view of the surrounding countryside. Near the headquarters building, they had built a small museum

housing an interesting collection of old mining tools and equipment. There were rock drills, saws for cutting timbers, and various other tools, but no minerals except for a few mica books. Also nearby, set in a shallow cave, is a small shrine to "Saint Lafaiete". Lafaiete, we were told, was not officially a saint, but had been a friend of the Neves family and was greatly revered by them. Before showing us the mining operations, the Neveses fed us lunch. We had been told that we would be fed at the mine, but we were not prepared for such a fabulous lunch. I was expecting perhaps sandwiches and fruit, but they had prepared a full hot meal featuring a local specialty, *frango com quiabo* (chicken with okra).

As we finished lunch, we were told that they were washing tourmaline that had just been brought out of the mine and that this would be the best time to see that part of the operation. Outside the headquarters building is a cement water tank about 6 feet across and 2 feet deep where workers were using round screens made of wire mesh to wash the material. Each screenful held several pounds of stones, most of them tourmaline, and they washed several screenful while we were there. There was tourmaline in a variety of colors, including greens, pinks and bicolors, and some pieces were gemmy. Most were loose, but there were also some on a quartz matrix. Washed material was bagged up for transport to Governador Valadares for grading. Also being washed were some large quartz crystals, up to about a foot



BOB FARRAR PHOTO

Large quartz crystals are found at the Cruzeiro mine.



BOB FARRAR PHOTO

This tourmaline specimen, measuring about 4 inches long, is fresh from the mine.

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BOB FARRAR PHOTO

Our gracious hosts, Douglas, Beatriz and Diego Neves, are the fifth generation of the Neves family to be in the gemstone business.



BOB FARRAR PHOTO

Spodumene crystals over a foot long that had altered to soft, pink montmorillonite were visible in the roof of the side tunnel.

long. These were coated with an iron stain, but would be spectacular when cleaned.

Finally, it was time for the part that I was anticipating most: the visit to the mine itself. For this, the Neveses provided us with rubber boots and hardhats, which I have not always had when visiting mines in Brazil, but for which we would later be grateful. It was then a short ride by car down the mountainside to the entrance to Vein 1½. The entrance was an adit (horizontal tunnel), with a small track on which mine carts could ride to bring out rock. The way was lighted with electric lights—no old-fashioned carbide lamps here. We followed the tunnel about 100 yards into the mountain. At that point, we came to a steeply inclined shaft leading to the working areas. To get to those areas, it was necessary to climb down a series of ladders. The ladders were just for people; rock was not being carried up that way. For this purpose, a single rail was attached to the roof with a large bucket suspended from it, which could be drawn up by cables. The shaft continued up past the horizontal tunnel to the surface, where material could be taken out.

If we wanted to see the workings, we would have to climb down the ladders about 100 feet. I've been in a lot of mines in my time, but I must admit I had some trepidation about going down. But this was what we came for, so I was not about to quit. It was not an easy climb. The ladders were slick with mud, and the rungs were far apart. Nevertheless, we all made it down and, more importantly, back up, including Sebastian, who was 84 at the time.

Partway down, there was a side tunnel in which pegmatite formations were clearly visible. There were, of course, the usual quartz, mica, and weathered feld-

spars. In some areas, finger-size green tourmaline crystals (not gem quality) in quartz were visible. In another spot, there was an aquamarine crystal several inches long. In the roof, there were spodumene crystals over a foot long that had altered to soft, pink montmorillonite, a type of clay. Douglas told us that the miners use this material like soap to remove grease from their hands. At the very bottom of the shaft, workers had opened a pocket of large quartz crystals and were in the process of taking them out. We each got a chance to crawl into it for a close look and to take a few photos.

We were all thrilled to be able to experience the mine firsthand. However, it was soon time to head back to the surface for a much-appreciated breath of fresh air. I, for one, had new respect for the men who toil in the mine day in and day out to bring us beautiful gems and minerals.

Well, you might be thinking, the Cruzeiro mine is certainly an interesting place, but what makes it the greatest tourmaline mine in the world? What sets it apart in my opinion is the combination of quality and quantity of material. Other mines may have produced greater *bamburros*, such as the Jonas mine in Conselheiro Pena, Minas Gerais, which yielded the greatest single pocket of rubellite ever found in 1978. Other tourmalines may even command a higher price per carat, such as the electric blue "Paraiba" tourmaline of the Batalha mine in the Brazilian state of Paraiba. But these mines and many others have come and gone in a relatively short time. The Cruzeiro mine is an exception. Mica has been mined there since the 1930s and tourmaline since the 1950s. Yet, it is estimated that only about 20% of the deposit has been mined, and

the lease on that deposit covers 5 million square meters (almost two square miles). Douglas told us that, in the previous year, some 8 tons of tourmaline had been produced, of which about 5% (2 million carats) was gem quality. The quality of the material is perhaps more significant than the quantity. The rubellite comprises a relatively small percentage of the total production, but as I mentioned earlier, it is considered the finest in the world. Thus, considering quantity and quality of material, and longevity of production, I would argue that no other mine could be considered the greatest tourmaline mine in the world.

I am grateful to the Neves family for allowing us to visit the Cruzeiro mine. Neveses is in the business of gemstone mining, not giving tours, so I consider our visit to be a rare privilege. In light of what I have learned, I am sure that we will continue to see beautiful material from the Cruzeiro mine for many years to come. ♥



BOB FARRAR PHOTO

This fine piece of rough rubellite is destined to be used for carving material.





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## Show Dates from page 10

### JULY 2012

blown glass beads, vintage beads, crystals; contact Tonya Nicholson, 3865 Lawrenceville Hwy ste 107, Lawrenceville, GA 30044, 888-729-6904; e-mail: [tonya.nicholson@beadshows.com](mailto:tonya.nicholson@beadshows.com); Web site: [www.beadshows.com](http://www.beadshows.com)

**21-22—DARRINGTON, WASHINGTON:** Show and sale; Darrington Rock & Gem Club; Grange Hall, 1265 Railroad Ave.; Sat. 10-6, Sun. 10-5; free admission; displays, demonstrations, door prizes, raffle, all amateur dealers, unusual materials, certificates for every dollar purchase (redeem for club's rocks), on-site rock cutting and polishing; contact Edward Lehman, 9120 20th St. SE, Lake Stevens, WA 98258, (425) 334-6282; e-mail: [wsmced@hotmail.com](mailto:wsmced@hotmail.com)

**21-22—FLAGSTAFF, ARIZONA:** Retail show; Sharon Szymanski; Radisson Woodlands Hotel, 1175 W. Rte. 66; Sat. 10-5, Sun. 10-4; adults \$3, children (under 12) free with adult; dealers, fine and costume jewelry, sterling silver and gold, minerals, rocks, slabs, cabochons, crystals, beads, unset gemstones, wire wrapping on the premises; contact Sharon Szymanski, 1792 E. Laddoos Ave., San Tan Valley, AZ 85140, (480) 215-9101; e-mail: [goldcanyon2@yahoo.com](mailto:goldcanyon2@yahoo.com)

**21-22—FORT WORTH, TEXAS:** Retail show; The Bead Market; Amon Carter Exhibit Hall, Will Rogers Center, 3400 Burnett Tandy Dr.; Sat. 10-5, Sun. 10-4; free admission; gemstones, glass and all kinds of beads, pearls, findings, lampwork, tools, books, beading supplies; contact Rebekah Wills, PO Box 494, Gilmer, UT 75644, (903) 734-3335; e-mail: [rebekah@thebeadmarket.net](mailto:rebekah@thebeadmarket.net); Web site: [www.thebeadmarket.net](http://www.thebeadmarket.net)

**21-22—KALISPELL, MONTANA:** 5th annual show; The Northwest Montana Rock Chucks; Northwest Montana Fairgrounds, 265 N. Meridian Rd.; Sat. 10-6, Sun. 10-4; adults \$1, children (under 12) free; dealers, jewelry, rocks, minerals, fluorescent minerals, kids' activities, demonstrations, silent auctions, door prizes, raffles; contact Milah Gano, (406) 844-3560; e-mail: [mallards\\_g@hotmail.com](mailto:mallards_g@hotmail.com)

**21-22—MOOSE LAKE, MINNESOTA:** Annual show; Carlton County Gem & Mineral Club, Moose Lake Area Chamber of Commerce; Moose Lake High School and parking lot, 413 Birch Ave.; Sat. 9-5, Sun. 9-4; free admission; dealers, Lake Superior agates, cutting materials, specimens, crystal groups, fossils, gems, jewelry, lapidary equipment, rough rock tailgaters, door prizes, field info, Agate Stampede; contact Gary Pitoscia, 815 N. 13th Ave. East, Duluth, MN 55805, (218) 724-1894; e-mail: [pitosciaj@charter.net](mailto:pitosciaj@charter.net)

**26-29—MINNETONKA, MINNESOTA:** Show and sale; Minnesota Mineral Club; Lindbergh Center, Hopkins High School, 2400 Lindbergh Dr.; Thu. 8-5, Fri. 12-7, Sat. 9-5, Sun. 10-4; adults \$5, students and children free; exhibits, sales, presentations, seminars by agate experts from around the world (pre-registration and additional fee required); Midwest and American federation annual meetings; contact Sandy Fuller, PO Box 82, Newport, MN 55055; e-mail: [2012agates@gmail.com](mailto:2012agates@gmail.com); Web site: [minnesotamineralclub.org](http://minnesotamineralclub.org)

**27-29—EUGENE, OREGON:** Wholesale and retail show; Gem Faire Inc.; Lane County Event 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, exhibitors, on-site jewelry repair; contact Yooy Nelson, (503) 252-8300; e-mail: [info@gemfaire.com](mailto:info@gemfaire.com); Web site: [www.gemfaire.com](http://www.gemfaire.com)

**27-29—PENDLETON, OREGON:** Show; Jean Miller; Pendleton Convention Center, 601 Westgate; Fri. 10-6, Sat. 10-6, Sun. 10-4; free admission; gems, minerals, jewelry, fossils; contact Jean Miller, PO Box 136, 702 E. 5th, Molalla, OR 97038, (503) 829-2680; e-mail: [shadow92337@molalla.net](mailto:shadow92337@molalla.net); Web site: [ogmshows.net](http://ogmshows.net)

**28-29—MATTITUCK (LONG ISLAND), NEW YORK:** 31st annual show; Long Island Mineral & Geology Society; Mattituck High School, 15125 Main Rd.; Sat. 10-5, Sun. 10-5; adults \$6, children (under 12) free; exhibits, sales, minerals, gems, fossils, lapidary, jewelry makers, repairs, wire wrapping, precious and semiprecious beads, pearls, amber, antique jewelry, geode cracking, grand door prize; contact Frank Basile, (631) 398-6066; Web site: [www.limags.com](http://www.limags.com)

**28-29—SOUTH BURLINGTON, VERMONT:** 33rd annual Champlain Valley Gem, Mineral & Fossil Show; Burlington Gem & Mineral Club; Tuttle Middle School, 500 Dorset St.; dealers, exhibits, lectures, demonstrations, children's activities, silent auction, door prizes; Sat. 10-5, Sun. 10-5; adults \$3, seniors and students (6-16) \$2, children (under 6) free with adult; contact Jeff Higgins, (802) 849-6076; Web site: [www.burlingtongemandmineralclub.org](http://www.burlingtongemandmineralclub.org)

**28-29—TENINO, WASHINGTON:** 18th annual show; Washington Agate & Mineral Society of Olympia; Parkside Elementary School, Stage St. S.; Sat. 9-6, Sun. 9-5; free admission; tailgating, indoor dealers, display cases, demonstrations, concurrent with Oregon Trail Days Celebration; contact Daniel De Boer, PO Box 2553, Olympia, WA 98507; e-mail: [keylock1@live.com](mailto:keylock1@live.com)

**28-29—YORK, PENNSYLVANIA:** Wholesale and retail show; Intergalactic Bead & Jewelry Show; York Expo Center-Horticultural Hall, 334 Carlisle Ave.; Sat. 10-5, Sun. 10-5; adults \$5 (discount coupon on Web site), children (12 and under) free; precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals; contact Tonya Nicholson, 3865 Lawrenceville Hwy., Ste. 107, Lawrenceville, GA 30044, (888) 729-6904; e-mail: [tonya.nicholson@beadshows.com](mailto:tonya.nicholson@beadshows.com); Web site: [www.beadshows.com](http://www.beadshows.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: [colisdonna@yahoo.com](mailto:colisdonna@yahoo.com)

### AUGUST 2012

**2-5—BANCROFT, ONTARIO, CANADA:** 49th annual show, "Rockhound Gembooree"; Bancroft & District Chamber of Commerce; 63 & 103 Newkirk Blvd.; Thu. 10-7, Fri. 10-7, Sat. 10-7, Sun. 10-5; adults \$8, seniors and students \$7, children (under 6) free; field trips, gold panning, rock climbing, speakers, door prizes, demonstrations, minerals, crystals, fossils, gems, jewelry, books, tools, equipment, lapidary supplies; contact Jody Didier, Bancroft & District Chamber of Commerce, Flint Ave., Bancroft, ONT K0L 1C0, (613) 332-1513; e-mail: [gemboree@bancroftdistrict.com](mailto:gemboree@bancroftdistrict.com); Web site: [www.bancroftdistrict.com](http://www.bancroftdistrict.com)

**2-5—SPRUCE PINE, NORTH CAROLINA:** Annual show; Mitchell County Chamber of Commerce; The Bridge Coliseum, 97 Pinebridge Ave.; Thu. 10-6, Fri. 10-6, Sat. 10-6, Sun. 12:30-5; adults \$3, seniors \$1, children under 5 free; dealers, gemstones, minerals, silver, fine jewelry, hand-crafted pieces, mine tours; contact Patti Jensen, PO Box 858, Spruce Pine, NC 28777, (828) 765-9033; e-mail: [pjensen@mitchell-county.com](mailto:pjensen@mitchell-county.com); Web site: [www.ncgemfest.com](http://www.ncgemfest.com)

**3-5—CREEDE, COLORADO:** Annual show; Rare Things Gallery; Underground Mining Museum/Community Center, Forest Service Road 503, #9; Fri. 10-5, Sat. 10-5, Sun. 10-5; free admission; evening programs; contact Jenny Inge, PO Box 371, Creede, CO 81130, (719) 658-2376; e-mail: [rarethingsgallery@yahoo.com](mailto:rarethingsgallery@yahoo.com); Web site: [www.creederocks.com](http://www.creederocks.com)

**3-5—HILLSBORO, OREGON:** Wholesale and retail show; Gem Faire Inc.; Washington County Fairgrounds, 873 N.E. 34th Ave.; Fri. 12-6, Sat. 10-6, Sun. 10-6; adults \$7 (weekend pass), children (11 and under) free; jewelry, gems, beads, crystals, silver, rocks, minerals, exhibitors, on-site jewelry repair; contact Yooy Nelson, (503) 252-8300; e-mail: [info@gemfaire.com](mailto:info@gemfaire.com); Web site: [www.gemfaire.com](http://www.gemfaire.com)

**3-5—OVERLAND PARK, KANSAS:** Wholesale and retail show; Heartland Innovative Trade Shows; Overland Park Convention Center, 6000 College Blvd.; Fri. 10-6, Sat. 10-6, Sun. 12-5; free admission; dealers, fine jewelry, gems, minerals; contact Rain Dove, 11184 Antioch #222, Overland Park, KS 66210, (913) 620-4278; e-mail: [rain.dove@hitsgemshows.com](mailto:rain.dove@hitsgemshows.com); Web site: [www.hitsgemshows.com](http://www.hitsgemshows.com)

**3-5—PRESCOTT, ARIZONA:** Annual show; Prescott Gem & Mineral Club; Embury Riddle Aeronautical University Activity Center, 3700 Willow Creek Rd.; Fri. 9-5, Sat. 9-5, Sun. 9-4; adults \$2, children (12 and under) free; rocks, gems, jewelry, fossils, beads, slabs, cabochons, lapidary tools, raffle, kids' Mineral Mine and spinning wheel, displays, dealers, special "Pebble Pups" display; contact Judy Sullins, PO Box 3923, Chino Valley, AZ 86323, (928) 445-1117; e-mail: [sullinsjs@cableone.net](mailto:sullinsjs@cableone.net); Web site: [www.prescottgemmineral.org](http://www.prescottgemmineral.org)

**4—ISHPEMING, MICHIGAN:** 37th annual show; Ishpeming Rock & Minerals Club; Ishpeming Elks Club, 597 Lake Shore Dr.; Sat. 9:30-4:30; free admission; mineral displays, dealers, kids' area, silent auction, hourly prizes, raffle, mineral demonstrations, field trips, Cracker Barrel session, auction, raffle, program; contact Ernest Johnson, 1962 W. Fair, Marquette, MI 49855, (906) 228-9422; e-mail: [ejohnson@nmu.edu](mailto:ejohnson@nmu.edu)

continued on page 36

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# ROCK SCIENCE

by Steve Voynick

## A Look at Silicon

Silicon, the second most common element after oxygen, makes up about 27% of the mass of the earth's crust. Despite this abundance, few people apart from steelmakers and the manufacturers of semiconductor devices have ever actually seen elemental silicon.

At ambient temperatures, elemental silicon has two allotropic forms: amorphous and crystalline. Amorphous silicon is an unremarkable brownish powder. The crystalline form, which has considerably greater visual appeal, is an opaque, silvery-gray, brittle material with a bright metallic luster and an attractive blue iridescence. Silicon exhibits a conchoidal fracture and, at Mohs 7, is as hard as quartz. It has an atomic weight of 28.09, about that of aluminum, and a relatively low specific gravity of 2.3.

Silicon occurs only rarely as a native element, usually as a volcanic exhalant; it also occurs as minor inclusions in native gold and as a component of certain types of meteorites. Because of its affinity for oxygen, with which it forms strong, covalent bonds, virtually all silicon in the crust is locked up in quartz (silicon dioxide) or other silicate minerals. Although silicon was identified as an element in 1787 and isolated in 1823, it was not known to exist naturally in an elemental state until 1983.

