

Bulletin of the Mineralogical Society of Southern California

Volume 76 Number 10

October 2006

The 824th Meeting of The Mineralogical Society of Southern California

"Seeking Prehnite, Epidote and Garnet in Mali"

by Rock Currier

Friday, October 13, 2006, at 7:30 p.m.

**Geology Department, E-Building, Room 220
Pasadena City College
1570 E. Colorado Blvd., Pasadena**

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Rock Currier Presents Mali Mineral Adventures

On Friday, October 13, 2006, at 7:30 p.m. Rock Currier will talk about his recent trip to the Kayes region of Mali where he and his friend Demetrius Pohl visited the area where they are currently producing the prehnite, epidote and garnet specimens that have recently been seen on the market.

In 1994 gem quality garnets were discovered, and there was a rush of "miners" to the region all hoping to make their fortunes. The initial discoveries were alluvial deposits in the Kayes region near the villages of Kadina, Guedigie and Douale. Soon many other sites were discovered and bedrock deposits were exploited. Three thousand people extracted more than 15 tons of garnet, most of it in large, intergrown, yellow-green and brown intergrown crystals from Kembele and Madina. Most of the garnets were hammered down to pea gravel sizes by miners looking for gem rough. This material is still being broken down in Bamako but is no longer being mined. The emphasis has now changed to mining prehnite for the East Asian bead and carving market in China and Thailand. While mining for lapidary grade prehnite good specimens of prehnite and epidote have also been found.

Always a popular and knowledgeable speaker, Rock Currier is the legendary proprietor of Jewel Tunnel Imports, a wholesale mineral business famous for importing specimens from all corners of the globe.

Special November 17th Meeting and Field Trip Combination via Jim Imai

The November meeting will be held on the third Friday of the month, the 17th, to accommodate PCC's holiday schedule. The speaker will be Howard Brown, geologist for Omya, Inc. His talk will be "Geology, Mining and Fluorescent Minerals at the White Knob Limestone Quarry, Lucerne Valley CA. On Saturday, November 18, Mr. Brown will be the MSSC's host for a field trip to the quarry.

October Board Meeting

There will be a short MSSC Board meeting immediately after the regular meeting on Friday, October 13. All board members should attend and all members are welcome to participate.

Minutes of the September 8, 2006 Meeting

The 823rd meeting of the Mineralogical Society of Southern California was held on Friday, September 8, 2006 at Pasadena City College. President Ilia Lyles brought the meeting to order at 7:30 p.m.

She then introduced the speaker of the evening, Dr. Alan Rubin, who gave a presentation entitled: "Meteorites and Asteroids." Dr. Rubin, who earned his Ph.D. in Geology and is currently a Research Geochemist at UCLA, has been a prolific author of both peer-reviewed scientific papers on meteorite mineralogy and

petrology, and popular articles on space science.

Dr. Rubin began his presentation by clarifying the respective definitions of meteors, meteorites, asteroids and comets. He then proceeded to discuss historic information regarding such space rocks, the links between meteorites and asteroids, the classification of meteorite groups, asteroid structure (the high porosity, low density "rubble pile") and potential mitigation of the asteroid threat. In response to enthusiastic questions, Dr. Rubin provided the various bases upon which scientists were able to determine the different sources of space bodies.

President Lyles announced that board candidates were needed and that interested members should contact her.

At show and tell, Shou-Lin Lee displayed greenish crystals which were identified by MSSC members as quartz. Fred and Linda Elsnau presented a large specimen of millerite. Geoff Caplette brought a specimen from pegmatite near the Fano Mine; its identity remains unknown. The door prize was won by Geoff Caplette. President Lyles brought the meeting to a close at 9:00 p.m.

