RECOVERY OF THE 17 TON COPPER BOLU- 
DER FROM LAKE SUPERIOR, by Bob Bar-
ron, Department of Geological and Mining 
Engineering and Sciences, Michigan Tech Uni-
v.

The Twenty-Third Annual New Mexico Min-
eral Symposium was held November 9 and 10, 
2002, at New Mexico Institute of Mining and 
Technology, Socorro. Following are abstracts 
from all talks given at the symposium.

For well over a century, the Keweenaw Peninsu-
la has served as a home to a multi-billion-dollar 
copper industry. The roots of mining go back 
several thousand years when Native Americans 
first discovered the nearly pure copper and sil-
ver deposited in fissure veins cutting across the 
Keweenaw Peninsula. Along the sparsely vege-
tated shores of Lake Superior and inland lakes 
of the post-glacial period, the Native Americans 
mined the red metal for possibly 10,000 yrs. The 
malleable copper was easily shaped into tools 
and other valued implements and was traded 
across North America and perhaps beyond. 

As an avid scuba diver and mineral collector 
for over 25 yrs, I was drawn to Lake Superior 
because mineral collecting for fine specimens 
on the Keweenaw was becoming an activity of the 
past. With the closing of many old mines and 
the crushing of rock piles, it was becoming 
exceedingly difficult to obtain high-quality 
specimens. I was spending countless hours sift-
ning through old geology maps of the Keweenaw 
and studying the copper-bearing series along its 
length when one day it struck me—why not fol-
low the fissure veins into Lake Superior and see 
where they cross the offshore shallow reefs? So 
in the summer of 1991, I concentrated my efforts 
on a large reef between the old seaports of Eagle 
River and Eagle Harbor and realized within a 
short period of time it was well worth the effort.

During July of 1991, I discovered the largest 
piece of fissure vein copper, 30 ft offshore of 
Great Sand Bay just northeast of Eagle River, 
Michigan. It measures 19 ft long, 8 ft wide, and 
weighs approximately 17 tons. Salvage permits 
had to be obtained from the Michigan Depart-
ment of Natural Resources and the U.S. Army 
Corps of Engineers before the recovery project 
could begin. We had two nylon straps specially 
made to support the copper and to prevent 
damage to the natural color during the lift. A 
single 20-ton hydraulic jack was used to lift the 
copper high enough to slide the straps under-
neath. Then the U.S. Army Corps of Engineers’ 
barge and crane were used to lift the boulder from 
where it had been resting for thousands of 
years.

The state-owned boulder now resides in the 
historic Quincy mine 1894 hoist house just north 
of Hancock, Michigan, and will be curated by 
the A. E. Seaman Mineral Museum. It is the 
largest piece of natural native metal ever recov-
ered from a body of water and resides on prob-
ably the largest hydraulic mineral display stand 
in the world! Hopefully, its final destination will 
be in the main foyer of the new museum to be 
located in the blacksmith and machine shops of 
the Quincy mine complex, which is slated to 
brake ground in 2005.

HEMATITE COLLECTING IN THE IRON 
HILL DISTRICT, SOUTHWESTERN ROBLE-
DO MOUNTAINS, DONA ANA COUN-
TY, NEW MEXICO, by Robert D. Beard, 6259 
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The geology of the district was summarized 
by Dunham (1935). Hematite is present in dark-
red botryoidal masses with radiating fibers and 
minor quartz and gypsum. Many of the botry-
oidal masses are aggregates of rough spheres of 
hematite that have grown together and often 
resemble bunches of small grapes. The rough 
spheres range in size from less than a millimeter 
to a few centimeters. The botryoidal character is 
similar to that of manganese oxide deposits near 
Socorro and Deming, but no significant man-
ganese mineralization is apparent in the Iron 
Hill district.

The hematite bodies replace sections of Penn-
sylvanian limestone of the Magdalena series, 
which dip to the southeast approximately 20°. 
The orebodies are lenticular and appear to be 
related to fissure zones that cut across the bed-
lime of the limestone in various directions. Six-
ten bodies of hematite have been opened up, 
and many other outcrops have not been 
explored. The dimension of the bodies varies, 
from small masses to large bodies as much as 
200 ft long, 120 ft wide, and of unknown vertical 
extent. Dunham indicated that a moderate 
resource of iron was available, but the remote-
ness of the deposits and their distance to mar-
kets made them uneconomic to mine.