Among silicon's few natural, oxygen-free compounds is the rare mineral moissanite (silicon carbide) which, at Mohs 9.5, approaches the hardness of diamond. The synthetic analog of moissanite is Carborundum™, a mass-produced industrial abrasive. Moissanite gems are cut from specially grown, synthetic, silicon carbide crystals.

Elemental silicon is used to deoxidize molten steel and to make steel alloys; 4% silicon steel has many electrical uses due to its low hysteresis (tendency to magnetize), while 15% silicon steel has very high corrosion resistance. Silicon is also manufactured into silicides, ceramic-metal alloys that combine the high-temperature strength and stability of ceramics with the ductility and shock resistance of metals.

Silicon's most important application utilizes its unusual electrical properties. As a semiconductor, its conductivity at ambient temperatures falls between that of conductors and nonconductors. At low temperatures, silicon acts as an insulator, but high temperatures, bright light, and added impurities, called "dopants", increase its conductivity dramatically. "Doped" silicon functions as a biterminal diode "switch"



Elemental silicon, which is rarely seen, has a bright metallic luster and an attractive blue iridescence.

with a directionally selective response to passing electrical current. Silicon diodes are grouped to make transistors, which in turn are grouped to make semiconductor "chips"—the vital cores of our computers and miniature electronic devices.

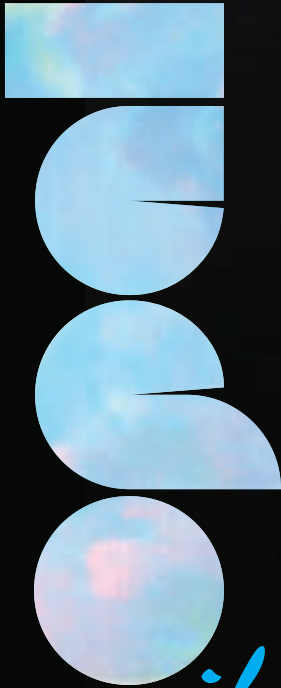
For semiconductor use, semiconductor-grade crystalline boules are grown from seed crystals immersed in doped, molten silicon in a process similar to that used to synthesize flux rubies. These boules, about 3 feet long and 1 foot in diameter, are then sliced into thin wafers and etched with complex, integrated circuits.

Elemental silicon is produced by melting a mixture of high-grade quartz sand and a carbon reducing agent in electric furnaces. At temperatures above 3,450°F (1,900° Celsius), the carbon combines with oxygen in the silicon dioxide to produce carbon dioxide gas and 98% pure, metallurgical-grade elemental silicon. Crude silicon, which costs about \$1 per pound, is refined to higher purity for fabrication into semiconductor-grade silicon boules.

Silicon boules tend to be crystallographically perfect and thus suitable for semiconductor use, though only at their terminal ends. Most non-semiconductor-grade portions of the boules are recycled. Some of the material, however, is broken into pieces or fashioned into paperweights and bookends and sold as novelty items in rock shops. Given the popularity of the many quartz varieties among collectors, it's nice to know what the key element in quartz actually looks like. ♥

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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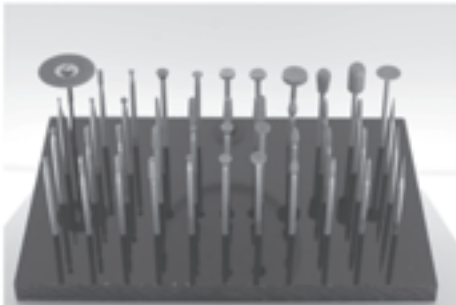
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# Sluice Box SHOOTOUT

## Which One Yields More Gold?

Story by Marc Davis/Photos by Marc and Mimi Davis

I've gotta get more gold," said my friend Jack. "I've been panning three times now and got some flakes, but I'd sure like to do better than that."

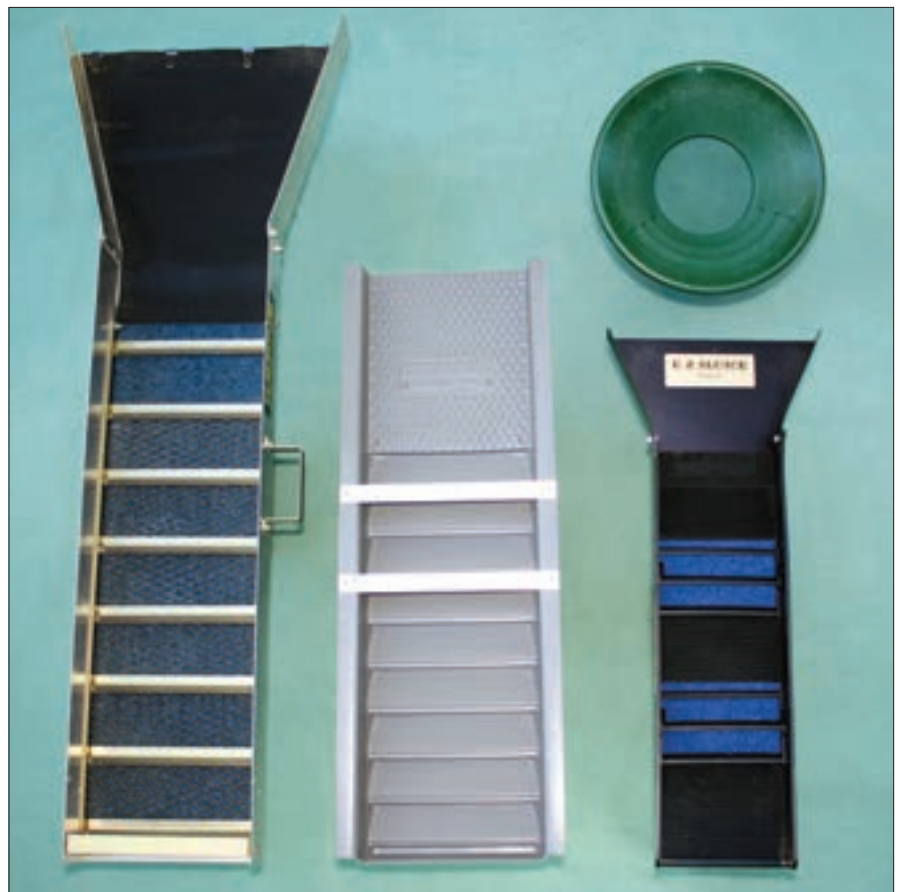
"Have you ever thought about trying a sluice?" I asked.

Jack scratched his chin as if deep in thought. "Well," he answered, "I know I could run a lot more dirt through a sluice than I can work with my pan, but there are so many different sluices out there I wouldn't know which one to get."

I pondered Jack's dilemma. There is a plethora of sluices on the market these days. Some are made of aluminum, some are plastic, some have removable riffles and others do not, some have carpet lining the bottom, some have "miner's moss", and some have no lining at all. The variations seem endless.

There weren't as many choices back in the day when I got my first sluice box. I've had the same old aluminum sluice for 20 or more years. It seems like an aluminum sluice in small, medium or large were my only choices back then. It was taken for granted that the bigger the sluice, the more dirt you could run through it, and therefore the more gold you would get, so I bought a size large.

Now, I also have a smaller, lightweight plastic sluice that I picked up quite a few years back. I use it when I'm backpack-



From left: Keene A52, Angus MacKirk Expedition, Tee Dee Co. E-Z Sluice, Garrett Gravity Trap gold pan.

ing into remote areas and don't want to carry the bulkier, heavier metal sluice. I have noticed, though, that I can't run as much dirt through the small sluice as I can run through the big one. I am sacrificing gold production when I use the smaller box.

There is a folding aluminum backpack sluice, made by Jobe Tools, that has been around for a while. Although it is heavier than the newer, lightweight plastic sluices

now on the market, it does fold up into a nice, small package, making it very convenient to carry. The idea behind this sluice is that it can be used for backpacking and still provide the higher capacity of the traditional large metal sluice.

In addition to these sluices, there is a whole new breed of plastic sluice now on the market. These sluices come in many sizes. Since there is almost no metal in them, even the large models are fairly light.

These sluices differ from my plastic sluice in that they do not have removable riffles or any sort of carpet to catch the gold. Instead, they rely on the design of the molded plastic riffles to create eddies in the water flowing through the sluice and do the work of catching the gold.

The theory is that these molded riffles will catch just as much gold as a regular sluice, but the cleanup time will be much quicker. The sluice operator will not have to take time to remove carpet and riffles, nor will they have to spend time rinsing out the carpet once it is removed. Instead, when the plastic sluice is ready for cleanup, the end of the sluice can be inserted directly into a 5-gallon plastic bucket. Pouring a couple gold pansful of water into the top of the sluice will wash the concentrates that were trapped in the sluice into the bucket. Then the sluice can be put right back into the river, ready for the next go-round. The idea is to spend less time doing your cleanup and more time running the sluice.

Theoretically, the increased time should yield more gold. I say "theoretically" because I was not convinced that the molded plastic riffles could catch as much gold as a sluice box full of traditional riffles and carpet or miner's moss. Miner's moss is a mat of woven plastic strands that are randomly looped. When placed in a sluice, the strands serve as hundreds of little gold traps to catch fine gold and small flakes.

I thought it would be really interesting to test one of the new sluices to see whether those molded riffles could really compete with the traditional sluice in capturing fine



Nearly all the gold captured by the sluices and pan was minus 20 mesh and smaller, which means this exercise was an excellent test of their abilities to capture fine gold.



Plastic riffles and "miner's moss" are removed from the E-Z Sluice as part of the cleanup process.



I processed a lot less material with my gold pan, but felt that I was really saving the gold.

### PAN AND SLUICE COMPARISON CHART

	Dimensions	Weight (pounds)	Cleanup & Reinstall Time (minutes)	Volume of Concentrates (compared to gold pan)	Gold Recovered (compared to gold pan)
<b>Garrett Gravity Trap Gold Pan</b>	14" diameter	0.77	N/A	1	1
<b>Tee Dee Co. E-Z Sluice</b>	7½" x 30" with optional 12" flair	2.27	13	1.66	1.3
<b>Angus MacKirk Expedition</b>	12" x 34" (10" wide riffles)	3.9	2	2.16	2
<b>Keene A52</b>	10" x 50" with 18" flair	12.35 with extra mat	17	2.33	2.2



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## Sluice Box SHOOTOUT from page 31



I more than doubled my take of gold when I changed from a gold pan to the Keene A52 sluice.

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gold. I also got thinking about my little plastic backpacker sluice. When I used it instead of my big sluice, just how much production was I giving up? I'd never really tested it to find out, but had been operating on guesswork when deciding whether it was worth the hassle of bringing in the bigger sluice box.

In addition, I had never actually tested a sluice box against a gold pan to see what the difference in production would be. I know a lot of serious prospectors and have never heard of any of them this, either. Everyone just accepts that you can get more gold by using a sluice, but just how much more gold has remained a mystery. I set up a test using a pan, my plastic backpacker sluice, a new carpet-free plastic sluice, and my traditional aluminum sluice to see which one would capture the most gold.

I made a trip to my local mining store to pick out one of the new carpet-free sluices. The store I went to had at least eight different models from one manufacturer, and a couple more from other manufacturers. I checked out the numerous models made by Angus MacKirk ([www.angusmackirk.com](http://www.angusmackirk.com)) and noted that the primary difference was size. I decided that I wanted a sluice that was big enough to compete with my aluminum sluice, but small enough to fit in a

backpack. I settled on an Expedition model. Armed with this new sluice, along with my gold pan, my backpacker Tee Dee Co. E-Z Sluice, and my Keene model A52 aluminum sluice, I headed out to the Bear River, in Northern California, to start my test.

There are large gravel deposits on the Bear River from which fairly consistent amounts of fine gold are recovered. This would be a tough test for the sluices. I figured that all the sluices would likely capture bigger flakes and nuggets, but catching fine gold could be a different story.

I checked some gravel deposits near the river's edge for good gold. I didn't find much, so I moved farther from the river. I zeroed in on some diggings in which the gold was better and seemed fairly consistent throughout. I verified this by running several test pans before actually starting the sluice box shootout.

Next, I selected a good spot in the river and set up the Expedition sluice to start the test. This sluice proved to be easy to position in the river. It has two aluminum bars spanning the width of the box that a large river rock can be set on top of. The weight of the rock pins the sluice into place. I ran the sluice for one hour and then did my first cleanup. I was amazed at how quickly the cleanup process went.



The flair on the Jobe sluice is removable and the entire box can be folded into a small package for backpacking.





The Tee Dee Co. E-Z Sluice is a small, lightweight model that is convenient to backpack.

The time it took to pull the box out of the river, wash the concentrates into a bucket, and reinstall the sluice in the river was just a hair over two minutes! After running the sluice for another hour, I cleaned up again. I saved the concentrates from both cleanups in a plastic container to process at home.

Then I switched to my E-Z Sluice. I ran this box for an hour, as well, and timed the cleanup. It took longer than normal because some rocks had jammed in the plastic riffles and were not easy to remove. Cleanup took 13 minutes, including the time to re-set the box for another run. I completed a second hour with the E-Z Sluice and saved the concentrates.

Then I switched to my big boy, the Keene A52 aluminum sluice. I set the Keene up in the same spot in which I had worked the other two sluices. After I had the sluice positioned, however, I realized that it wouldn't do well there because the water flow was too slow. I moved the sluice to a new location, not far from the first, where the flow was stronger and started work, following the same pattern I had with the two previous sluices. Cleanup and reinstall time for the Keene ran 17 minutes.

After I finished with the Keene, I switched back to my gold pan. I processed a lot less material, but felt that I was really saving the gold, something that I was not sure of with any of the sluices. In order to keep things consistent with how I worked with the sluices, I didn't pan the material all the way down to clean gold. Instead, I panned it almost to the bottom and then saved the black sand and gold in a plastic container to be finished at home. This allowed me more time to rough pan material in the field. After I finished my two hours of panning, I headed for home.

Over the next few days, I made more trips to the river to pan and sluice. I continued to track the time and the volume of material processed for each pan. After several days of sluicing and panning, I felt that I had worked enough to get a fairly good sample for evaluating the sluices and the pan. Then I got down to the fun part. I did my final cleanup at home and weighed the gold!

While separating the gold from the concentrates, I noticed a couple of things. As I had hoped, the gold I was getting from the Bear River was very fine. Almost all of it was minus 20 mesh, meaning that it could pass through a screen that has 20 holes per lineal inch and, correspondingly, 400 holes per square inch. Of course, much of the gold that fell through the screen was much tinier than the openings in the screen, so this was a really good illustration of the sluices' abilities to capture really small gold.

I also noticed that there was a substantial difference in the volume of concentrates that had been retained by each sluice and the pan. There was very little material to process from the pan since I had already worked it down pretty well at the river. Next to the pan, use of the E-Z Sluice resulted in the least amount of concentrates. Measuring by volume, the Expedition sluice captured about 1.4 times more than the E-Z Sluice. The Keene A52 sluice, with all its riffles and carpet, retained about 3.5 times more concentrates than the Expedition sluice and roughly five times as much material as the E-Z Sluice. I was more concerned about the amount of gold that each sluice would capture than the amount of concentrates they retained, but I noted that, because of the volume of concentrates, it took a lot more time to work through the material captured by the Keene A52.

In weighing the gold, I found, as expected, that the pan yielded the least. All the sluices topped the gold pan in overall gold recovery. Of course, the material I was working was bank run gravel, so there was no way of knowing whether I was running pay dirt with the same amount of gold through the pan as I was running through the sluices; there could have been more gold or there could have been less. That being said, with the E-Z Sluice, I was able to go through about 1.6 times as much gravel as with the pan and came out with about 1.3 times more gold.

Next up on the list was the Expedition sluice. I was pleasantly surprised that, even without carpet or miner's moss, it did a good job of capturing the fine gold. I was

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## Sluice Box SHOOTOUT from page 33



The Broll hauler holds a 3- or 5-gallon bucket and makes it easier to move a bucketful of rock to the river for sluicing.

able to process 2.16 times more material with this sluice than with the pan and came out with 2 times as much gold.

At the top of the list for gold capture was the Keene A52 sluice. It handled slightly more dirt than the Expedition sluice—2.33 times more dirt than the pan—and caught about 2.2 times more gold.

All things considered, my results were pretty much as expected. In total volume, the pan got the least of gold and the biggest sluice captured the most. The E-Z Sluice beat the pan and, considering its small size and light weight, it is an improvement over the pan for overall gold production and a good option for backpacking.

There was a lot to be said for the Expedition sluice. It captured the fine gold, even without any carpet. Also, it was small enough and light enough to work as a backpacker, yet it handled a lot of material. It worked well in low water flow, it was quick and easy to set up and clean up, and there were not a lot of concentrates to go through to get the gold at the end. If I had used the time saved during cleanups to continue working pay dirt, this sluice would likely have captured as much gold as the Keene. With all these positive attributes, I am quite happy that I purchased it.

As for the Keene A52 sluice, in this test it captured the most gold. Had I set it up in even faster water flow, however, it may have been able to run at a higher volume, potentially getting even more gold. I think the A52 remains a good choice for high-volume sluicing.

Besides getting the results for the sluice boxes, there were some other lessons I learned while conducting this test. I found that working pay dirt a long distance from the river had both positive and negative impacts on my gold recovery. On the positive side, because I was so far away, the material I was working was very dry. Because it was dry, very little of the fines stuck to the bigger rocks. Therefore, I could use a bucket grizzly to screen my material as I shoveled bank run gravel into the bucket. Almost all the fine material passed through the grizzly

screen and fell into the bucket. Had I been closer to the river, where the material was damp, much of the sand and probably some gold would have stuck to the larger rocks and would not have made it into the bucket.