Respectfully submitted,
Pat and Geoff Caplette

**Pacific Micromount Conference
Call for Specimens**

by Walt Margerum

The 42nd Pacific Micromount Conference will be held January 26-28, 2007 at the San Bernardino County Museum, 2024 Orange Tree Lane, Redlands CA. As part of this Conference we will hold two auctions, a verbal auction of fine micro's and a silent auction. Sugar White has again volunteered to photograph the specimens for the verbal auction. If you have any fine specimens to donate please send them to Sugar White at 7686 W. Copper Nugget Dr., Tucson, AZ 85735. Specimens for the silent auction can be brought to the Conference or sent to me at 14892 Sutro Ave. Gardena, CA 90249. The schedule for the Conference as well as the pre-registration form will be in the November Bulletin.

This is the first year for the MSSC to run this event, and the support of all the membership is needed to make it a success. Especially needed is someone to volunteer as chair. Much of the work has been done, and what is left is mainly coordination. We have volunteers for all of the other positions. Please someone help us out!

\$

Dues Notice

By Walt Margerum

If you will owe dues for 2007 you will receive a notice in the mail during October.
Your prompt remittance will be appreciated.

\$

MSSC Banquet

Save the Date! The MSSC Annual Banquet will be held on Saturday evening, January 20, 2007. Janet Gordon is looking for a special speaker for the event and would welcome your suggestions!

Basic Concepts about Ore Deposits (That Every Mineral Collector Should Know) Part 2

by Janet Gordon

Last month's article introduced this topic and outlined five categories of ore deposits to be discussed. A discussion of the first category, magmatic deposits, followed. This installment begins with the second category, hydrothermal deposits.

2. Hydrothermal deposits:

In hydrothermal deposits, ores have been concentration by the activity of hot aqueous solutions. In a way these are the first cousins of magmatic deposits, because buried bodies of magma usually heat the water, and a portion of the water may have been derived from the magma itself. Some hydrothermal deposits lack an obvious connection with a magmatic body, but they will not be included here in our simplified discussion.

First a word about typical hydrothermal solutions: Think of a smelly hot spring as a hydrothermal solution that has reached the surface. Most hydrothermal solutions are hot aqueous brines with considerable salt. Metals such as gold, copper, iron, lead, zinc, arsenic, and molybdenum travel within the brine as complex molecules, such as $(\text{ZnCl}_4)^{-2}$. As the solution cools, the individual metals precipitate out at different temperatures often making a chemically zoned deposit.

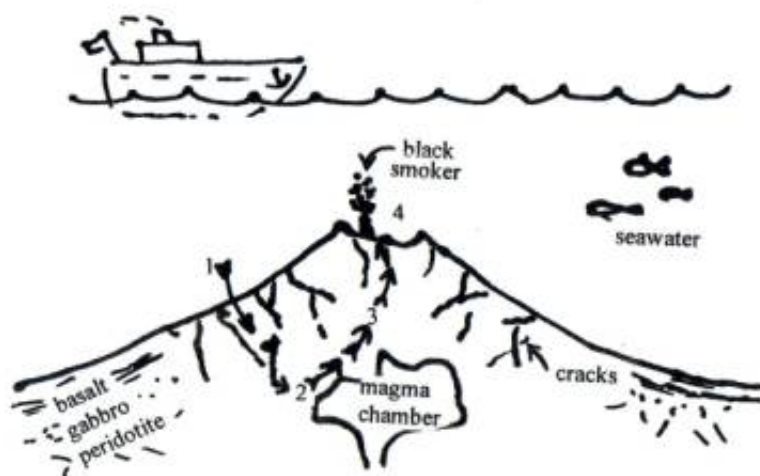
Two important examples of the many varieties of hydrothermal deposits are (a) volcanogenic massive sulfide deposits and (b) copper porphyry deposits. They illustrate how initially dispersed metals become concentrated.

a. Volcanogenic massive sulfide deposits:

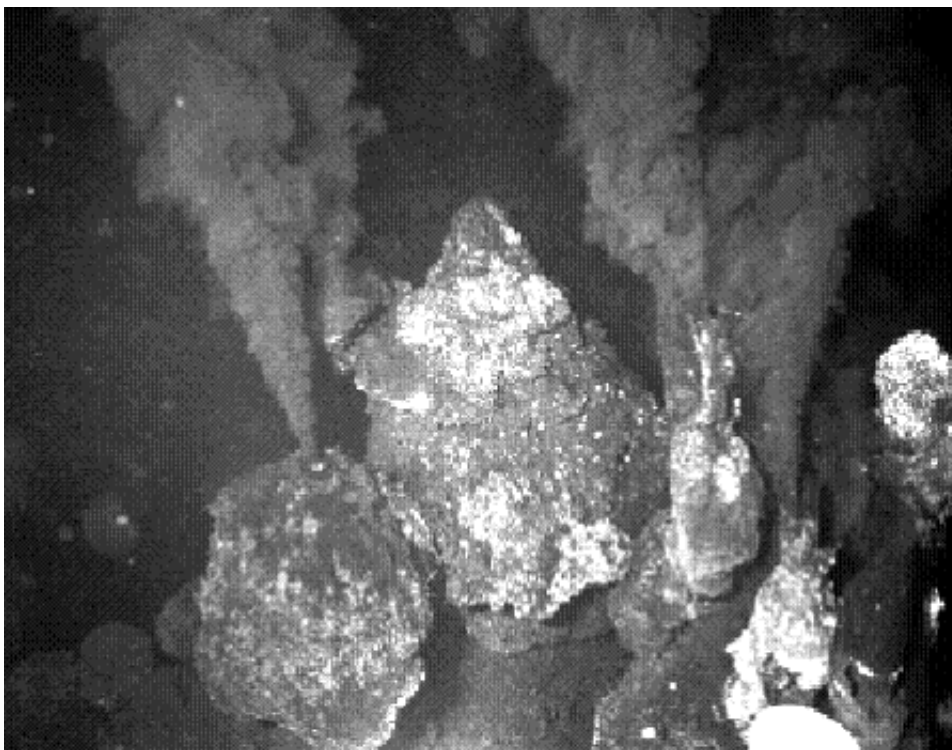
Despite the cumbersome name, it simply translates to large deposits of sulfide minerals that are related to volcanic activity. One of the most extensive belts of volcanic activity is the Earth's ocean ridge system. Exploration of the sea floor along the ridges revealed that hot springs now popularly called "black smokers" occur at numerous locations. These are related to the volcanic activity, and the black "smoke" is actually fine-grained crystals of sulfide minerals., which through time cover the seafloor.

Mid-ocean ridges are the locus of the Earth's divergent tectonic plate boundaries. As the plates move apart, the space is continuously filled with hot rising material from the mantle that melts to produce magma chambers and feed lava flows. The magma crystallizes to become the basalt and gabbro layers of the oceanic crust. With the exception of iron, which is abundant, the metals of economic interest are present in parts per million concentrations in these rocks. Consider the cartoon below to illustrate how the dispersed metals are concentrated by circulating hot water.

First seawater circulates into fractures in the ocean crust (1). At depth (2) it encounters rocks heated by the nearby magma chamber and the seawater becomes a hot corrosive brine. As the heated seawater continues to circulate (3) it leaches metals (usually iron, copper, zinc, lead, and traces of others) from the rocks. Returning to the surface (4) with temperatures as hot as 350(C, it interacts with cold (about 2(C) seawater to cause the precipitation of sulfide minerals such as pyrite, chalcopyrite, sphalerite, and galena. Sulfur for this reaction is available in the seawater although some could have been leached out of the rocks with the metals. The "smoke" of sulfide crystals settles out on the seafloor and if the process continues long enough a massive deposit is produced.



Cartoon cross section of a mid-ocean ridge with a hydrothermal system that could produce a volcanogenic massive sulfide deposit.
Drawing is not to scale. See text for discussion.



"Black smokers" spewing out sulfide minerals that will accumulate on the sea floor.

USGS photo.