Index map showing the locations referred to in the abstracts.
The deposits are reported to be mineralogically similar to the hematite deposits of West Cumberland and Iron Hill. Two iron-rich limestones are known for “knight ore” hematite. Like these deposits in England, the Iron Hill district formed in Carboniferous limestones that were formerly overlain by a great thickness of “red bed” deposits. The red beds may have provided hematite cement that leached and subsequently precipitated into the underlying limestones. The deposits are easily spotted on the hillsides because the dumps are a distinct dark red against the outcrops of light-gray limestone.

**Reference**


**MINES AND MINERALS OF SOCORRO PEAK, NEW MEXICO**, by Ransom S. DeMark, 8240 Eddy Avenue, N.E., Albuquerque, N.M. 87109 (Location 6 on the index map)

The Socorro Peak mining district is quite today, but 120 yrs ago it was a different story. The town of Socorro, also known then as the “Gem City” was alive with mining and smelting activity, and there was great hope for a bright future (Silver City Southwest Sentinel, 1889). During the early 1880s as many as 150 oxen and mule teams were busy haul ing lead and silver ores from the Magdalena district (Kelly, Graphic, and other mines west of Socorro; Eveleth, 1893). They pushed through Blue Canyon on the south side of Socorro Peak (“M” Mountain) to the busy smelters of Gustav Billing in Park City, 2 mi west of Socorro. The ores from the Socorro Peak district also added to the activity. The Socorro Chieftain (1896) cites that “768,410 oz of silver came from Socorro Mountain mines: one half from Torrance and the rest from Merritt, Silver Bar, and New Find.” Enthusiasm was riding high during this time. The Socorro Tunnel Mining Company of New Mexico prospectus (Robinson, 1881) wrote “immense” on many occasions to describe the orebody and cites the “extensive deposits of auriferous rock that occurs.” With regard to the mines on Socorro Peak, the Socorro Chieftain also writes: “It is a well known fact that these claims are permeated with an inexhaustible supply of silver in a chloride form.” This is not exactly true because in 1904, Fayette Jones reported: “This once prominent smelting plant is now practically deserted and ended with the dying fires of its stacks, the life of the Socorro district passed out.”

Today we can still see the dumps of the mine shafts and the tunnels that fired the dreams of the early prospectors, miners, and residents of Socorro. On the east face of Socorro Peak they remain a silent testimony to the activity that once dominated the area. Much of the production history of these mines has been lost, and little of the mineralogy has been documented. In Rocks and Minerals magazine geologist and mineral collector Will Moats offers the most comprehensive information on the minerals of Socorro Peak (Moats, 1991).

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These days the mines of Socorro Peak beckon to the mineral collector, but access to the mines is only possible through the approval of the Energetic Materials Research Test Center (EMRTC), an affiliate of the New Mexico Institute of Mining and Technology. With the approval of EMRTC, I was able to visit the following Socorro Peak mines in preparation for this presentation: May Flower, Socorro (Woodss) Tunnel, Silver Bar, Dewey Load, Merritt, Torrance, and the Main Tunnel. In most cases, hazardous underground conditions, vertical shafts, and collapsed drifts prevent underground inspection and collecting, but the mine dumps can produce most, if not all, of the minerals of interest to the collection. Minerals collected during this investigation include: motttramite, mimetite, vanadinite, wulfenite, willemite, hemimorphite, bromargyrite/chlorargyrite, barite, malachite, cerussite, chrysocolla, calcite, quartz, and gypsum. Caledonite, deslozite, and linitare (Moats, 1991) and argentite/acanthite and fluorite (Lasky, 1932) have been reported but were not observed.

**Acknowledgments**

I would like to thank EMRTC director, Dr. John Meason, and associate director of administration and support, Mr. Rudy Correa, for granting permission to visit and collect at the Socorro Peak mines. I would also like to thank EMRTC engineer and raconteur, Mr. Alain Perryman, for his helpful assistance and for his company while visiting the mines.