If I were digging damp material, I wouldn't have used the bucket grizzly and would have opted to wet screen the material at the river. This way, the

rocks would get washed and the small gold would end up in the bucket. The bad news is that I would have had to carry all those big rocks to the river to screen them off. I don't like to run large rocks through my sluice because it takes a lot of water pressure to move them through the box. I believe the high water flow needed to move the bigger rocks will wash out some of the fine gold.

On the negative side of being a long way from the river, the long walk with the heavy buckets full of pay dirt gets old really quickly. There was another prospector working near me who had a better way of getting his buckets to the water. This old sourdough was using a Broll® hauler to wheel his dirt to the sluice (www.brolltools.com). The Broll holds one 4- or 5-gallon bucket between two 14-inch wheels and has a long handle, making it easy to get the load to the river. The prospector who was using this device was very happy with it and said he preferred the 4-gallon bucket because it had better ground clearance when he was rolling the hauler over the rough rock piles.

I also discovered that, because I was a long way from the river, I spent half my time digging the material and transporting it to the water. Only half my time was actually spent feeding gravel through the sluice. Had I been closer to the water, the volume of material that I was able to run would have increased substantially.

I also could have worked my sluice with a partner; one prospector could be digging while the other was feeding the sluice. A two-person operation with one sluice should net each prospector with just as much gold as I got working alone. So next time around, I'll bring my friend Jack and let him carry the buckets until I get a Broll.

Visit the Angus MacKirk and Keene (www.keeneeng.com) Web sites for information on those companies' products. An Internet search will turn up information on the E-Z Sluice at a number of online mining stores. ♥

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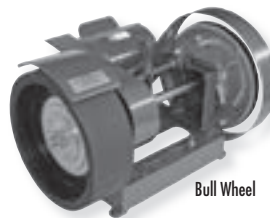
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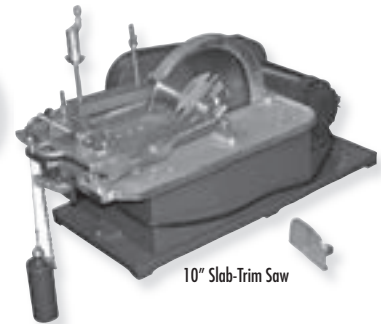
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## Show Dates from page 26

### AUGUST 2012

**4-5—FREDERIC, WISCONSIN:** 44th annual show; Indian-head Rock & Mineral Society; Frederic High School, 1437 Clam Falls Dr.; Sat. 10-5, Sun. 10-4; free admission; contact Roy Wickman, (715) 357-3223

**4-5—RICHMOND, VIRGINIA:** Wholesale and retail show; Intergalactic Bead & Jewelry Show; Richmond Raceway Complex-Colonial Bldg., 600 E. Laburnum Ave.; Sat. 10-5, Sun. 10-5; adults \$5 (discount coupon on Web site), children (12 and under) free; precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals; contact Tonya Nicholson, 3865 Lawrenceville Hwy., Ste. 107, Lawrenceville, GA 30044, (888) 729-6904; e-mail: [tonya.nicholson@beadshows.com](mailto:tonya.nicholson@beadshows.com); Web site: [www.beadshows.com](http://www.beadshows.com)

**4-5—ST. JOHNSVILLE, NEW YORK:** Rock Swap & Mineral Auction; Fulton County Mineral Club; Crystal Grove Diamond Mine & Campground, 161 County Hwy. 114; daily 8-8; adults \$10, students \$8, children (under 5) free; swap, Herkimer diamond mines, mineral auction; contact Cecily or Evan Myers, 161 County Hwy. 114, St. Johnsville, NY 13452, (518) 568-2914; e-mail: [fun@crystalgrove.com](mailto:fun@crystalgrove.com); Web site: [www.crystalgrove.com](http://www.crystalgrove.com)

**9-12—BUENA VISTA, COLORADO:** Annual show; Contin-Tail LLC; Rodeo Grounds, Rodeo Rd. and Gregory Dr.; Thu. 9-5, Fri. 9-5, Sat. 9-5, Sun. 9-5; free admission; more than 100 dealers, rocks, minerals, fossils, gemstones, beads, jewelry, slabs, cabs, tools, equipment, free rocks for kids; contact Carolyn Tunncliff, 1130 Francis #7010, Longmont, CO 80501, (720) 938-4194; e-mail: [ctunncliff@comcast.net](mailto:ctunncliff@comcast.net); Web site: [www.coloradorocks.org](http://www.coloradorocks.org)

**10-12—DALTON, GEORGIA:** Annual show; Treasures Of The Earth Gem & Jewelry Shows; Northwest Georgia Trade & Convention Center, 2211 Dug Gap Battle Rd., (I-75 Exit 333; Fri. 2-7, Sat. 10-6, Sun. 11-5; adults \$3 (3-day pass), children (under 16) free with adult; jewelry makers, goldsmiths, silversmiths, reconstruct, repair, design or make original jewelry from customer-selected gems, stones, opals and crystals, wire wrap, wire sculpture, stone beads, pearls, stone setting, amber, opal, minerals, fossils, dealers, hourly door prizes, grand prize, children's gifts; contact Van Wimmer Sr., 5273 Bradshaw Rd., Salem, VA 24153, (540) 384-6047; e-mail: [vawimmer@verizon.net](mailto:vawimmer@verizon.net); Web site: [www.toteshows.com](http://www.toteshows.com)

**10-12—HOUGHTON, MICHIGAN:** Annual show; Copper Country Rock & Mineral Club; Houghton Elementary School, 203 W. Jacker Ave., corner of Jacker and Bridge; Fri. 1-8, Sat. 10-6, Sun. 11-5; free admission; rocks, minerals, jewelry, books, demonstrations, displays, grab bags for kids, silent auction; contact Norman Gruber, 1850 Clark St., Marquette, MI 49855, (906) 228-6764; e-mail: [pres@ccrmc.info](mailto:pres@ccrmc.info); Web site: [ccrmc.info](http://ccrmc.info)

**10-12—PASS CHRISTIAN, MISSISSIPPI:** Annual show; Harrison County Gem & Mineral Society; West Harrison County Civic Center, 4470 Espy Ave.; Fri. 12-6, Sat. 9-6, Sun. 10-4; adults \$3, children (under 10) free; rock identification, grand prize raffle; contact Tomsey Westermeyer, 9270 Serenity Dr., Pass Christian, MS 39571, (228) 586-5279; e-mail: [tomsey@cablone.net](mailto:tomsey@cablone.net); Web site: [www.gulfportgems.org](http://www.gulfportgems.org)

**10-12—SAN DIEGO, CALIFORNIA:** Wholesale and retail show; Gem Faire Inc.; Scottish Rite Center, 1895 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, exhibitors, on-site jewelry repair; contact Yooy Nelson, (503) 252-8300; e-mail: [info@gemfaire.com](mailto:info@gemfaire.com); Web site: [www.gemfaire.com](http://www.gemfaire.com)

**10-12—WEST SPRINGFIELD, MASSACHUSETTS:** East Coast Gem, Mineral & Fossil Show; Martin Zinn Expositions LLC; Better Living Center, Eastern States Exposition, 1305 Memorial Dr.; Fri. 10-6, Sat. 10-6, Sun. 10-5; adults \$6, children (12 and under) free with adult; more than 200 dealers, door prizes, guest speakers, museum-quality exhibits, gem panning, large wholesale section, mineral art of Fred Wilda; contact Martin Zinn Expositions, PO Box 665, Bernalillo, NM 87004-0665; e-mail: [mzexpos@gmail.com](mailto:mzexpos@gmail.com); Web site: [www.mzexpos.com](http://www.mzexpos.com)

**11-12—BATON ROUGE, LOUISIANA:** Annual show; Baton Rouge Gem & Mineral Society; Marriott Hotel, 5500 Hilton Ave., off I-10; Sat. 10-5, Sun. 10-5; adults \$4, children \$3; contact Diana Martin, (225) 931-7543; e-mail: [cajunladi@cox.net](mailto:cajunladi@cox.net)

**11-12—EDMONDS, WASHINGTON:** Show and sale; Maplewood Rock & Gem Club; Maplewood Clubhouse, 8802 196th St. SW; Sat. 9-5, Sun. 10-5; free admission; more than 20 dealers, minerals, fossils, rough rock, finished jewelry, free

rocks for kids; contact Lauryn MacGregor, 3507 172nd St. SW, Lynnwood, WA 98037; e-mail: [little-toad@att.net](mailto:little-toad@att.net); Web site: [www.maplewoodrockclub.com](http://www.maplewoodrockclub.com)

**11-12—HAMPTON, VIRGINIA:** Wholesale and retail show; Intergalactic Bead & Jewelry Show; Hampton Roads Convention Center, Exhibit Hall A, 1610 Coliseum Dr.; Sat. 10-5, Sun. 10-5; adults \$5 (discount coupon on Web site), children (12 and under) free; precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals; contact Tonya Nicholson, 3865 Lawrenceville Hwy., Ste. 107, Lawrenceville, GA 30044, (888) 729-6904; e-mail: [tonya.nicholson@beadshows.com](mailto:tonya.nicholson@beadshows.com); Web site: [www.beadshows.com](http://www.beadshows.com)

**11-12—LAKVIEW, OREGON:** Annual show; Tallman Rock Chippers; Lake County Fairgrounds, 1900 N. 4th; Sat. 10-5, Sun. 10-4; free admission; dealers, demonstrations, kids' activities, silent auction, field trips; contact LeRoy Johnson, (541) 947-4267; e-mail: [lostmymarbles@yahoo.com](mailto:lostmymarbles@yahoo.com)

**11-12—RICE LAKE, WISCONSIN:** 14th annual show; Northwest Wisconsin Gem & Mineral Society; University of Wisconsin, Barron County, 1800 College Dr.; Sat. 10-5, Sun. 10-4; free admission; contact Roy Wickman, (715) 357-3223

**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@crystalfair.com](mailto:jerry@crystalfair.com); Web site: [www.crystalfair.com](http://www.crystalfair.com)

**16-19—WOODLAND PARK, COLORADO:** 3rd annual show; Rock Gypsies; Woodland Park Saddle Club, 19250 E. Hwy. 24; Thu. 9-6, Fri. 9-6, Sat. 9-6, Sun. 9-5; free admission; more than 40 dealers; contact Kim or Bodie Packham, 87 Plum Creek Rd., Divide, CO 80814, (719) 360-9665; e-mail: [runninboar@hotmail.com](mailto:runninboar@hotmail.com)

**17-18—TAHLEQUAH, OKLAHOMA:** Annual show; Tahlequah Rock & Mineral Society; Tahlequah Community Bldg., 300 W. First St.; Fri. 9-6, Sat. 9-5; adults \$3, students and children (under 18) free; rocks, minerals, fossils, gemstones, jewelry, auctions, educational exhibits, demonstrations; contact Sara Brasel, 14236 Cross Timbers Rd., Tahlequah, OK 74464, (918) 458-0801; e-mail: [rockhound Sally@aol.com](mailto:rockhound Sally@aol.com)

**17-19—LAKE GEORGE, COLORADO:** Show and sale; Lake George Gem & Mineral Clubs; lot east of the Post Office, US Hwy. 24; daily 9-5; free admission; contact Dick Lackmond, PO Box 729, Green Mountain Falls, CO 80819, (719) 684-9736; e-mail: [dlackmond@msn.com](mailto:dlackmond@msn.com); Web site: [LGMClub.org](http://LGMClub.org)

**17-19—LEBANON, PENNSYLVANIA:** 15th annual show and sale, "Gem Miner's Jubilee"; Mid-Atlantic Gem & Jewelry Association; Lebanon Expo Center, Rte. 72 and Rochery Rd.; Fri. 10-6, Sat. 10-6, Sun. 10-4; adults \$6, children (under 12) free; gems, jewelry, minerals, fossils, beads; contact Teresa Schwab/MAGMA, (301) 565-0487; Web site: [www.gem-show.com](http://www.gem-show.com)

**17-19—MELBOURNE, FLORIDA:** Show and sale; Frank Cox Productions; Melbourne Auditorium, 625 E. Hibiscus Blvd.; Fri. 10-5, Sat. 10-5, Sun. 10-5; adults \$4 (mention listing for \$1 off), children (under 16) free; gems, jewelry, crystals, minerals, beads; contact Frank Cox, 755 S. Palm Ave., Sarasota, FL 34236, (941) 954-0202; e-mail: [frankcox@comcast.net](mailto:frankcox@comcast.net); Web site: [www.frankcoxproductions.com](http://www.frankcoxproductions.com)

**17-19—SACRAMENTO, CALIFORNIA:** Wholesale and retail show; Gem Faire Inc.; Scottish Rite Center, 6151 H 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, exhibitors, on-site jewelry repair; contact Yooy Nelson, (503) 252-8300; e-mail: [info@gemfaire.com](mailto:info@gemfaire.com); Web site: [www.gemfaire.com](http://www.gemfaire.com)

**17-19—SEASIDE, OREGON:** Annual show; Jean Miller; Seaside Convention Center, 415 1st Ave.; Fri. 10-6, Sat. 10-6, Sun. 10-4; free admission; gems, minerals, jewelry, fossils; contact Jean Miller, PO Box 136, 702 E. 5th, Molalla, OR 97038, (503) 829-2680; e-mail: [shadow92337@molalla.net](mailto:shadow92337@molalla.net); Web site: [ogmshows.net](http://ogmshows.net)

**18-19—BOSSIER CITY, LOUISIANA:** Annual show; Ark-La-Tex Gem & Mineral Society; Bossier Civic Center, 620 Benton Rd.; Sat. 10-6; adults \$4, students \$1, children (under 6) free; demonstrations, youth activities, exhibits, classes, door prizes, dealers; contact Charlie Johns, 9314

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## 44th Annual Lakeland Gem and Mineral Show MINOCQUA, WISCONSIN

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(715) 477-2519 • [Gypsy1120@coslink.net](mailto:Gypsy1120@coslink.net)

Overlook Dr., Shreveport, LA 71118, (318) 687-4929; e-mail: cwsejohns@bellsouth.net; Web site: larockclub.com

**18-19—DULUTH, GEORGIA:** Wholesale and retail show; Intergalactic Bead & Jewelry Show; Gwinnett Center, Hall C, 6400 Sugarloaf Pkwy.; Sat. 10-5, Sun. 10-5; adults \$5 (discount coupon on Web site), children (12 and under) free; precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals; contact Tonya Nicholson, 3865 Lawrenceville Hwy., Ste. 107, Lawrenceville, GA 30044, (888) 729-6904; e-mail: tonya.nicholson@beadshows.com; Web site: www.beadshows.com

**18-19—LIVE OAK, TEXAS:** Retail show; The Bead Market; Live Oak Civic Center, 8101 Pat Booker Rd.; Sat. 10-5, Sun. 10-4; free admission; gemstones, glass and other beads, pearls, wire, findings, tools, books, beading supplies; contact Rebekah Wills, PO Box 494, Gilmer, TX 75644, (903) 734-3335; e-mail: rebekah@thebeadmarket.net; Web site: www.thebeadmarket.net

**24-26—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, exhibitors, on-site jewelry repair; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

**24-26—SARASOTA, FLORIDA:** Show and sale; Frank Cox Productions; Sarasota Municipal Auditorium, 801 N. Tamiami Trail; Fri. 10-5, Sat. 10-5, Sun. 10-5; adults \$4 (mention listing for \$1 off), children (under 16) free; gems, jewelry, crystals, minerals, beads; contact Frank Cox, 755 S. Palm Ave., Sarasota, FL 34236, (941) 954-0202; e-mail: frankcox@comcast.net; Web site: www.frankcoxproductions.com

**24-26—SOUTH BEND, INDIANA:** 49th annual show and sale; Michiana Gem & Mineral Society; St. Joseph County 4-H Fairgrounds, Esther Singer Bldg., 5177 S. Ironwood Rd.; Fri. 2-7, Sat. 10-6, Sun. 10-4; adults \$3, children (6-12) \$1, under 6 free; dealers, jewelry, gems, minerals, displays, demonstrations, Kids' Korner, door prizes, silent auction, exhibits; contact Marie Crull, (574) 272-7209; e-mail: musicman0311@gmail.com

**25-26—CONCORD, NEW HAMPSHIRE:** 49th annual Gem & Mineral Festival; Capital Mineral Club; Everett Arena, 15 Loudon Rd.; Sat. 9-5, Sun. 10-4; adults \$5, children (under 12) free with adult; retail and wholesale dealers, displays, raffles, door prizes, free gift for children; contact Scott Higgins, (207) 439-1107

**25-26—FREEPORT, NEW YORK:** Annual show; Freeport Recreation Center; Freeport Recreation Center, 130 E. Merrick Rd.; Sat. 10-5, Sun. 10-5; adults \$5.50, children (12 and under) free; dealers, minerals, gems, jewelry, fossils, beads; contact Ralph Gose, PO Box 1418, Melville, NY 11747, (631) 271-8411; e-mail: ralph\_gose@kaleidoscopegemshows.com; Web site: kaleidoscopegemshows.com

**25-26—JACKSONVILLE, FLORIDA:** Wholesale and retail show; Intergalactic Bead & Jewelry Show; University of North Florida University Center, Grand Banquet Hall, 12000 Alumni Dr.; Sat. 10-5, Sun. 10-5; adults \$5 (discount coupon on Web site), children (12 and under) free; precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals; contact Tonya Nicholson, 3865 Lawrenceville Hwy., Ste. 107, Lawrenceville, GA 30044, (888) 729-6904; e-mail: tonya.nicholson@beadshows.com; Web site: www.beadshows.com

**25-26—JASPER, TEXAS:** 18th annual show; Pine Country Gem & Mineral Society; The Event Center, 6258 Hwy. 190 W, 5 miles west of Jasper; Sat. 9-5, Sun. 10-5; adults \$2, students and children free; South Central Federation of Mineral Societies annual meeting, Spinning Wheel, silent auction, lapidary demonstrations, hourly door prizes, grand prize raffle, student prize; contact Lonnie Stalsby, (409) 382-5314

**25-26—MADRID, NEW YORK:** Annual show; St. Lawrence Co. Rock & Mineral Club; Madrid Community Center, 1835 St. Hwy. 345; Sat. 9-4:30, Sun. 9-3; free admission; children's fluorescent mineral hunt, field trips, indoor/outdoor show; contact William deLorraine, 1 Indian Head Trail, Gouverneur, NY 13642, (315) 287-4652; e-mail: wdelie@gmail.com; Web site: stlawrencecountymineralclub.org

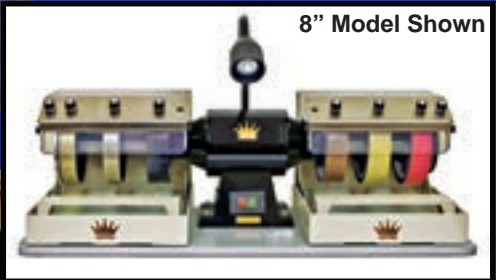
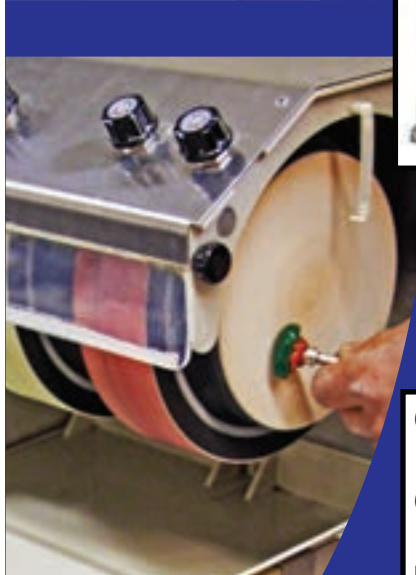
**25-26—MOUNTAIN HOME, ARKANSAS:** Annual show; Ozark Earth Science Gem, Mineral & Fossil Club; Van Matre Senior Center (Cooper Park), 1101 Spring St.; Sat. 10-6, Sun. 10-4; adults \$1, children (12 and under) free; minerals, fossils, beads, jewelry, games; contact Ed Hakesley, 821-1 Alexis Circle, Mountain Home, AR 72653, (870) 424-0956; e-mail: edscamp3@yahoo.com

continued on page 42

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# ROCK & GEM **Kids**

## Halite

NaCl

You've likely heard of sodium chloride. You probably sprinkled some on your dinner! Table salt is sodium chloride, which—in mineral form—is known as halite. Look at your table salt under a magnifying glass and you'll see tiny cubic crystals.