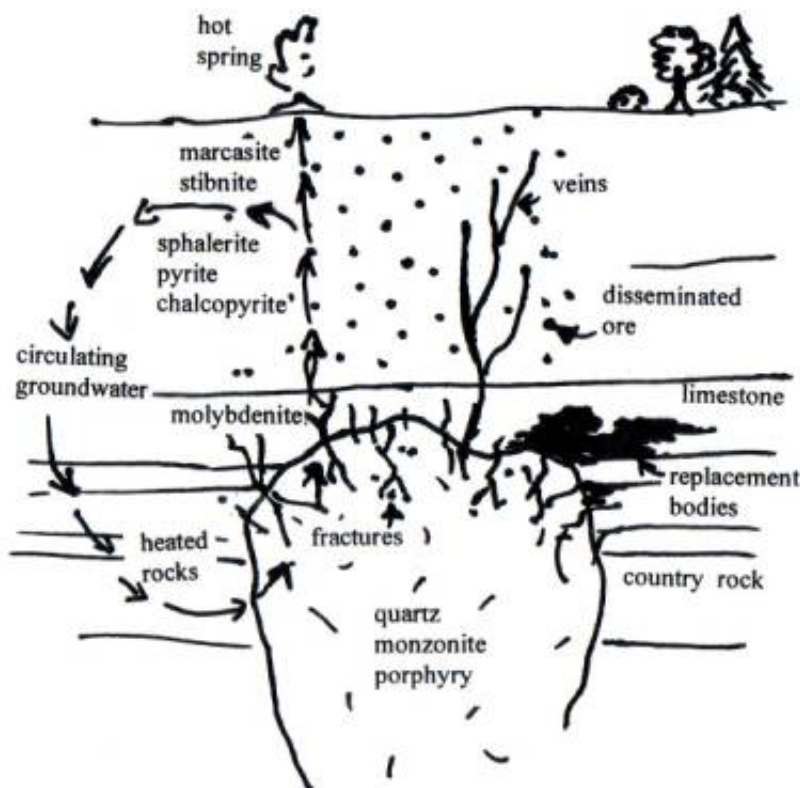
Although some massive sulfide deposits are produced by variations on this theme, the mid-ocean ridge model fits many of them. The fabled copper deposits on the island of Cyprus were produced by "black smokers," and the chimneys that channeled the metal-rich solutions to the surface have been recognized in the mines. Closer to home, the copper deposit at Jerome, Arizona, is also a good example of a mid-ocean ridge deposit. At one time a section of "black smoker" chimney was on display at the local museum, and it may still be there.

b. Copper porphyry deposits:

Mineral collectors are familiar with copper porphyry deposits with names like Bisbee and Ajo, in Arizona and Bingham Canyon, Utah. As the name implies, these deposits are principally mined for copper, but many of them contain significant amounts of molybdenum, plus incidental concentrations of silver and gold. The "porphyry" part of the term needs a little explanation. It refers to the distinctive texture of the intrusive igneous bodies associated with the deposits. In these plutons, a population of large feldspar crystals is set in a background of smaller feldspar and quartz crystals. This arrangement is known as porphyritic texture, and rock bodies that display it are often simply called porphyries. Compositionally, the plutons are usually quartz monzonite, which is similar to granite but with less quartz.

The whole process gets underway when columns of quartz monzonite magma rise and freeze at shallow depths within the crust. In doing so it provides the heat and

some of the metals to form the ore deposit. As in the formation of pegmatites (discussed in last month's first installment of this article), water-rich magma rises to the top of the pluton as quartz and feldspar crystals grow, and metals that were formally dispersed in the magma as trace elements become concentrated in the water-rich portion. These include copper, molybdenum, iron, zinc, silver, gold, arsenic, and lead. Sulfur for making sulfide minerals with these metals is concentrated at the same time.



Cartoon cross section of a copper porphyry deposit system.
Drawing is not to scale. See text for discussion.

When the pluton is nearly completely crystallized, water can separate from the magma entirely. As it does so it takes the desired metals with it, thereby producing a hydrothermal ore solution. Things can then get more exciting at shallow crustal levels if the water explodes into steam and cracks the carapace of the pluton and surrounding country rock. The hot solution can travel through the fractures into the overlying rock leaving a series of sulfide minerals as it encounters progressively cooler rock. As shown in the cartoon below, molybdenite precipitates out in the warmer rocks nearest the pluton, sphalerite, pyrite, and chalcopyrite are concentrated at an intermediate distance, and stibnite and marcasite don't make an appearance until the hydrothermal solution has reached even cooler rocks. Depending on the paths the solution takes, the ore may be distributed as disseminated flakes, in veins, or as large replacement bodies.