**References**


Chieftain, Newspaper, February 12, 1892. Socorro, New Mexico.

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Chieftain, Newspaper, February 12, 1892. Socorro, New Mexico.

Jones, F. A., 1904, New Mexico mines and minerals; World’s Fair edition: Santa Fe, New Mexico Printing Company, 349 pp. plus biographical supplement.

that have produced significant amounts of turquoise in the past, two of which are still worked today. Turquoise is associated with Tertiary-age felsic igneous rocks, though at Leadville and Cripple Creek the productive turquoise veins are hosted by adjacent Precambrian granite. The turquoise occurs as near-surface supergene veins and veinlets, which are characteristically free of other normally common secondary copper minerals such as azurite, malachite, or chrysocolla.

The King turquoise mine is in Conejos County, in the San Luis Valley, about 9 mi east of Manassa and 19 mi west of the town of San Luis. The workings are in a hill composed of chalky, hydrothermally altered silicic volcanic rock, part of the Conejos Formation of Oligocene age. Turquoise was discovered here by Israel Per- voice King in 1890, but extensive Native Ameri- can workings already existed and tools made of stone and horn have been found here (Harvey and Harvey, 1938). The most extensive mining took place in the 1940s and included open cuts, inclines, and shafts. An 8.75-lb nugget was reported to have been recovered in 1941 (Pearl, 1951). The property is still worked sporadically by Bill King of Manassa, who markets silver jewelry set with the material. Polished turquoise from the mine is white, and colored blue when brown limonitic matrix in an attractive pattern, and sky-blue turquoise that tends to be more solid but does require some stabilization treatment (King, pers. comm. 2002).

The Hall turquoise mine is about 8 mi north- west of Villa Grove in Saguache County. It lies about 5 mi east of the Bonanza mining district and near the head of the Turquoise Gulch drainage. Said to have been developed first as a copper mine, turquoise production was report- ed by Kunz (1894), who described the workings as the Blue Gem and Manitou mine. The turquoise veinlets occur in a highly fractured and altered, light-colored silicic volcanic rock, near the edge of the Bonanza caldera. The visible mine workings consist of a pit (now partial- ly water filled) and open cuts. The mine is said to have also once included underground work- ings, though little information exists (19 that 4–5 tons per day of dump material was hand sorted daily to produce several pounds of turquoise, valued at $15–$45 a pound. Colorado Bureau of Mines records show that the most extensive produc- tion was during the mid-1950s. The patented mining claims are currently inactive and posted. Most of the turquoise reported from Cripple Creek has come from the Florence mine, located on the south side of Mineral Hill at the northern edge of town. Mining for turquoise was begun here by Wallace C. Burris in 1939 and continues today on a small scale. Turquoise occurs as residual weathered nuggets and as veins along fractures in moderately weathered Pikes Peak Granite at the northwest edge of the Cripple Creek volcanic center. Two slabs of pure turquoise, each weighing slightly over 6 lb, were recovered around 1987 by Burris’ son, Wallace F., who now works the property to produce sil- ver and turquoise. Contiguous workings slightly higher on Mineral Hill are operated by David and Harriet Graham (business name, The Bad Boys of Cripple Creek), who also mine, pol- ish, and sell the turquoise. Limonitic vein mate- rial in some of the Grahams’ turquoise is report- ed to contain flecks of native gold (Jones, 2001). The nearby Roanoke shaft is also known to have intersected turquoise veins.

The Turquoise Chief and nearby smaller mine workings are in Lake County, about a mile north of the center of Turquoise Lake. They are about 6 mi northwest of the Leadville mining district, and closer to (about 1 mi southeast of) the St. Kevin mining district. The Turquoise Chief mine is reported (Pearl, 1951) to have been initially worked by two Navajos in 1935, at which time a thousand pounds of turquoise is said to have been mined over a 2 yr period. Excavations apparently continued over the next half century, but little has been published about the deposits or the mining history. The present workings consist of a relatively large open pit at the Turquoise Chief mine proper and several smaller, open-cut workings (the Josie May mine) about 1⁄4 mi to the northeast of the San Isabel National Forest Road 103. Turquoise occurs as veinlets and nodules in variably altered Silver Plume-age (1.4 Ga) St. Kevin Granite.