Halite crystals form when water evaporates from landlocked seas and desert lakes, like Utah's Great Salt Lake, and concentrates the minerals in the solution. Thus, halite is called an "evaporite" mineral. The evaporation of ancient inland seas left thick salt deposits that became buried beneath sediments in New York, Michigan and Ohio, and the coasts of Texas and Louisiana are famous for their underground "salt dome" deposits.

Halite is still forming at Searles Lake in California's Mojave Desert, where it's mined for commercial uses. In addition to these natural deposits, halite is evaporated



Pink "hopper" crystals



Pure halite

from seawater in salt ponds, such as those found around San Francisco Bay.

Halite gets its color from impurities. Pure halite is clear, but it may also be white to pink, orange or blue. Pink-tinted halite is colored by algae that grow in salt ponds, and a blue type of halite that can be found in Carlsbad, New Mexico, gets its color from the presence of radioactive potassium isotopes.

While most halite crystals form as perfect little cubes, you sometimes find interesting "hopper" crystals, in which the edges grew at a faster rate than the centers, leaving stair-step layers from the crystal center to the edges.

Halite has many uses. In addition to flavoring food, it's used to preserve it. Coarse "rock salt" is used to de-ice roads because it lowers the temperature of the ice, allowing it to melt. It also has uses in chemical industries and as an ore for sodium and chlorine.

—Jim Brace-Thompson

The Quiz is open to U.S. residents 17 and younger. Mail your answers to **July Quiz, Rock & Gem magazine, P.O. Box 6925, Ventura, CA 93006-9899**. Five winners will be drawn from the valid entries received by **July 31, 2012**. 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 fossil-pattern rubber stamps and a washable ink pad, generously donated by Butter Side Down Stamps ([www.buttersidedownstamps.com](http://www.buttersidedownstamps.com)).

## The Quiz

1. " \_\_\_\_\_ " minerals form as the water in shallow lakes dries up.
2. \_\_\_\_\_ halite is colorless and pink halite is colored by \_\_\_\_\_ .
3. Halite is still forming at \_\_\_\_\_ , California.
4. Most halite crystals form as perfect little \_\_\_\_\_ .
5. Rock salt de-ices roads by lowering the \_\_\_\_\_ of the ice.



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

**Junior Rockhound Spotlight:  
Erica Nathan**

Erica Nathan started mineral collecting thanks to a Christmas gift. Little did anyone know where that gift would lead. Geographically, it has led her to North Carolina to dig minerals, South Dakota to pan for gold, Iowa for geode cracking, and Florida for collecting fossil shark teeth. Intellectually, it has led to the learning experience of a three-week summer geology camp called "Earth Shaking Geology" at Trinity University (Texas), where Professor Glenn Kroger taught students how to use gravity meters and seismographs. Erica was also able to observe Texas' geological wonders.

Erica became active in the Coquina Kids program at the Tomoka Gem & Mineral Society in Florida. She took classes in faceting and cabbing and developed displays and kids' activities for the club's local show, including "Touch n Feel" rocks, "Minerals in the Home", a "Mystery Mineral Dig" box, and the "Miner's Cabin" dollhouse. She even resurrected the "Pet Rock" craze of the 1970s as a fundraiser for her juniors club.

By age 13, Erica had been named Junior Rockhound of the Year not once, but twice (2010, 2011) by the Southeast Federation of Mineralogical Societies. She gained both Rockhound and Rock Star status in the American Federation of Mineralogical Societies Future Rockhounds of America by earning every badge offered through the program.

As she delved deeper into the hobby, Erica received another gift. John Withey, a senior rockhound in her club, shared his talents, wisdom, and memories of rockhounding with her. Sadly, John passed away, but his gift did not. Erica honored and shared it with all junior rockhounds in the AFMS/FRA program by designing and submitting ideas toward a "Reaching Across Generations" badge that encouraged seniors in rock clubs to pair with juniors to share their knowledge and experience. Gift-giving is now in Erica's blood. Her favorite activity? "Our annual show because I get to share my love of geology and mineralogy with others, especially kids!"



Erica cracks Keokuk geodes in Iowa.

—Jim Brace-Thompson

**FOSSIL WORD SCRAMBLE**

Unscramble the letters below to reveal the fossil-related words. A good fossil-collecting guide may help. As an extra challenge, label the fossil drawings with the correct names. (See answers below.)

- MMAEITNO \_\_\_\_\_
- EELMNBTE \_\_\_\_\_
- ELVVABI \_\_\_\_\_
- POORCTLEI \_\_\_\_\_
- NODRIIC \_\_\_\_\_
- SNODIRUA \_\_\_\_\_
- NFRE \_\_\_\_\_
- HIFS \_\_\_\_\_
- TOOPRIFTSN \_\_\_\_\_
- TSROODAGP \_\_\_\_\_
- SCINET \_\_\_\_\_
- RRNIBEEVTAE \_\_\_\_\_
- FELA \_\_\_\_\_
- MOTHMAM \_\_\_\_\_
- TERPIIFDE OOWD \_\_\_\_\_
- LESHL \_\_\_\_\_
- RITBILOTE \_\_\_\_\_
- RRUTILTAEL \_\_\_\_\_
- ETTHE \_\_\_\_\_
- TTEBARRVEE \_\_\_\_\_



**ANSWERS** Ammonite, Belemnite, Bivalve, Coprolite, Crinoid, Dinosaur, Fern, Fish, Footprints, Gastropod, Insect, Invertebrate, Leaf, Mammoth, Petrified Wood, Shell, Teeth, Trilobite, Turretella, Vertebrate. **DRAWINGS** Left: trilobites, Right: fern, turrilella.

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Erica became active in the Coquina Kids program at the Tomoka Gem & Mineral Society in Florida. She took classes in faceting and cabbing and developed displays and kids' activities for the club's local show, including "Touch n Feel" rocks, "Minerals in the Home", a "Mystery Mineral Dig" box, and the "Miner's Cabin" dollhouse. She even resurrected the "Pet Rock" craze of the 1970s as a fundraiser for her juniors club.

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- EELMNBTE \_\_\_\_\_
- ELVVABI \_\_\_\_\_
- POORCTLEI \_\_\_\_\_
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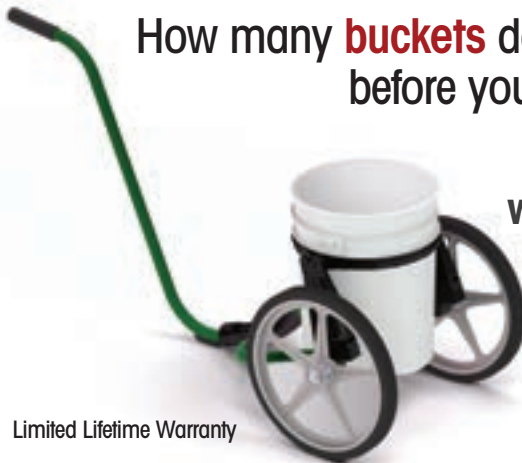
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## Show Dates from page 37

### AUGUST 2012

**25-26—PEORIA, ILLINOIS:** 49th annual show; Geology Section of the Peoria Academy of Science; Grand Hotel, 4400 N. Brandywine Dr.; Sat. 9-5, Sun. 10-5; free admission; displays, demonstrations, bead making, flint knapping, fossil preparation, fluorescent display, kids' area, panning flume, silent auction; contact Jim Travis, 2812 N. Peoria Ave., Peoria, IL 61603, (309) 645-3609; e-mail: boatnick@aol.com; Web site: pasgeology.com

### AUGUST-SEPTEMBER 2012

**31-2—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, exhibitors, on-site jewelry repair; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

**31-3—HENDERSONVILLE, NORTH CAROLINA:** Annual show; Henderson County Gem & Mineral Society; Whitmire Activity Center, Lily Pond Rd.; Fri. 10-6, Sat. 10-6, Sun. 10-6, Mon. 10-5; adults \$4, children (under 12) free; exhibits, programs, demonstrations, dealers, door prizes, grand prizes, free shuttle from the Apple Festival; contact Diane Lapp, (828) 775-8098; e-mail: dlapp\_2000@yahoo.com; Web site: HCGMS.org

### SEPTEMBER 2012

**1-2—ASHLAND, OREGON:** Annual show; Scott's Rocks; Wesley Hall, United Methodist Church, 175 N. Main St.; Sat. 10-5, Sun. 12-5; adults \$2; dealers, crystals, minerals, fossils, gemstone jewelry, lapidary art, Oligocene leaf fossil field trip; contact Scott Blair, 1009 Talent Ave., Talent, OR 97540, (541) 621-2558; e-mail: scottsrocks@scottsrocks.com; Web site: www.scottsrocks.com/scotts-blog/item/52-ashland-rocks-gem-mineral-show

**1-2—AUGUSTA, MAINE:** 23rd annual show; Kennebec Rocks & Minerals Club; National Guard Armory, Western Ave.; Sat. 10-5, Sun. 10-4; door prizes, demonstrations, mineral displays, dealers, minerals, jewelry, gems, fossils, geode slicing, rockhounding information, "Rocky" the rockhound dog, kids' mineral mine and games, free stone; contact Ronald LePage, (207) 873-6270

**1-3—SILVER CITY, NEW MEXICO:** 29th annual show; Grant County Rolling Stones; Grant County Conference Center, 3031 US Hwy. 180, at 32nd St. Bypass; Sat. 10-5, Sun. 10-5, Mon. 10-4; free admission; free collecting and educational trips; contact Lee Stockman, 16 McKinley St., Silver City, NM 88061-8823, (575) 956-8578; e-mail: leet@stockmanfamily.net; Web site: http://rollingstonesgms.blogspot.com/

**3-5—CANBY, OREGON:** Annual show; Jean Miller; Clackamas County Fairgrounds, off Hwy. 99 E; Sat. 9-6, Sun. 9-6, Mon. 10-4; free admission; gems, minerals, jewelry, fossils; contact Jean Miller, PO Box 136, 702 E. 5th, Molalla, OR 97038, (503) 829-2680; e-mail: shadow92337@molalla.net; Web site: ogmshows.com

**7-9—FERNDALE, CALIFORNIA:** 8th annual Wildcat Gem Fest; Wildcat Gem Society; Humboldt County Fair Grounds, 1250 5th St.; Fri. 12-7, Sat. 10-6, Sun. 10-5; free admission; gems, jewelry, minerals, fossils, gold, silver, jade, demonstrations, raffles, kids' games, free door prizes, silent auctions; contact Mike Martin, PO Box 189, Miranda, CA 95553, (707) 943-1575; e-mail: micknorma@directv.net

**7-9—GREENFIELD, INDIANA:** Annual show; 500 Earth Sciences Club; Hancock County 4-H Fairgrounds, 802 Apple St.; Fri. 10-7, Sat. 9-7, Sun. 10-4; free admission; kids' activities, demonstrations, educational displays and programs, special fossil exhibits by The Children's Museum of Indianapolis; contact Erit Marchani, 1328 S. Buttercup Dr., New Palestine, IN 46163, (317) 370-1008; e-mail: emarchani@sbcglobal.net; Web site: 500earthsciences.org

**7-9—MARIETTA (ATLANTA), GEORGIA:** Show and sale; Frank Cox Productions; Cobb County Civic Center, 548 S. Marietta Pkwy.; Fri. 1-5, Sat. 10-5, Sun. 10-5; free admission; gems, jewelry, crystals, minerals, beads; contact Frank Cox, 755 S. Palm Ave., Sarasota, FL 34236, (941) 954-0202; e-mail: frankcox@comcast.net; Web site: www.frankcoxproductions.com

**7-9—TOLEDO, OHIO:** Annual show; Toledo Gem & Rockhound Club; Stranahan Theater Complex, 4645 Heatherdowns; Fri. 2-8, Sat. 10-6, Sun. 11-5; adults \$4,

*continued on page 50*

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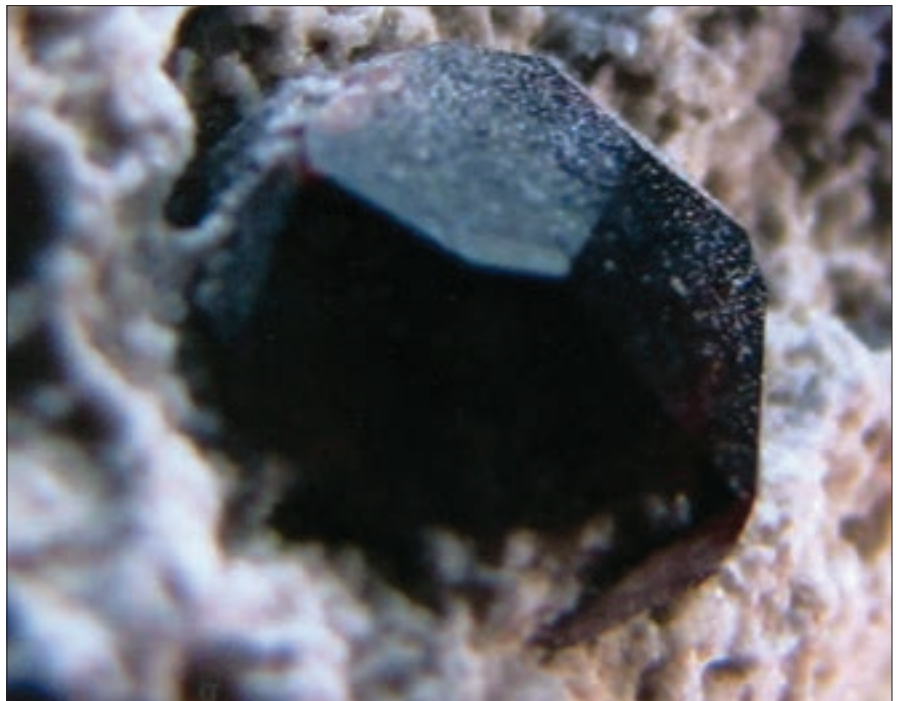
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# RUBY MOUNTAIN REVISITED

## A Colorado Collecting Site Changes—and Survives

Story and Photos by Steve Voynick



Most Ruby Mountain spessartine crystals show six sides of a dodecahedron.

**I**n the 1958 classic *Colorado Gem Trails and Mineral Guide* (Sage Books, Denver), the first comprehensive treatment of the state's mineral collecting localities, author Richard Pearl listed 75 specific sites. Today, due to the collective impacts of population growth, suburban and rural land development, the demise of metal mining, mine and mine-dump reclamation, environmental restrictions, and tighter public land-use regulations, that list has been halved. Some of Pearl's original collecting sites have disappeared entirely, and many of the remaining sites have changed significantly.



**This Ruby Mountain topaz specimen is a double crystal with well-developed terminations.**



**The privately owned western side of Ruby Mountain looms behind the entrance to the recreation site. Collecting is allowed on the eastern side, which is administrated by the BLM.**

A good example of one that has changed is Ruby Mountain, one of Colorado's oldest and—until recently—most popular mineral-collecting localities. Its name is somewhat misleading, for Ruby Mountain is neither a mountain nor a source of rubies. It is actually a 200-foot-high, quarter-mile-long, rhyolite dike that, for nearly 150 years, has yielded well-developed, deep-red crystals of the garnet-group mineral spessartine, along with straw-colored prisms of topaz and obsidian Apache tears.

Situated near the geographic center of Colorado, Ruby Mountain is 120 highway miles southwest of Denver via U.S. Highway 285 and 100 miles west of Colorado Springs via U.S. Highway 24. It is due east of the tiny community of Nathrop, located six miles south of Buena Vista, and is easily accessed from U.S. Highway 285 via well-marked, graded county roads.