At this stage there may not be a sufficient concentration of ore minerals to make an

economic deposit, but there is more going on that can further enrich the deposit. The shallow pluton heats the groundwater in the surrounding country rock, and it begins to circulate. Metals can then be leached out of large volumes of country rock in a manner similar to that described in the previous discussion of volcanogenic massive sulfide deposits. These metals are redeposited in a smaller volume above the pluton with potential for greatly enhancing the ore concentration. If the circulating water reaches the surface, hot springs form.

So what about all the azurite, malachite, and other favorite non-sulfide minerals from famous copper porphyry deposits? They are the product of yet another process that takes place late in the evolution of many ore deposits, not just copper porphyries. Please wait for the next installment which will include a look at secondary enrichment processes.

Mineral Locality Symposium Mines & Minerals Near Joshua Tree National Park

October 28 and 29, 2006

Sponsored by Friends of Mineralogy (Southern California Chapter) & Copper Mountain College

\$5.00, Saturday Lectures & Field Trip
\$5.00, Sunday Field Trip

Copper Mountain Community College
6162 Rotary Way
Joshua Tree, CA 92252
CMC Tel: 760.366.3791 x0266 (Bruce Bridenbecker)
Cell contact if lost: 619.244.0757 (Doug Peeler)

Take Interstate 10 past Whitewater to Highway 62, then northeast approximately 35 miles on Hwy 62 to the Town of Joshua Tree. East of Joshua Tree on Highway 62 is Sunfair Road. Continue two miles to Rotary Way, Turn North (Left).

Turn left at 6162 Rotary Way, which intersects with the Highway 62 and is about seven minutes east of the town of Joshua Tree. Follow the signs to: Room CMC 5, Phase 1 (upper level)

Saturday Symposium & Field Trip

9:00 AM Registration for Symposium and Field Trip
Coffee and snacks available

9:45 Welcome, Bob Reynolds, President, SCFM

9:50 History of Copper Mountain College and staff personal interests, Dr. Bruce Bridenbecker

10:00 Regional Geology and Ore Body Emplacement of the Joshua Tree Area Mineral Deposits by Bruce Bridenbecker, Professor of Earth & Physical Science, Copper Mountain College

11:00 Southern California Volcanism by Molly McCanta, Professor of Geology, Pomona College

12:00 - 1:00 PM Lunch Break (Tables Available)

Lunch Meeting SCFM

1:00 Origin of Spheroidal Granitic Landforms at Joshua Tree by Robert E. Reynolds, LSA Associates, Inc.

2:00 Fieldtrip Introduction: Mining History and Localities in the Dale District by Jim Worff, Mining Consultant

3:00 Silent Mineral Auction, Please bring mineral specimens for auction.

3:30 Afternoon fieldtrip led by Bruce Bridenbecker to the porphyritic granites and pegmatites at Rattlesnake Canyon/Indian Cove Camp Ground.

Sunday Field Trip Information

9:00 a.m. Meet at the ranger station at Joshua Tree National Park north gate and consolidate into 4WD vehicles.

9:30 a.m. Head down Gold Crown Road to the Gold Crown Mine

Lunch in the field. Work our way back toward the Park

12:30 p.m. Arrive at the Virginia Dale Mine.

3:30 p.m. Leave for home. The Virginia Dale Mine is situated close to the Park access road so people who want to leave early will find it easy to get back into the Park and leave for home.

Please note: None of these mines is accessible without 4WD. Please arrange car pooling in advance by calling or emailing Doug or Jennifer stating "Need Ride" or "Have Room." There will be a \$15 per car NPS entrance fee per vehicle for this field trip.

2006 Calendar of Events

October 1, Fallbrook, Fallbrook Gem & Mineral Society, 123 W. Alva (FGMS)

Headquarters), "Fall Festival of Gems" Hours: 10-4, www.fgms.org, Janice Bricker (760) 728-1333.

October 7-8, Lakeside, El Cajon Valley Gem & Mineral Society, Lakeside Rodeo Grounds, 12584 Maplevue, Hours: 10-5 both days, David Newton (619) 390-5054.

October 14-15, Grass Valley, Nevada Co. Gem & Mineral Society "Earth's Treasures," Nevada Co. Fair Grounds, 11228 McCourtney Rd., Hours: 10-4 both days. Cliff Swsenson, 530-272-3752.

October 14-15, Trona, Seales Lake Gem & Mineral Society "Gem-O-Rama" Searles Lake Gem & Mineral, 13337 Main St., Hours: Sat. 7:30-5, Sun. 7:30-4. Bonnie Fairchild 760-372-5356, jbfairchild@verizon.net. Field trips: Mud Trip on Sat. at 9 a.m.; Blow Hole on Sat. at 2:30 p.m., Pink Halite on Sun. at 9 a.m. Additional community events and food available. More information at www1.iwvisp.com/tronagemclub/.

October 14, West Hills, Woodland Hills Rock Chippers, 8th Annual Gem & Mineral Show, 22700 Sherman Way, Hours: 10-5, Virginia Rotramel (818) 790-7598, Show@rockchippers.org.

October 21-22, Anderson, Shasta Gem & Mineral Society, Shasta District Fairgrounds, Hours : Sat. 10-5, Sun. 10-4, Alex Stoltz 530-474-4400.

October 21-22, Placerville, El Dorado Mineral & Gem Society, El Dorado Co. Fairgrounds, 100 Placerville Dr., Hours: 10-5 daily, Jackie Cerrato (530) 677-2975, jacobcer@directcon.net, www.rockandgemshow.org.

October 21-22 Whittier, Whittier Gem & Mineral Society, Whittier Community Center, 7630 Washington Ave., Hours 10-5 both days. Jay Valle (626) 934-9764, res19pnb@verizon.net.

October 27-28, Northridge, Del Air Rockhounds Gemboree, United Methodist Church, 9650 Reseda Blvd. (at Superior St.), Hours: Friday 3 pm-9:30 pm, Sat. 10-5, Bim Wendler (818) 993-0119, del_air_rockhounds@yahoo.com.

October 28-29, Stockton, Stockton Lapidary & Mineral Club, San Joaquin Co. Fairgrounds, 1658 Airport Way, Hours: Sat. 10-5, Sun. 10-4, Mary Anne Mital (760) 758-4599.

October 28-29, Vista, Vista Gem & Mineral Society, Brengle Terrace Recreation Center, 1200 Vale Terrace, Hours: Sat. 10-5, Sun. 10-4, Mary Anne Mital 760-758-4599.

November 4-5 Lancaster, Palmdale Gem & Mineral Club, "Rock n Gem Roundup," Antelope Valley Fairgrounds, 2551 West Ave. H, Hours 9-5 both days, Susan Walblom 661-943-1861.

November 4-5 Ridgecrest, Indian Wells Gem & Minerals Society, Desert Empire Fairgrounds, Call (760) 375-8000 for RV parking, 520 S. Richmond Rd., Hours: 9-5 both days, John De Rosa (760) 375-7905.

November 4-5, San Diego, San Diego Mineral & Gem Society, Al Bhar Shrine Center (behind Hampton Inn) 5440 Kearny Mesa Rd., Hours: St. 9:30-5, Sun. 10-4.

November 10-12, Costa Mesa, West Coast Gem & Mineral Show, Holiday Inn, 3131 S, Bristol St., Hours: Fri & Sat. 10-6, Sun. 10-5. www.mzexpos.com.

November 11-12 Anaheim, American Opal Society, Clarion Hotel Anaheim Resort, 616 Convention Way, Hours: Sat. 10-6, Sun. 10-5, website: opalsociety.org, Jim Lambert (714) 891-7171, jlamb777@yahoo.com.

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Contact: Bill Besse (wbesse@altrionet.com, 626.359.4488) or Walt Margerum (wmargerum@earthlink.net, 310.324.1976).



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