Ruby Mountain sits on both public and private land. The Bureau of Land Management (BLM) administers the lower-elevation, eastern side of this volcanic formation, while the higher-elevation ground on the east side, the summit ridge, and the entire western side are privately owned. Until recently, Ruby Mountain and its surroundings were undeveloped. The privately owned—but not posted—western side had the greatest concentration of spessartine and topaz and was therefore the primary collecting area.

But Ruby Mountain was always more than just a collecting site: It was a popular place for picnicking, hiking, camping, fishing along the cottonwood-shaded Arkansas River, or just relaxing and enjoying the

picture-perfect views of the soaring peaks along the Continental Divide to the west. Folks who visited Ruby Mountain once always seemed to return, lured either by its mineral-collecting opportunities or by its beauty and tranquility.

But in recent years, many who have returned after a long absence have been disappointed. The open site that they remember is now a place of restricted land access, private-home and public-campground development, fences, "Private Property" signs, and posted lists of public land-use regulations. Understandably, some returning collectors have assumed that Ruby Mountain is no longer a collecting site at all.

But the facts about collecting at Ruby Mountain these days are a mixed bag. The good news is that collectors can still find specimens of spessartine, topaz, and Apache tears. The not-so-good news is that the collecting area is now substantially smaller and less productive than it was in the past.

## GEOLGY

A visit to Ruby Mountain is enhanced by a basic understanding of the local geology as it relates to rift valleys and volcanics. Ruby Mountain sits at the edge of the long, narrow, north-south-trending, upper Arkansas River Valley, a rift valley that was created by crustal subsidence. Rift valleys form when blocks of crust between parallel fault systems drop. The most familiar and spectacular examples are the Great Rift Valley of Asia and Africa, which incorporates the Red Sea and the East African Rift; Europe's Rhine Valley; and the Gulf of California.



**Topaz, like this large, dark-sherry crystal, occurs as slender prisms about 3mm long at Ruby Mountain.**

The upper Arkansas River Valley is part of the Rio Grande Rift, the New Mexico-Colorado section of the Great American Rift that extends from central Mexico into Canada. The Great American Rift began taking shape some 39 million years ago when a massive upwelling of magma slowly raised the greater American Southwest to its current elevation. As regional doming stretched the crust in an east-west direction, two parallel, north-south-oriented fault systems developed along a weakened section of the continental plate. In present-day Colorado and New Mexico, the crust pulled apart along these fault systems, enabling the long, narrow sections of crust between them to slowly drop as much as 10,000 feet and create the Rio Grande Rift. As quickly as the rift subsided, it was filled by sediment eroded

*Rock & Gem* gives locality information for reference purposes only. Readers should never attempt to visit any of the sites described in this publication without first verifying that the location is open to collecting and obtaining the permission of the land and/or mineral rights holders.

from the surrounding mountains, which created the modern topography of the upper Arkansas River Valley.

As the edges of the developing rift valley fractured, magma rose to or near the earth's surface, creating numerous hot springs and other volcanic features. Located within 10 miles of Ruby Mountain, rift-related volcanic features include three major hot springs, all of which have been developed as commercial pools or spas; basaltic lava flows, some of which yield gem-quality peridot; and several rhyolite dikes, one of which is Ruby Mountain.

The Ruby Mountain rhyolite was emplaced some 35 million years ago when silica-rich, granitic magma intruded the Precambrian granite and gneiss country rock. Depending upon the speed at which the magma cools, silica-rich magma can solidify into three different types of rock. When it intrudes rock at depth and cools slowly, it forms coarse-grained granite. Nearer to or at the surface, where cooling is much more rapid, granitic magma hardens into fine-grained rhyolite. But when it solidifies immediately, or "freezes", with no time for crystallization, it forms obsidian, a noncrystalline volcanic glass that consists of a variable mixture of silica and lesser amounts of feldspar and ferromagnesian minerals.

At Ruby Mountain, silica-rich magma rose through a rift-related fracture. Near the surface, it was forced laterally through radiating fractures to form vertical, sheetlike dikes. This magma did not erupt, but it was emplaced at such shallow depths that it solidified quickly into fine-grained rhyolite. At the edges of the dikes, where cooling was almost immediate, some obsidian formed.

Surface erosion eventually wore down the surrounding country rock to expose these resistant, rhyolitic dikes as three hills: Ruby Mountain, a steep-sided formation 200 feet high and 1,400 feet long; Sugarloaf Mountain, a larger formation immediately to the north; and Dorothy Hill, a small dike to the west.

Gold-rush prospectors discovered ruby-red spessartine crystals in vugs in all three of these volcanic dikes. They named Sugarloaf Mountain after the sugary texture of its rhyolite. The dike with the greatest concentration of red gems became "Ruby Mountain", a name that first appeared on regional maps in 1868. Ruby Mountain is one of dozens of "ruby" creeks, hills and mountains scattered across the West, most of which were named for garnet occurrences.

Collecting spessartine crystals at Ruby Mountain quickly became popular. The *American Journal of Science* first documented

the site and described the local geology in 1886. The 1890 Mineral Industries of the United States report, compiled by the U.S. Geological Survey (USGS), explained how experienced Ruby Mountain collectors relied on blasting to break the tough rhyolite and expose crystal-filled vugs. In 1908, the USGS reported that some spessartine crystals had been faceted and that Ruby Mountain seemed destined to become a commercial source of spessartine and topaz.

Ruby Mountain, Sugarloaf Mountain, and Dorothy Hill consist almost entirely of rhyolite that has weathered to a dull, dark gray. Freshly broken surfaces are an attractive gray-white, fine-grained rock with faint, parallel, purple-pink banding. Its distinctive,



**At Ruby Mountain, Apache tears occur in a matrix of perlite, a decomposed form of obsidian whose concentric structure resembles pearls.**

bright, sugary glitter comes from tiny crystals of two essential mineral components of rhyolite: quartz and sanidine (a potassium sodium aluminum silicate of the feldspar group). The rhyolite's distinctive banding represents the flow patterns of the magma as it solidified; its purple-pink color is due to the presence of manganese.

The Ruby Mountain rhyolite is laced with miarolitic cavities, or vugs, that formed when gas bubbles were trapped in the solidifying magma. Ranging in length from 1 inch to 12 inches, these vugs are most numerous in the more intensely banded, pink-and-purple sections of the rhyolite. All of them are lined with a coating of small, white quartz and sanidine crystals; some vugs contain larger, collectible crystals of spessartine and topaz, which formed by vapor deposition soon after the rhyolite solidified.

Spessartine, or manganese aluminum silicate, is one of the more common garnet-group minerals. Nearly pure spessartine is orange, a color caused by the essential element manganese. Most spessartine, however, contains such accessory elements as iron and chromium, which shift the color toward red. At Ruby Mountain, spessartine colors range from brown-red to deep blood red; smaller crystals are a bright hyacinth red.

Although most spessartine crystals measure only about 1mm or less in diameter, crystals up to 6mm (about ¼ inch) are not hard to find. Extraordinary specimens can have a diameter of up to 12mm. The crystals occur as brittle dodecahedrons that show as many as six smooth, glassy faces.

The less-common topaz, which is basic aluminum fluorosilicate, occurs as slender prisms averaging about 3mm in length, with exceptional specimens exceeding 12mm. The crystals' colors range from light straw-yellow to a darker sherry.

Another interesting and collectible mineral in the vugs at Ruby Mountain is bixbyite,  $(\text{Mn,Fe})_2\text{O}_3$ , a rare manganese iron oxide. Although usually only about ¼ inch

in size, bixbyite crystals are popular among collectors because of their perfect modified-cubic shapes. Found almost exclusively in rhyolitic environments and associated with spessartine and topaz, bixbyite is black, with a metallic or submetallic luster, and exhibits a subtle, but colorful, iridescence.

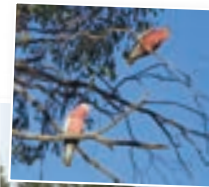
The current division of public and private land at Ruby Mountain emerged in the late 1860s when most land near the Arkansas River was either staked for placer gold or homesteaded for farming or grazing. The boundary between the private riverside land and the public domain ran roughly midway along the eastern slope of Ruby Mountain. The lower eastern section was first administered by the federal government through the General Land Office, which became the Grazing Service in 1934 and, finally, the BLM in 1946.

Meanwhile, though the private land passed through a series of owners, it remained undeveloped until recently. Because landowners did not restrict mineral collecting or other activities, the easily accessible west side of Ruby Mountain, with its huge talus slope of purple-and-pink banded rhyolite boulders, became the primary collecting area. During the 1980s and early 1990s, one landowner attempted, with limited success, to establish a fee-collecting site.

But then the land-use picture changed radically. Landowners built homes, erected fences and gates, and posted the property to end public access to the west side of Ruby Mountain. Meanwhile, the BLM leased the land immediately north of Ruby Mountain to the Colorado state park system. This area, now part of the new Arkansas Headwaters Recreation Area, has been developed as a campground with trailheads and river access.

The BLM land on the lower eastern side of Ruby Mountain is now part of the Browns Canyon Wilderness Study Area.

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## Ruby Mountain Revisited from page 46



**This rhyolite boulder shows the distinctive flow patterns that existed when the original magma solidified.**

Mineral collecting is allowed, provided that it is conducted by nonmechanical methods and for noncommercial purposes. Access is from the Ruby Mountain Recreation Site at the end of Chaffee County Road 300. From the off-highway-vehicle parking area, a foot trail leads a short distance from the Browns Canyon Wilderness Study Area gate directly to the east side of Ruby Mountain and a prominent outcrop of partially mined, gray-white perlite. The trail continues upward for about 100 yards, leading to a gray outcrop of perlite that contains a profusion of small, jet-black Apache tears. Although most are smaller than ¼ inch in diameter, it is not hard to half-inch specimens.

Perlite is what we call decomposed obsidian. When it first solidifies, obsidian contains only a trace of water, but through a slow process of hydration it eventually alters into perlite, a rock with a similar chemistry, but a much higher water content. Perlite is gray or grayish-white and has a distinctive, crumbly, glassy structure of tiny, shell-like, concentric flakes that weather into small spheres resembling pearls for which perlite is named. Apache tears that occur in a matrix of perlite are the unaltered remnants of the original obsidian.

When perlite is heated, the water in it changes into steam that expands each "pearl" structure into a solid "bubble" many times its original volume. "Expanded" perlite is a lightweight, inert material that is used in insulation, roofing tiles, soil additives, and lightweight concrete. In the late 1940s, miners dug exploratory trenches into these perlite outcrops, which proved too small and low-grade to warrant commercial mining. Another problem with the Ruby Mountain perlite was the profusion of small Apache tears, which tended to damage crushing equipment.

From the high perlite outcrop, the foot trail continues a short distance farther to a line of "No Trespassing" signs placed on the trunks of piñon trees that mark the boundary between the lower BLM land and the higher, privately owned land. On the BLM land just below the signs, the trail crosses a

talus slope of rhyolite boulders and fragments of rhyolite that have been broken off them by collectors.

Exposed spessartine and topaz crystals can sometimes be found simply by sorting through the talus, but most collectors prefer to break the rhyolite with hammers to expose fresh vugs. Rhyolite is very durable and can absorb great amounts of mechanical energy. That means that, when the rock breaks under hammer blows, small,

sharp fragments can fly in any direction. When you are breaking rhyolite, eye protection—preferably tight-fitting goggles rather than open-sided eyeglasses—is absolutely necessary.

The spessartine and topaz crystals have their greatest interest and visual appeal when they are still attached within the rhyolite vugs. It is important to trim the tough excess rhyolite from specimens as carefully and gently as possible to minimize physical shocks, which can dislodge the crystals.

Some Ruby Mountain collectors have recovered loose spessartine and topaz crystals by panning. The gravel beneath the talus slopes consists primarily of quartz and sanidine from decomposed rhyolite. Because the densities of spessartine (specific gravity 4.0) and topaz (SG 3.5) are considerably greater than those of quartz (SG 2.65) and sanidine (SG 2.52), panning, using water from the Arkansas River, can effectively recover loose, somewhat abraded crystals of spessartine and topaz.

The geology and mineralogy of Ruby Mountain are similar to those of two other well-known collecting sites: Garnet Hill near Ely in White Pine County, Nevada, and Topaz Mountain, in the Thomas Range of Juab County, Utah. These are also rhyolite formations that contain crystal-filled vugs. At Garnet Hill, where the rhyolite contains little fluorine, topaz is rare and garnets of the spessartine and almandine varieties predominate. Spessartine crystals from Garnet Hill are almost identical in appearance to those from Ruby Mountain. Topaz Mountain, which consists of fluorine-rich rhyolite, has a preponderance of topaz and relatively little spessartine.

### DIRECTIONS

The Ruby Mountain turnoff is located six miles south of Buena Vista on U.S. Highway 285, where signs point the way to the Ruby Mountain Recreation Site. Between mile markers 144 and 145, turn east on County Road 47 and follow the signs along county roads 301 and 300 for four miles to Ruby Mountain.



**Modified cubic crystals of bixbyite, a rare manganese iron oxide mineral, occur in vugs in the rhyolite.**

There is an outstanding rock shop nearby. The Rock Doc ([www.therockdoc.net](http://www.therockdoc.net)) is located on U.S. Highway 285, five miles south of Nathrop. The "Rock Doc" is Cindy Peratt, a geological engineer with firsthand knowledge of local collecting sites. Billed as the "largest rock shop in the Rockies", The Rock Doc is well-stocked with dredges, prospecting tools, books, maps, and thousands of mineral specimens, many from nearby sites such as Ruby Mountain.

Summertime visitors to Ruby Mountain should plan to attend the annual Contin-tail Gem & Mineral Show, held in early August at Buena Vista. This three-day event, sponsored by the Colorado Federation of Gem & Mineral Societies and hosted by the local Columbine Gem & Mineral Society, attracts 150 dealers from 10 western states and Mexico. Local dealers often exhibit Ruby Mountain spessartine and topaz.

Fifty-five years have passed since Richard Pearl helped make Ruby Mountain one of the state's most popular collecting areas. If Pearl were around today, he'd be the first to admit that Ruby Mountain is no longer the collecting site that it once was, but he might be pleased that, unlike many of the other sites he listed in his book, it is still a place where collectors can find specimens of spessartine, topaz, and Apache tears.

I think Pearl might also consider the BLM land adjacent to Ruby Mountain to be a fine opportunity for mineral exploration. Because previous attention was focused only on the west side of Ruby Mountain, the public land on the east side and all of Sugarloaf Mountain has yet to be thoroughly searched. It's possible that new concentrations of vugs with crystals of spessartine and topaz could be discovered.

Although there are fewer collecting areas today than there were in Pearl's day, many specimens are still waiting to be found. But success now requires a little more effort and determination—and at Ruby Mountain, perhaps a little mineral exploration, as well. ♥

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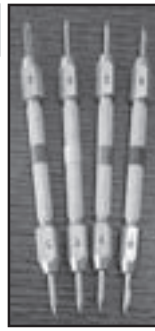


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## Show Dates from page 42

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seniors and students \$3, children (under 12) free; dealers, club sales, finished and unfinished gems, jewelry, beads, minerals, equipment, tools, prize drawings, raffles, displays, lapidary demonstrations, beading, wire wrapping; contact Suzanne Shimatzki, 107 Florentine Dr., Holland, OH 43528, (419) 861-0147; e-mail: ssshimatzki@gmail.com; Web site: [www.rockyreader.com](http://www.rockyreader.com)

**7-9—WINSTON-SALEM, NORTH CAROLINA:** 41st annual show and sale; Forsyth Gem & Mineral Club; Educational Bldg., Dixie Classic Fairgrounds; Fri. 10-7, Sat. 10-7, Sun. 12-5; adults \$2, grades 12 and under free; contact W.A. Marion, 1163 Bear Creek Church Rd., Mocksville, NC 27028; e-mail: MarionA1@yadtel.net

**8-9—MOUNT PLEASANT, SOUTH CAROLINA:** Wholesale and retail show; Intergalactic Bead & Jewelry Show; Omar Shrine, 176 Patriots Dr.; Sat. 10-5, Sun. 10-5; adults \$5 (discount coupon on Web site), children (12 and under) free; precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals; contact Tonya Nicholson, 3865 Lawrenceville Hwy., Ste. 107, Lawrenceville, GA 30044, (888) 729-6904; e-mail: [tonya.nicholson@beadshows.com](mailto:tonya.nicholson@beadshows.com); Web site: [www.beadshows.com](http://www.beadshows.com)

**8-9—PORT ANGELES, WASHINGTON:** Annual show, "Earth's Treasures"; Clallam County Gem & Mineral Association; Vern Burton Community Center, 308 E. 8th St.; Sat. 9-6, Sun. 10-5; free admission; "Earth's Treasures"; contact Jen Bourassa, PO Box 98, Sequim, WA 98382; e-mail: [jednennie@msn.com](mailto:jednennie@msn.com); Web site: [SequimRocks.com](http://SequimRocks.com)

**8-9—ROSEBURG, OREGON:** 42nd annual show; Umpqua Gem Club; Douglas County Fairgrounds, 2110 Frear St., directly off I-5 Exit 123; Sat. 10-6, Sun. 10-4; free admission; "Rockin' Around Oregon"; contact Eileen Paul, (541) 672-5229; e-mail: [beadpatch@cmspan.net](mailto:beadpatch@cmspan.net)

**8-9—SILOAM SPRINGS, ARKANSAS:** Show and sale; Northwest Arkansas Gem & Mineral Society; NWAGMS Clubhouse, Hwy. 43 North; Sat. 9-5, Sun. 10-5; free admission; tailgate swap, auction, grab bags, assorted activities; contact Dave Leininger, 14029 White Oak Ln., Bentonville, AR 72712, (479) 263-1424; e-mail: [hulagrub@aol.com](mailto:hulagrub@aol.com); Web site: [www.nwarockhounds.org](http://www.nwarockhounds.org)

**8-9—WALLA WALLA, WASHINGTON:** Annual show; Marcus Whitman Gem & Mineral Society; Walla Walla County Fairgrounds, Community Center, 9th St. and Orchard; Sat. 10-5, Sun. 10-5; adults \$2, children (under 12) free; dealers, rough, slabs, gems, minerals, beads, fossils, jewelry, equipment, silent auction, door prizes, raffle, demonstrations, rock cutting, interactive kids' section; contact Warren Rood, (509) 522-2330; e-mail: [warrenrood@yahoo.com](mailto:warrenrood@yahoo.com)

**8-16—DENVER, COLORADO:** Denver Coliseum Show; Eons Expos; Denver Coliseum; 4600 Humboldt St.; Daily 9-6; free admission; 150 wholesale and retail dealers, fine minerals, fossils, meteorites, petrified wood, amber, articulated dinosaurs, museum exhibits, tent show begins Sept. 8, Coliseum show opens Sept. 12; contact Eons Expos, Christine Perner, (516) 818-1228; e-mail: [christine@eons-expos.com](mailto:christine@eons-expos.com); Web site: [www.ColiseumShow.com](http://www.ColiseumShow.com)

**12-16—DENVER, COLORADO:** Fall Colorado Mineral and Fossil Show; Martin Zinn Expositions LLC; Ramada Plaza Hotel (formerly Holiday Inn-Denver Central), 4849 Bannock St.; daily 10-6, Sun. 10-5; free admission; 200 wholesale and retail dealers, free shuttle bus to Merchandise Mart; contact Martin Zinn Expositions, PO Box 665, Bernalillo, NM 87004-0665; e-mail: [mzexpos@gmail.com](mailto:mzexpos@gmail.com); Web site: [www.mzexpos.com](http://www.mzexpos.com)

**14-16—DENVER, COLORADO:** Colorado Fossil Expo; Martin Zinn Expositions LLC; Denver Merchandise Mart Plaza Annex, 451 E. 58th Ave.; Fri. 9-6, Sat. 10-6, Sun. 10-5; adults \$6, seniors and teens \$4; 50 dealers, fossils, meteorites, petrified wood, amber, paleontology exhibits, part of the Denver Gem & Mineral Show; contact Martin Zinn Expositions, PO Box 665, Bernalillo, NM 87004-0665; e-mail: [mzexpos@gmail.com](mailto:mzexpos@gmail.com); Web site: [www.mzexpos.com](http://www.mzexpos.com)

**14-16—HOLLAND, MICHIGAN:** 43rd annual show and sale, "America's Free Treasures"; Tulip City Gem & Mineral Club; Holland Civic Center, 150 W. 8th St.; Fri. 9-8, Sat. 9-7, Sun. 11-5; adults \$2 (3-day pass \$6), families \$6, students 50 cents; exhibits, dealers, fluorescent rock dark room, demonstrations, glass fusing, cabochons, beadworking, lapidary, children's games, Petoskey stones, fossils, geodes, agates; contact Merridy Jeffery, MI, (207) 478-0994; e-mail: [merridy@famlink.com](mailto:merridy@famlink.com); Web site: [www.tulipcity.org](http://www.tulipcity.org)

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**14-16—LINCOLN, MISSOURI:** Annual show; Mozarkite Society of Lincoln; Lincoln City Park, Shelter House; Fri. 9-5, Sat. 9-5, Sun. 9-4; free admission; contact Ted Bolich, (660) 890-4983; Web site: Mozarkite.com

**14-16—SAN RAFAEL, CALIFORNIA:** Wholesale and retail show; Gem Faire Inc.; Marin Center, 10 Avenue of the Flags; 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, exhibitors, on-site jewelry repair; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

**15-16—CASTLE ROCK, WASHINGTON:** 47th annual show; Southern Washington Mineralogical Society; Castle Rock Fairgrounds, A St. and Cowlitz River; Sat. 10-6, Sun. 10-4; free admission; contact Jackie Furuli, PO Box 704, Longview, WA 98632, (360) 431-0059

**15-16—HARRISBURG, PENNSYLVANIA:** 47th annual show; Central Pennsylvania Rock & Mineral Club; Zembo Shrine, 3rd St. and Division St.; Sat. 10-6, Sun. 10-5; adults \$6, children (under 12) and Scouts free; jewelry, beads, minerals, gemstones, fossils, activities for children and Scouts, educational exhibits; contact Betsy Oberheim, CPRMC, Box 6271, Harrisburg, PA 17112-0271; email: aoberheim3@comcast.net

**15-16—NEWARK, DELAWARE:** Wholesale and retail show; Intergalactic Bead & Jewelry Show; Executive Banquet & Conference Center, 201 Executive Dr.; Sat. 10-5, Sun. 10-5; adults \$5 (discount coupon on Web site), children (12 and under) free; precious and semiprecious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals; contact Tonya Nicholson, 3865 Lawrenceville Hwy., Ste. 107, Lawrenceville, GA 30044, (888) 729-6904; e-mail: tonya.nicholson@beadshows.com; Web site: www.beadshows.com

**15-16—PASO ROBLES, CALIFORNIA:** Annual show; Santa Lucia Rockhounds; Pioneer Park & Museum, 2010 Riverside Ave.; Sat. 9-5, Sun. 9-5; free admission; dealers, exhibits, demonstrations, prize drawings, silent auction, kids' activities; contact Dale Conrad, (805) 226-0719; e-mail: conrad@att.net; Web site: www.slrockhounds.org

**15-16—POUGHKEEPSIE, NEW YORK:** 43rd annual Gem, Mineral, Fossil & Jewelry Show and Sale; Mid-Hudson Valley Gem & Mineral Society; Gold's Gym & Family Sports Complex, 258 Titusville Rd.; Sat. 10-5; Sun. 10-4; adults \$5, seniors \$4, students \$2, children (under 12) free with adult; featuring Mineral Photography, six free rocks for kids, more than 30 dealers, minerals, fossils, meteorites, gemstones, jewelry, beads, tools, books, museum and club mineral displays, fluorescent mineral display, lapidary demonstrations, grand door prize; contact Carolyn Reynard, (845) 471-1224; e-mail: sunstone33@verizon.net; Web site: www.mhvngms.org

**15-16—REDWOOD CITY, CALIFORNIA:** Annual show; Sequoia Gem & Mineral Society; Community Activities Bldg., 1400 Roosevelt Ave.; Daily 10-5, Daily -; adults \$3, children (12 and under) free with adult; contact Mary Lou Froese, 119 Duval Dr., South San Francisco, CA 94080, (650) 755-8753; e-mail: mfroese@sbgglobal.net; Web site: http://sgms.driftmine.com

**15-16—SCARBOROUGH (TORONTO), ONTARIO, CANADA:** 43rd annual show, "Wonders of the Earth"; Gem & Mineral Club of Scarborough; Don Montgomery Community Centre, 2467 Eglinton Ave. E.; Sat. 10-6, Sun. 11-5; adults \$5, children \$1; auction, silent auctions, kids' auction, demonstrations, door prizes, fluorescent mineral room, swap area, museum and member displays, gemstones, mini workshops; contact Russ Bruce, (416) 282-5319; Web site: scarbgemclub.ca

**21-23—JACKSONVILLE, FLORIDA:** Annual show; Jacksonville Gem & Mineral Society; Morocco Shrine Auditorium, 3800 Saint Johns Bluff Rd.; Fri. 1-6, Sat. 10-6, Sun. 10-5; adults \$4; contact Karen Olson, 9353 River Pine Rd., Jacksonville, FL 32257, (904) 448-5182; e-mail: jgmsnews@gmail.com; Web site: www.jaxgemandmineral.org

**21-23—SANDY, UTAH:** Wholesale and retail show; Gem Faire Inc.; South Towne Expo Center, 9575 S. State St.; Fri. 10-6, Sat. 10-6, Sun. 10-5; adults \$7 (weekend pass), children (11 and under) free; jewelry, gems, beads, crystals, silver, rocks, minerals, exhibitors, on-site jewelry repair; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

**22-23—CHICO, CALIFORNIA:** Annual show; Feather River Lapidary & Mineral Society; Silver Dollar Fair Grounds, 2357 Fair St.; Sat. 10-5, Sun. 10-4; adults \$2, students and children (15 and under) free; dealers, opals, rough rock,

*continued on page 71*

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**Tom Thumb**

# Color in *MINERALS*

## Part I: It Gives Collector Specimens Their Appeal

Story and Photos by Bob Jones

**I**t's a simple fact of mineral collecting: Species with vibrant color are more eagerly sought than those that lack color. This should be obvious to anyone who attends a mineral show. Ask any dealer whether white zeolites sell more readily than colored minerals or compare the number of black-to-gray sulfide and sulfosalt specimens in private collections to the number of colorful minerals. Then check the mineral exhibits and displays for black or white minerals. The preference for colorful minerals seems clear. Does the greater percentage of minerals with color play a part in their popularity? It may, but I think color is the greater reason.



Chalcopyrite looks a little like gold because both are band gap minerals that absorb blue to violet wavelengths.

Color is the result of light interacting with the human eye. Light travels in waves of various lengths, which make up the spectrum of light. The wavelengths that are reflected by an object, and are therefore perceived by the eye, determine the color of the object. White minerals, for instance, reflect all wavelengths, without absorbing any. Black—and, to a lesser extent, gray—minerals absorb all light waves. Since they lack color, these minerals are simply not as eye-appealing to most collectors.

The color spectrum of light energy is a very narrow band of energy that our eyes can register. It lies within the total energy spectrum, which runs from cosmic rays through ultraviolet (UV), radio, TV and electrical waves.

The human eye can only register a specific set of light wavelengths. This visible color spectrum ranges from violet, the shortest wavelength, to red, the longest wavelength, with blue, cyan, green, yellow and orange in between. When white light, which is made up of all these wavelengths, enters a mineral and passes right through, the mineral appears transparent and colorless. In order for us to see color in minerals, something has interfere with the passage of light through the mineral.

Remarkably, a few minerals actually have the ability to absorb some of the invisible UV light waves, which have a shorter wavelength than violet, and convert that energy into a visible color. The result is fluorescence, a phenomenon that constitutes a unique segment of the mineral collecting hobby. Some minerals can even absorb light energy, store it, and then briefly continue to emit it when the light source is removed. We call this phenomenon phosphorescence. Some minerals will give off light energy when heated. This oddity is known as thermoluminescence. And some minerals, like quartz and sphalerite, will give off light



In organic shells, a diffraction grating effect is created by microscopic, hexagonal platelets of calcium carbonate.

when two pieces are vigorously rubbed together. That reaction is triboluminescence. This series is only concerned with the colors that can be seen in minerals and gems when they respond to ordinary light.

It should be admitted here that think one can accurately and completely describe why minerals have color is more than a bit presumptuous. I hope, however, that this simple explanations will give readers a good idea of how nature creates gorgeous the colors we see in gems and minerals.

Scientists have studied the causes of color in minerals, the most common of which is electron activity, and have categorized species accordingly. The terminology in this article differs slightly from that in other sources. The five basic causes of color in minerals and gems are color centers, band gaps, physical phenomena, crystal fields, or trace metal impurities, and molecular orbital, or charge, transfer. The last two involve electrons of trace metal impurities in the structure of a mineral or gem that act alone or in concert with other electrons.

A sixth color cause is inclusions, which do not involve electron action, but are crystals of one mineral trapped inside another (i.e., iron oxide in chalcedony, forming jasper).

Many of the minerals used in lapidary have color due to inclusions.

If color in minerals and gems was due to one cause, I could describe that in one article. I chose instead to deal with each cause separately to give readers a better grasp of these mechanisms.

### BAND GAP THEORY

Perhaps the most difficult cause of color to grasp is the band gap theory. Virtually all metals are either silver or grayish in color; the exceptions are yellow gold and reddish copper. Band gaps are responsible for these colorful metals. The band gap theory also explains the colors we see in sulfosalt minerals such as red realgar, proustite and pyrargyrite, and orange orpiment. Band gap minerals can be subgrouped based on the size of the gap, or the distance between two energy levels within the mineral. Very narrow band gaps are found in black or gray minerals. All light energy is absorbed by the electrons, so no light energy is reflected back to the viewer. Medium-gap minerals use the higher levels of light energy at the blue end of the color spectrum to jump the gap, leaving the longer wavelengths of light energy to be reflected as yellow, orange



The lamellar structure of labradorite crystals acts like a diffraction grating.



Medium-gap minerals, like these fine realgar crystals, are often red.



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Precious opal's rainbow of colors is caused by cristobalite spherules bending light and making each color visible.

or red. If the gap is so wide that electrons can't jump the gap at all, the mineral can be colorless, as in the case of diamond.

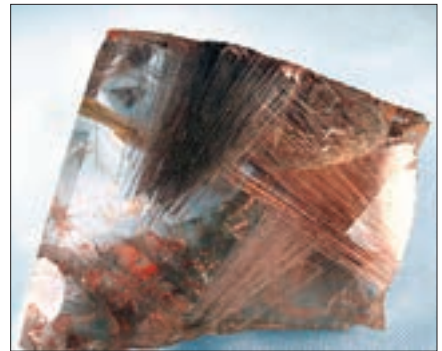
The longer list of minerals in the band gap theory category include some that will surprise you. Such common minerals as the iron sulfides pyrite, pyrrhotite and marcasite are fitting because of their near-gold color. More surprising are blue and yellow diamonds, cinnabar, sphalerite, some meteorites, and the small group of semi-metals lead, silicon, tin and germanium. Band gap minerals don't always show color, but if they do, it is toward the red end of the color spectrum.

Band gap minerals differ internally from all other minerals. This is because all their electrons act in concert, moving as a "gang" or cluster of free electrons. In all other minerals, the negatively charged electrons cluster around the positively charged protons, either singly or in pairs.

How important is this odd electron clustering? It explains many of a metal's properties. It is why metals are good conductors of electricity and heat and are more or less ductile. This grouping of electrons is responsible for just about all of a metal's useful properties, including the lovely metallic shine most metals have. In many cases, these electron gangs give the band gap mineral a color, provided they can absorb enough light energy to move from one energy level, or band, to a higher band. The space between these bands in a mineral is the gap.

If, as in the case of copper, the electron cluster absorbs energy from the blue end of the color spectrum, the metal looks red, as the longest wavelengths are reflected to the eye. In gold, which tends to absorb the shorter wavelengths, red and yellow light are reflected, and the combination creates that rich golden yellow color.

In order for the electron gang to jump a band gap, they often absorb fairly high energy wavelengths from the blue end of the color spectrum. This explains why many band gap minerals look red to orange, the



When one mineral, like rutile, is included in another, like quartz, it can impart a color to the colorless mineral.

complementary colors of the absorbed blue-wave energy. Complementary colors are positioned opposite each other on a color wheel.

You'll note that there are a number of black and gray band gap minerals. Black is considered the absence of all color. It is, in fact, a result of the mineral absorbing all light wavelengths, so that no light is reflected back to the eye. The electrons, though energized, still didn't make the jump from a lower energy band to a higher one. Gray minerals allow a trace of light energy to escape, producing that tone. Since all the light is absorbed, none escapes and what you see is a black mineral!

Just the opposite happens with white minerals. Light strikes the mineral's surface, but little or none of it is absorbed. When all the color wavelengths are reflected back to the eye, you see a white mineral.

### PHYSICAL PHENOMENA

The group of minerals colored by physical phenomena includes some of the very nicest gems, of which precious opal is the most valuable and popular. Papua shell and other organic substances that show a play of colors are also in the group. The colors are not due to some trace mineral inclusion, but by the structure of the mineral, which actually breaks white light into its component



Band gap minerals, like the red sulfosalts proustite, are subgrouped by the size of the gap between energy levels.

colors, making them visible. Think of a rainbow, which is created when sunlight shines on fine droplets of water in the atmosphere. It shows us the entire color spectrum, from violet to red, without any help from impurities. Instead, as light passes through the closely grouped water droplets, each color wavelength is bent (refracted) at a slightly different angle and reflected back, making each color visible.

We see this same refraction/reflection phenomenon on a thin film of oil, in a crack in a piece of glass, in thinly sliced iris agate, in several feldspar varieties, of which labradorite is the most popular, and in precious opal, the ultimate rainbow gem!

Opal has been known for millennia. Its lovely rainbow of colors, often dominated by one or two colors, is the result of the internal structure of the opal. Of course, for centuries this color cause was a scientific unknown. Some early humans described it as magic. However, with the invention of the electron microscope in 1964, opal's secret was revealed. Internally, precious opal is made up of the quartz polymorph cristobalite, with a distinct spherulitic crystal structure. The spherules form from the original silica medium, of which not all is used. The remaining silica fills the spaces between the spherules and plays a role in the stones' colors. The submicroscopic silica spherules, uniform in size and perfectly aligned, act like water droplets in the sky, bending light into its individual colors, which are reflected back to the viewer. The reflected colors vary, and often green, red or blue is seen most strongly. The dominant color is determined by the size of the spherules.

We see the same effect when we inscribe tiny lines or grooves parallel to each other, as in the physical phenomenon of a diffraction grating. DVDs and CDs display this same physical effect; light, when it is reflected off the surface of the disk, is split into its play of colors.

In organic shells like oyster and Papua, the same diffraction grating effect is cre-

ated by microscopic, hexagonal platelets of calcium carbonate, usually aragonite. This iridescent layer of aragonite is often called "Mother of pearl".

The lovely schiller and moonstone effects we see in some feldspars is the result of crystal twinning. A whole series of names have been devised to describe this color phenomenon, including labradorence and adularescence. Moonstone, peristerite, labradorite, and other feldspars show a play of colors due to mechanical, not chemical, reasons. As the minerals develop, wafer-thin individual crystals line up parallel to each other and in reverse order (positive end to negative end). As light shines on the surface of these diffraction grating crystal patterns, it is scattered, and a play of colors is seen. In some cases, the dominant color is blue. In labradorite, there can be a definite play of colors, from blue to bronze and even red or green.

One of the more remarkable uses of labradorite I've seen was in the Moscow Kremlin's inner courtyard. Kept in beautiful shape, the grounds in the Kremlin boast all sorts of rectangular flowerbeds of considerable size, about 7m or 8m on a side. These flowerbeds are bordered with large, rectangular, polished slabs of various types of stone, like marble. The most attractive flowerbed perimeter was made of huge blocks of polished labradorite. As you walked by on a sunny day, the labradorite flashed a beautiful array of colors!

Of course, dedicated and learned collectors don't allow the lack of color to influence their mineral selections. Advanced collectors enjoy fine white minerals, scientifically interesting dark sulfides, and other dark minerals, not so much for eye appeal as for scientific interest. But for collectors who purchase specimens at mineral shows to put in their display cabinets, those with color carry the day! ♥

**Next Month:** The most common cause of color in gems and minerals.

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## OFF THE DOP

## Keeping Up



On Apr. 22, 2012, I attended the Ohio Chapter Alumni Association (OCAA) meeting and seminar of the Gemological Institute of America (GIA). I have been a member since before I became an alumnus of the GIA. I attended a few meetings and realized how beneficial taking some courses would be in enhancing my enjoyment of my hobby. I also realized that, even if I didn't further my education, the fact that gem treatment is having such a profound effect on the industry today made it worth the price of membership and seminar fees to remain current with industry trends.

Typically, our chapter meets for lunch, has a short business meeting, then adjourns for an intensive, hands-on learning experience. The workshop this year was Corundum Treatment and Pricing, designed by Gemworld International Inc. Since I often cut sapphires, I was anxious to attend and learn. The presenters at the meeting were Stuart Roberson, GIA G.G., and Cigdem Lule, PhD, GIA G.G., and FGA. Both were professional and knowledgeable.

OCAA meetings are opportunities to network with leaders in the gem and jewelry industry throughout Ohio and find out which jewelers are striving to keep up with an ever-changing world. I consider this important information when advising buyers on where to go for appraisals or to make significant purchases with confidence.

Approximately 90% of the cut gems on the market have been treated. Also, a lot more treated and synthetic rough is being sold as "natural". Heating and other methods of enhancing corundum are having a profound effect on the market due to higher demand for affordable gems. Rubies sold by low- or middle-market resellers often contain more filler than ruby. When buyers have this jewelry appraised, they are often surprised to learn they have been deceived.

Treatments and synthetics can significantly reduce the value of high-end market products. Most people cannot recognize treated and synthetic stones. Gems sold on cruise ships, at vacation resort destinations, and on Internet or TV shopping networks contain a lot of filler and a little gemstone. It's important for gemologists and consumers to understand these enhancements so they can ask the right questions.

Most gemologists agree that, when in doubt, you should send a stone to a lab for further analysis. Many treatments and synthetics today are so good that sophisticated analysis by a PhD is required to detect them.

We know that treatments and synthetics were known to the ancients, so even older jewelry may contain altered or fake gems.

One of the most important things I've learned by continuing my education is that things we've heard or thought we knew about gems may not be true. The mining and marketing of colored gemstones is not as organized as that of diamond; colored gem sales are estimated to equal only 10% of diamond sales. However, treated diamonds and colored stones are extremely common today due to higher demand and new treatment methods and technologies.

Word of new gem discoveries travels quickly, and transient miners can move rapidly from one gem source to another. For as little formal education as these miners have, their knowledge of colored gems is amazing. They know what sells and what doesn't. They know the value of the stones and how to enhance inferior material at or near the mine site so they can sell it for a higher price. While many miners are honest dealers, some are not above doing whatever it takes to make a living. I have seen imitation stones and glass-filled or heated rough gems offered as faceting rough. It is only through continuing education that I can stay current with all these deceptions.

I recommend that anyone who is interested in cutting or buying gems join their local GIA Alumni Association, subscribe to *Gems & Gemology*, attend seminars, or read books by Professional Gemologist Antoinette Matlins ([www.gemstonepress.com](http://www.gemstonepress.com)).

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](mailto:jimperkins@zoominternet.net).



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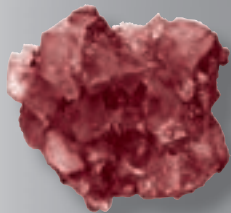
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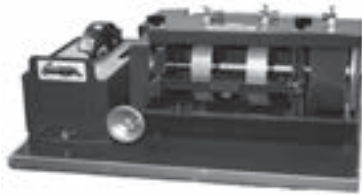
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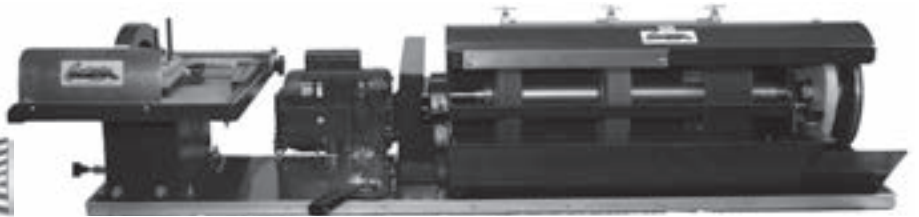
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# A BIG SNOWY MOUNTAIN ADVENTURE

## Fossil Collecting in Montana's Russell Country

Story and Photos by Kenneth H. Rohn



This thin piece of shale holds several imprints of brachiopods, possibly of the species *Dolerothis*.

I was on my way to another adventure in Lewis & Clark National Forest in north-central Montana, also referred to as “Russell Country”. My destination was the Crystal Lake campground in the Lewis & Clark National Forest, almost 6,000 feet above sea level, where I’d search for invertebrate fossils that lived in a huge, shallow sea during the tremendous time span between the Mesozoic and Paleozoic eras, 350 million to 180 million years ago. I’d also take a hike in the wilds of the Big Snowy Mountains. The prospect of camping in such a picturesque setting was exciting to say the least and I looked forward to every minute of it.

From Lewistown, Montana, I traveled west on U.S. Highway 87/State Road 200 approximately eight miles to the Crystal Lake Road junction. This is a well-maintained gravel road leading off toward the Big Snowy Mountains in the distance. The drive to Crystal Lake Campground on this road is an adventure in itself, with a few hairpin turns to make it interesting. Fortunately, the Forest Service has placed easy-to-read signs at each intersection along the route to eliminate any confusion.

Crystal Lake Campground makes an ideal base for rockhounding in the area. The scenery is spectacular, with high mountain peaks surrounding the campground and lake. Patches of snow can be seen in the shaded areas on the higher peaks, even during midsummer (I was there in July). The lake is like a blue jewel resting in this mountain valley, a short walk from the campground.

There are 28 campsites, spaced far enough apart to afford privacy, each with tables and fire pits. The entire area is heavily wooded, with pines and firs dominating. The sun rises a bit later here, due to the majestic peak to the east of the campground. An interesting and beneficial natural feature in camp is an artesian spring that dispenses a continuous flow of very cold drinking water. There is no garbage service here, so we must carry out what we bring in.

Invertebrate fossils can be found in outcrops and road cuts in several places in the foothills and higher elevations of the Big Snowy mountain range. It extends for approximately 25 miles in an east-west direction. The highest point is Greathouse Peak, at 8,681 feet above sea level. I found that a little investigating for fossils along the entrance road near camp proved fruitful. I only collected in a small area, but I found enough invertebrates to satisfy my needs.

As you approach the boundary of the national forest along Crystal Lake Road, the Mississippian limestone horizon is the most obvious, situated in bedded layers on the precipitous mountainside. This limestone is very dense and so fine-grained that, to the naked eye, it appears velvety smooth. In fossiliferous limestone such as the Mississippian, that texture is altered by the fossilized remains of numerous ancient shellfish embedded in it. I placed a few scrapings from a specimen of fossilized limestone on a slide and studied it under my microscope. At 300x magnification, the granules look like thin, wispy flakes. It would take a much higher magnification to actually discern the grains of this sedimentary rock. They are extremely fine.

When I arrived at the national forest boundary, I stopped at Rock Creek before going on to the campground. I just had to do some investigating near the bridge, curious to see what might materialize in the dry, rocky bed. To my surprise, the first gray fragment of limestone that I picked up contained a perfect print of a fish scale that was  $\frac{3}{8}$  inch in diameter. When I turned the rock over, I found two more scales. I have no idea what species of fish they might be from.

When my curiosity was satisfied, I was off to the campground. I found a nice site and registered. I was hungry from the drive up and all the fresh mountain air. After lunch, I headed back out to an interesting area I had seen on the way in.

My experience collecting in national forests hasn't been as extensive as on Bureau of Land Management (BLM) property in the Western states. I do, however, live quite near Superior National Forest in Minnesota and have collected there from time to time. Collecting in a national forest isn't that much different from BLM collecting; the rules are probably not as clearly defined, but hobby collecting is permitted. Reasonable amounts of minerals may be collected, but not enough to disturb the area. Digging holes, uprooting rocks and allowing them to roll down onto the roadway, and disrupting traffic by parking in undesignated areas are frowned upon. If we continue to use common sense, we will have practically a free hand collecting in any national forest long into the future. If you wish to collect more rocks, such as a load for a patio or other large project, a special permit must be obtained from the nearest Forest Service office.

**Rock & Gem gives locality information for reference purposes only. Readers should never attempt to visit any of the sites described in this publication without first verifying that the location is open to collecting and obtaining the permission of the land and/or mineral rights holders.**



**As you approach the boundary of the national forest along Crystal Lake Road, the Mississippian limestone horizon is the most obvious outcrop.**



**Though the clam shells in this piece of limestone are the same color as the host rock, they are quite noticeable when sunlight strikes them.**



**Fossilized remains of numerous ancient shellfish can be found in the strata of the Mississippian limestone formation near Crystal Lake.**

The fossils at Rock Creek do not show up well. The problem is that they are basically the same color as the host rock. It takes careful scrutiny to distinguish them from the rocks they formed in. When the sunlight strikes them at the right angle, they seem to jump out at you however.

One downside of fossils in the river bed is erosion. Running water has damaged many of the fossils I picked up, but it was encouraging to find them just the same. I drove on up the road to an outcrop that looked promising and parked the pickup. I was about to do some serious collecting.

One of the limestone rocks I found in an outcrop near the bridge is 3 inches long, 2 inches wide, and a couple inches thick. In this tiny rock are the impressions of seven brachiopod shells. Three are complete, while the others are only partial. Evidently, they had shattered into fragments before they were buried in the sediment of the sea bottom. The shells are small; the largest one is  $\frac{5}{8}$  inch in diameter. The limestone in which they formed in is light gray.

The specimen went into my rock bag and I returned to the pickup. I drove on up the road to an outcrop that looked promising and parked out of the way of traffic. I didn't know it at the time, but I was about to discover what I was looking for in this high-walled mountain road: shellfish fossils.

In this area, you can expect to find a variety of shellfish of various sizes in the strata of the Mississippian. The largest I found are about 1  $\frac{1}{2}$  inches in diameter. Others are as tiny as  $\frac{1}{4}$  inch. Brachiopods, crinoids, and—if you're lucky—coral colonies can be found. I collected only a few intact shellfish fossils that had separated from the matrix in which they formed. Along with oysters and belemnites, I found other fossils that I was unable to identify due to their eroded condition. The oysters are of the species *Graphaea*. During the much older Paleozoic Era, a confusing number of brachiopods lived in the huge inland sea that covered this land. Some of the fossils I found are quite good, and most of the details of the shells have been reproduced in detail.

In one slab of shale, I found several imprints of brachiopods that I was able to tentatively identify as *Dolerothis*, which grew to better than an inch in diameter. This animal lived sometime between the Ordovician and Silurian periods of the Paleozoic Era (about 350 million years ago). The specimens in this one rock have fine to coarse ribs. It's quite possible that they are two different varieties of the same species.

The talus piles below some of the outcrops I examined produced a few interesting fossils. Some of the rocks I picked up had fallen onto the edge of the roadway from somewhere higher on the mountain. Always keep safety in mind while collecting under high cliffs; no rock is worth an injury.



The white areas of this limestone outcrop were practically devoid of fossils, but I found specimens in loose rocks that had weathered out of the darker layers.

One afternoon at Rock Creek, as I stood looking at the very high monolith before me, I found it very hard to believe that the earth has changed so much since it was young. The red rock wall that makes up the south bank of the creek is probably 80 or more feet high. If you look closely, you'll see the individual layers of rock representing different geological times in the formation.

At one time, perhaps 250 million years ago, the Big Snowy mountain range didn't

exist. It was actually at the bottom of a body of water that covered thousands of square miles. On the eastern end of this range, shark remains were found, along with the fossils of other marine life. Without a doubt, a catastrophic event too horrendous for humans to comprehend took place sometime in the past. It quite possibly disrupted life at that time. Our earth's climate today is quite different than it was 300 million years ago. Even the angle of earth's axis was different.



This thin slab of limestone holds the distinct imprints of brachiopods and oysters, plus a number of unidentified shellfish remains.

I learned that much paleontological work is going on in Bear Gulch, at the eastern end of the range. Ray Vodicka, manager of Bear Gulch Pictographs ([www.beargulch.net](http://www.beargulch.net)), showed me a wonderfully preserved, three-dimensional petrified fish in the surface of a large slab of limestone that he had collected on his property. It's perfect in every detail, right down to the intricate lines in the scales.

#### ICE CAVES

Upon entering the campground, I had seen a sign indicating a hiking trail to some ice caves on the nearest mountain peak. After my second day in camp, I decided to inquire about it. I talked with the campground hosts and learned that it's a five-mile hike to the caves, a steady, gradual, uphill climb. I enjoy hiking and what better way to do it than to climb a mountain?

The sun was just beginning to cast its rays over the mountain peak to the east when I set out. The trailhead to the first switchback is rather wide. I assume that most campers walk this far and return to camp. The trail is steep, with at least a 15% uphill grade. This may not seem like much, but after two or three hours of climbing, I learned that I have muscles that aren't used very often.

A few places along the trail drew my attention. One was the huge talus pile at the 6,500-foot level. The other is a very narrow stretch of trail here, with a 600-foot drop to the next level. I took my time and watched where I put my feet on the loose rocks. Once past the talus pile, the going is easier. At least there are trees on the cliff side of the trail, which gives a feeling of safety.

My GPS registered 7,000 feet when I stopped to rest a second time. I noticed that several pieces of limestone were lying at the edge of the trail. In one slab, I saw two brachiopods slightly larger than a dime, distinctly visible on the surface. It's difficult to comprehend that, 300 million years ago, this mountaintop was a sea bottom, but here I was, looking at proof positive.

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**In mid-July, ice still fills the entrance to the Devil's Chute, situated at about 8,200 feet.**

didn't hike all the way to the ice caves, the view alone would be worth the effort.

I reached the first ice cave when the sun was high in the sky. It is called "The Devil's Chute". The name is very appropriate: It's a huge, almost vertical hole in the ground, filled with ice! I wouldn't want to fall into it. There would be no way out without a rope and help from one or more people.

In another half-mile or so, I reached two more caves. The opening of the first is 5 feet wide and situated between two gigantic boulders. The cave was full of ice, with the floor on a gradual downhill slope. I was able to step inside a few feet to take a photo.

The second cave, only a few yards away, has an even narrower opening. It's 3 feet wide, with the same configuration of huge, glacier-worn boulders at the sides of the entrance. It, too, was crammed full of ice that had a translucent aquamarine tint to it. I could step no more than a couple of feet into this strange phenomenon. I stayed in the cool opening for awhile. It was a refreshing pause after being out in the hot sun for several hours.

The return hike was a whole different ballgame. Other muscles would now be working on the downhill grade; I had five miles and 2,000 feet to descend. The 10-mile round-trip hike took me eight and a half hours to complete.

Next morning, bright and early, I was on my way east. This field trip at Crystal Lake had been a very fulfilling and enjoyable experience. I was able to collect a nice selection of invertebrate fossils, of which a few will be displayed in my cabinet, and I witnessed the phenomenon caves full of ice in midsummer.

For a free guide to the Crystal Lake area, call Russell Country tourism at (406) 761-5036 or (800) 527-5348, or visit [www.russell.visitmt.com](http://www.russell.visitmt.com).

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# MANY FACETS

by Guest Faceters

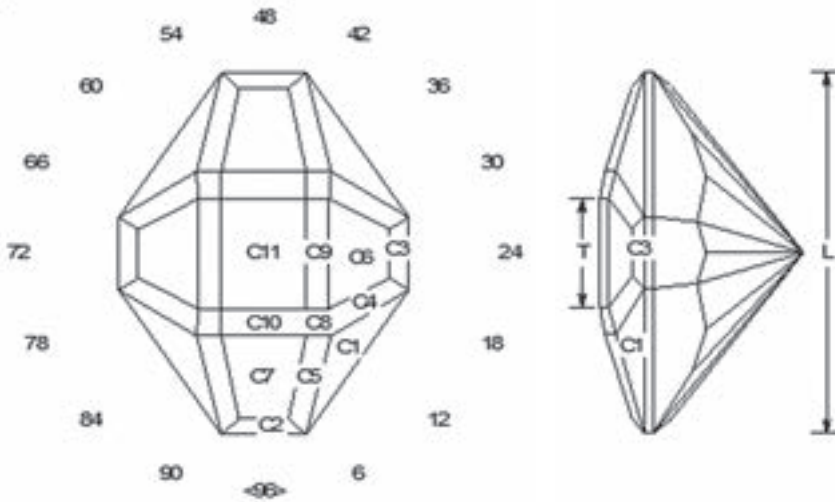
Faceters are welcome to submit their original designs for publication. Mail materials to Many Facets Submissions, *Rock & Gem* magazine, 3585 Maple St., Ste. 232, Ventura, CA 93003.

Find that one of the most difficult gem materials to cut is deep red garnet. Most times, the finished gemstone is so dark that only little glints of red can be seen in what otherwise looks like a black stone. Here is a design I created for just such a piece that produced a garnet with more color than I've gotten from many other designs.

It is not a difficult design to cut and has an average facet count. For having only two-fold symmetry, however, it is made up of quite a few tiers. With some angle changes, this design should also work with lower R.I. materials.

I hope you enjoy cutting this "kite"-shaped design and, as always, I would love to hear from you if you do.

—David Groncki  
digroncki@comcast.net



### DJG Kite

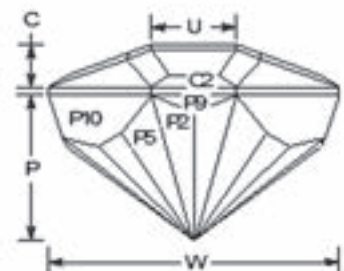
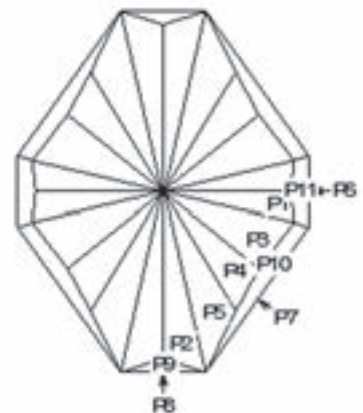
CAD by David Groncki  
©March 2012  
Angles for Garnet (R.I. 1.810)  
57 + 8 girdles = 65 facets  
2-fold, mirror-image symmetry  
96 index  
L/W = 1.300 T/W = 0.394 U/W = 0.290  
P/W = 0.521 C/W = 0.154 Vol./W<sup>3</sup> = 0.315

#### PAVILION

P1	38.44°	20-28-68-76	Establish permanent center point (PCP)
P2	38.00°	03-45-51-93	PCP
P3	39.08°	17-31-65-79	PCP
P4	38.63°	11-37-59-85	PCP
P5	38.39°	06-42-54-90	PCP
P6	90.00°	24-72	Cut to desired width
P7	90.00°	15-33-63-81	MP @ P1, P3
P8	90.00°	96-48	MP @ P2, P5
P9	50.04°	96-48	Level girdle
P10	72.29°	15-33-63-81	Level girdle
P11	71.80°	24-72	Level girdle

#### CROWN

C1	38.00°	15-33-63-81	Cut to desired girdle height
C2	38.00°	96-48	Level girdle
C3	32.32°	24-72	Level girdle
C4	28.84°	18-30-66-78	GMP
C5	27.63°	12-36-60-84	GMP
C6	21.66°	24-72	Float to size
C7	16.63°	96-48	Float to size, meet with C4/C6
C8	23.17°	16-32-64-80	MP @ C1
C9	20.35°	24-72	MP @ C4
C10	12.08°	96-48	MP @ C5
C11	0.00°	Table	MP @ C8



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## The Frugal Collector



by Robert Jones

From the Publishers of Rock & Gem Magazine

SEPTEMBER 2012

crystals, fossils, minerals, jewelry, beads, demonstrators, wire wrapping, jewelry making, flint knapping, capping, faceting, kids' games, wheel of fortune, grab bags, door prizes, raffle; contact John Scott, 1288 Glenwood Ave., Chico, CA 95926, (530) 321-6331; e-mail: jweazel@sbcglobal.net; Web site: www.orovillorocks.com

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**22-23—POMPANO BEACH, FLORIDA:** Wholesale and retail show; Intergalactic Bead & Jewelry Show; Emma Lou Olson Civic Center, 1801 NE 6th St.; Sat. 10-5, Sat. 10-5; adults \$5, children (12 and under) free; precious and semi-precious gemstone beads, sterling silver, findings, freshwater pearls, hand-blown glass beads, vintage beads, crystals; contact Tonya Nicholson, 3865 Lawrenceville Hwy., Ste. 107, Lawrenceville, GA 30044, (888) 729-6904; e-mail: tonya.nicholson@beadshows.com; Web site: www.beadshows.com

**22-23—RICHARDSON, TEXAS:** Retail show; The Bead Market; Richardson Civic Center, 411 W. Arapaho; Sat. 10-5, Sun. 10-4; free admission; gemstones, all kinds of beads, pearls, findings, wire, books, tools, beading and jewelry making supplies; contact Rebekah Wills, PO Box 494, Gilmer, TX 75644, (903) 734-3335; e-mail: rebekah@thebeadmarket.net; Web site: www.thebeadmarket.net

**28-30—PLEASANTON, CALIFORNIA:** Wholesale and retail show; Gem Faire Inc.; Alameda County Fairgrounds, 4501 Pleasanton 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, exhibitors, on-site jewelry repair; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

**29-30—FRANKLIN, NEW JERSEY:** 56th annual show; Franklin Mineral Museum; Franklin School, 50 Washington Ave.; Sat. 9-6; adults \$7, children \$4; contact Patricia Seger, 22 Palomino Trail, Vernon, NJ 07462, (973) 827-0160; e-mail: psolutions.minerals@gmail.com; Web site: franklinmineralshow.webs.com

**29-30—MESQUITE, TEXAS:** Annual show; Dallas Gem & Mineral Society; Mesquite Exhibition Hall, 1818 Rodeo Dr.; Sat. 10-6, Sun. 10-5; adults \$8; dealers, gems, minerals, fossils, demonstrations, kids' mine, fluorescent display, geode cracking, gold panning; contact Darrell Harrison, 1808 Tisinger, Dallas, TX 75228; e-mail: bravo1bravo@sbcglobal.net; Web site: dallasgemandmineral.org

**29-30—MONTEREY, CALIFORNIA:** 53rd annual show; Carmel Valley Gem & Mineral Society; Monterey Fairgrounds, 2004 Fairgrounds Rd.; Sat. 10-6, Sun. 10-5; adults \$3.50, children free with adult; more than 50 displays, gems, minerals, fossils, guest and member collections, 15 dealers, jewelry, cut and uncut gemstones, beads, crystals, rough and polished rocks, mineral specimens, fossils, demonstrations, jewelry making, sphere making, rock grinding, polishing, silent auction, children's hands-on activities, spinning wheel, grab bags; contact Janis Rovetti, 1047 Roosevelt St., Monterey, CA 93940, (831) 372-1311; e-mail: janis12@sbcglobal.net; Web site: www.cvgms.com

**29-30—MURFREESBORO, ARKANSAS:** Annual show; Crater of Diamonds State Park; Diamond Discovery Center, 209 State Park Rd.; Sat. 9-4, Sun. 9-4; adults (13 and up) \$7, children (6-11) \$3, under 6 free; jewelry, rocks, fossils, minerals, gems, demonstrations, free rock, mineral and gem identification, search for diamonds; contact Marge Jenks, Crater of Diamonds State Park, 209 State Park Rd., Murfreesboro, AR 71958, (870) 285-3113; e-mail: margaret.jenks@arkansas.gov; Web site: www.craterofdiamondsstatepark.com

**29-30—OSHKOSH, WISCONSIN:** Annual show; Oshkosh Earth Science Club; Sunnyview Expo Center, 500 E. County Road Y; Sat. 9-5, Sun. 10-4; adults \$2, students \$1, children (under 12) free; more than 80 dealers, rocks, minerals, fossils, lapidary arts, jewelry, cut and uncut gemstones, beads, club sales, geodes, crystals, demonstrators, exhibits, kids' events; contact Ann Voges, PO Box 413, Oshkosh, WI 54902-0413, (920) 725-1640; e-mail: hankemps@milwpc.com; Web site: www.oesclub.org

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## The Health of the Hobby



**Clubs need younger hobbyists to take over holding federation offices and running meetings and shows as the hobby population ages.**

In mid-January, I spent some time in Quartzsite, Arizona. I think every rockhound has heard of Quartzsite. I've written about it several times in *Rock & Gem* and *Arizona Highways* magazines. It is a winter haven for countless rockhounds who arrive in their RVs, campers, trailers and tents and set up a home site for the winter months. Some of the folks arrive early in October, while others wait until after the first of the year. The cumulative effect of all these visitors, affectionately called "snowbirds" by the locals, is to swell the population around Quartzsite from a couple thousand residents to well over 60,000. An accurate head count is impossible, since people come and go, staying for weeks or months at a time.

There is a reason all these rockhounds and winter visitors end up in Quartzsite, as well as other Arizona destinations like Yuma and Apache Junction: They are all retired! And therein lies the root of the problem with our hobby.

As I sat at the *Rock & Gem* table in the Quartzsite Improvement Association (QIA) show, I came to the realization that our hobby is graying, and doing it rapidly. Out of a crowd numbering in the thousands at Quartzsite, only a small fraction of attendees appeared to be young. Almost everyone who came through the door, including the dealers, were elderly. There were more walkers and oxygen bottles than there were young folks! I'll admit this was not a scientific sampling of our hobby's members, but it sure gave me cause to ponder. When I go on field trips and attend shows around the country, I see plenty of young folks eagerly collecting and buying minerals, jewelry, lapidary materials, and equipment. But they are inevitably outnumbered by older folks.

At the annual Tucson Gem & Mineral Show™, the ratio of young, working people to retirees is more even. But that show caters to the local Tucson population, as well as mineral collectors. The majority of dealers at the show offer jewelry, gems, artwork, and a broad range of other goods. Mineral

dealers at that show are less than half the total of dealers. All in all, my observations do suggest our hobby is graying and shrinking. And I'm not the only one who has raised the question, "Is our hobby a dying hobby?" Even the federations have recognized the problem and have instituted programs to combat the situation. Some clubs spend a lot of time working with school districts and invite teachers and their classes to take field trips to their shows. The Tucson club hosts upwards of 5,000 students during its February show. The Turlock, California, show does almost as well.

On the plus side of the equation, plenty of clubs are still going strong: their membership is growing, field trips are well attended, and club shows are well staffed. Such clubs enjoy good attendance at meetings. But all too often, with small clubs in particular, as older folks die off or are no longer able to drive at night, attendance at club meetings drops. Folks who were once anxious to hold office, run meetings, seek out field trip sites, and serve on a show committee are wearing out, have developed debilitating illnesses, or are off on that big field trip in the sky!

There are several reasons our hobby has lost its vigor. Surely, the number of young folks coming into the hobby is nowhere near what it was back in the 1950s and '60s, when club membership swelled dramatically. As the number of young folks tails off in clubs, so does the energy level. But why aren't the youngsters eager to join our hobby?

In part, I blame schools! Back when I was teaching in a school district with a dozen elementary schools, several of the science teachers were actively teaching earth science. In fact, when I offered adult educa-

tion classes in the earth sciences, district teachers were eager to join. The teachers and students in my classes represented all grade levels, from first grade through high school.

One thing I always tried to supply was teaching materials for each grade level because the materials chosen by the school

district and the state lacked emphasis on earth science. In talking with teachers from other districts and states, I find this lack of emphasis to be widespread. Yet, I think you'll agree that small children are fascinated by rocks, shells and minerals. Kids have a natural collecting instinct and a great curiosity for the world around them. Why don't school districts take advantage of that natural interest and incorporate appropriate materials on earth sciences beginning in Kindergarten or first grade? The educational system has failed miserably in capitalizing on children's natural interests! Few realize you can actually teach most subjects through earth science: geography, math, history, even exploration. Did you know that virtually every group of settlers that arrived in the New World had one or more geologists or other persons who were knowledgeable about minerals in the company? Imagine approaching the colonization question through that facet!

There is another reason our hobby is slowing down. If you collected rocks beginning in the 1950s, you are sure to recall the vast variety and quantity of minerals on the market. Mines in Namibia, Brazil and Mexico, and even some mines in America, were disgorging minerals at an enormous rate. Brazil's pegmatites were in full mining mode. Many dealers would have small trays of celestine, topaz, pyrite, quartz, and other crystals that had been collected very easily.

Tsumeb, Namibia, was an amazing source of specimens during those decades. At any major show, you could pick from flats of diopside, cerussite, calcite and wulfenite specimens, and a host of less common species, in reasonable



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.

## Volume v Velocity

Since I grew up in eastern Iowa, the article Devonian Fossil Gorge in the May issue had special significance. As a boy, I would take frequent fishing trips to Coralville Dam and fish the downstream side. Both the upstream and downstream sides of the dam are armored with fossiliferous Devonian limestone. If the fishing proved slow, I would walk the slopes of the dam looking for fossils. This exposure to fossil collecting may have had an impact on me becoming a full time geologist later in life.

I would like, however, to point out an error in the first paragraph of the article. The author states that flood water was moving "at a rate that reached the speed of 17,000 feet per second". What she meant to say was that "peak discharge was running at 17,000 cubic feet per second", referring to the volume of water discharging over the emergency spillway and not the velocity of the flow.

—S. Pearson, CPG  
Santa Fe, NM

## Polish Problem

I've reached the point of desperation on a new problem. I've been faceting for 15 years and, except on corundum, I've always used a cerium oxide or aluminum oxide Ultralap™ on Lucite. I've never had a problem. I stopped faceting for about five months. When I restarted, the polishing step was adding minor to major scratches. I'd get a polished surface, but with very obvious scratches. It has been this way with every stone: cerium oxide with amethyst and beryl and aluminum oxide with tourmaline and garnet. I tried distilled water. I tried surfactant in the water. Previously, I would use moderate pressure to polish. Now that technique leaves scratches. If I use fast, very gentle pressure on small facets, I'm OK. The more pressure, the deeper the scratches. Larger facets, particularly the table, are a problem. Something has changed, but I'm at a total loss as to what.

—Ken Fersch  
via e-mail

It sounds like something could be contaminated. I would begin by cleaning everything. Then I would replace the Ultralap and try a new one. If that one scratches, I'd replace the bag of them, as they may have some sort of defect. Make sure you are pre-polishing to a 1200 lap. I generally use 260 or 360 for roughing, 600 for fine cutting, and 1200 for pre-polish.

Sometimes, I will use a BATT™ lap with either 3,000 or 8,000 diamond powder and oil for pre-polish in place of the 1200 lap. There is no reason an Ultralap shouldn't polish your stone after that. Sometimes, I've used 100,000 diamond and oil on an Ultralap for harder materials. I have also added a slurry of oxide to an Ultralap with a brush when polishing. If you try all this and are still having trouble, contact a faceter from a local club and ask them to help you.

—Jim Perkins  
Off the Dop columnist

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[www.cachecreekcabins.com](http://www.cachecreekcabins.com)

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Girdwood, AK 99587  
[www.akmining.com/mine/crow.htm](http://www.akmining.com/mine/crow.htm)

### Chicken Gold Camp & Outpost

Box 70  
Chicken, AK 99732  
[www.chickengold.com](http://www.chickengold.com)

### Ganes Creek Gold

c/o Alaska Mining & Diving Supply  
3222 Commercial Dr.  
Anchorage, AK 99501  
[www.akmining.com/ganes.htm](http://www.akmining.com/ganes.htm)

### Alaska Gold Expedition

Gold Prospectors Association of America  
[www.goldprospectors.org/Events/Alaska/tabid/59/Default.aspx](http://www.goldprospectors.org/Events/Alaska/tabid/59/Default.aspx)

### Hilltop Campground Lynx Campground Lynx Creek Gold Pan Day Use Area

Prescott National Forest  
344 S. Cortez St.  
Prescott, AZ 86303  
[www.fs.usda.gov/recarea/prescott/recreation/rocks-minerals/recarea/?recid=67183&actid=59](http://www.fs.usda.gov/recarea/prescott/recreation/rocks-minerals/recarea/?recid=67183&actid=59)

### Auburn State Recreational Area

501 El Dorado St.  
Auburn, CA 95603  
[www.parks.ca.gov/?page\\_id=502](http://www.parks.ca.gov/?page_id=502)

### Gold Prospecting Adventures, LLC

18170 Main St./P.O. Box 1040  
Jamestown, CA 95327-1040  
[www.goldprospecting.com/index2.html](http://www.goldprospecting.com/index2.html)

### Jamestown Gold Panning

17712 Harvard Mine Rd.  
Jamestown, CA 95327  
[www.jamestowngoldpanning.com](http://www.jamestowngoldpanning.com)

### Joshua Vick's California Gold

Jamestown, CA

[www.goldfun.com](http://www.goldfun.com)

### Roaring Camp Gold

P.O. Box 278  
Pine Grove, CA 95665  
<http://roaringcampgold.com>

### Phoenix Gold Mine

P.O. Box 3236  
Idaho Springs, CO 80452  
[www.phoenixgoldmine.com/justpanning.html](http://www.phoenixgoldmine.com/justpanning.html)

### Alta Ranch

9203 West Fork Rd.  
Darby, MT 59829  
[http://alta-ranch.com/Gold\\_Panning.html](http://alta-ranch.com/Gold_Panning.html)

### Libby Creek Recreational Gold Panning Area

Kootenai National Forest  
506 U.S. Highway 2 West  
Libby, MT 59923  
[www.libbymt.com/areaattractions/libbycreekgold.htm](http://www.libbymt.com/areaattractions/libbycreekgold.htm)

### Reed Gold Mine

9621 Reed Mine Rd.  
Midland, NC 28107  
[www.nchistoricsites.org/reed/reed.htm](http://www.nchistoricsites.org/reed/reed.htm)

### Vein Mountain Gold Camp

1694 Polly Spout Rd.  
Marion, NC 28752  
[www.veinmountaingoldcamp.com](http://www.veinmountaingoldcamp.com)

### Cow Creek Recreation Area

Roseburg, OR  
[www.ohranger.com/cow-creek-rec-area](http://www.ohranger.com/cow-creek-rec-area)

### Rogue River Gold Panning

Oregon State Office, BLM  
333 S.W. 1st Ave.  
Portland, OR 97204  
[www.blm.gov/or/resources/recreation/rogue/gold-panning.php](http://www.blm.gov/or/resources/recreation/rogue/gold-panning.php)



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