In addition to the references cited, Murphy and Modreski (2002) summarize the history and mining activity at the four deposits and give additional literature references. The location and information about these deposits is being incorporated into a database on Colorado gem- stone occurrences at the Denver Museum of Nature and Science (Murphy, 2002).

Small amounts of turquoise have also been reported from Creede, Summitville, Silverton, the Holy Cross mining district in Eagle County, and the Sugarloaf district in Lake County, south of Turquoise Lake.

References


(Novelty 3 on the index map)

Native copper at Santa Rita resulted in some of
the earliest mining in the Southwest. Native copper artifacts from a Georgia archaeological site dated at A.D. 880 have been identified by trace element chemistry as being from Chino, and a copper bell dated to A.D. 1150 has been excavated from a Mogollon site. Spanish explorers came north from Mexico to explore the area beginning with Don Juan de Oñate in 1598. The exact time when the Spanish gained knowledge of the deposits is still uncertain. Captain Francisco Martínez stationed at El Presidio de Carizal mentions “El Cobre” near Santa Lucia Springs as a “criadero.” A criadero or nursery (where minerals “grow”) was at the time considered a natural wonder, with such occurrences of metals resembling Spanish Crowns. Consequently, there was little incentive to develop such deposits of native metal “growing” from the soil until José Manuel Carrasco, a soldier stationed about 150 mi south of Santa Rita at El Presidio de Janos, took the initiative to develop the deposit in the early 19th Century. By about 1801 Carrasco had interested his friend Don Francisco Manuel Elguea, a wealthy and influential merchant from Chihuahua, in Santa Rita copper, which by 1804 resulted in contracts to supply copper for Mexican coinage.

Native copper is common in the oxidation zone of porphyry deposits, typically forming near the top of chalcocite enrichment. Here, copper in chalcocite is reduced to the chalcopyrite variety of cuprite.

Don Francisco Manuel Elguea, a wealthy and influential merchant from Chihuahua, in Santa Rita copper, which by 1804 resulted in contracts to supply copper for Mexican coinage.

Sulfur to sulfate, as suggested by Lindgren from the west and beneath retrograde skarn mineralization in a number of mine districts, such as the West End of the Homemade Mine and in the most recent finds in the San Juan Mountains of Colorado and all of the enjoyable and some not so enjoyable memories I have of securing mineral specimens for my collection.

My first mining-related job in the San Juans was in 1968 when I was employed as a mining engineer with the Cleveland Cliffs Iron Company in Summitville, Colorado. Cleveland Cliffs was sinking a shaft on an enargite-pyrite vein called the Missionary orebody and was planning to mine the deposit by underground methods. At this time the Vietnam War was in full swing, and I was drafted into the U.S. Army for the next 2 years. When I was honorably discharged in the summer of 1970, the Summitville project had already gone belly up, but I was determined to return to the San Juans. I landed a job with the Camp Bird mine at Ouray where they were just starting to mine a base metal replacement orebody in the Telluride Conglomerate. During the 1970s a number of important discoveries were made including anatase on quartz, large quartz crystals from a solution cavity in the Leadville Limestone, and a number of important finds in the Red Mountain mining district. In the early 1980s the Mined Land Reclamation Division of the Colorado Bureau of Mines initiated a program of sealing all accessible shut down mines, and it then became a race against time to collect and preserve minerals that would never again see the light of day. The 1990s saw a number of mineral finds including rare secondary lead-copper-zinc minerals, colorful silver sulfosalts, and more discoveries of anatase and additional discoveries of quartz in the Leadville Limestone. During the past 2 years only a few notable mineral discoveries have been made in the San Juans. This is not to say that the mountains are worked out but only that the elusive pocket is still out there waiting to be discovered.

PUBLIC FLUORESCENT MINERAL DISPLAYS OF THE WESTERN UNITED STATES: AN OVERVIEW, by Aaron Rever, 573 Van Gordan St. #2-313, Lakewood, CO 80228, glowrock@netscape.net

On any one of my various road trips, I have wondered if I’ve missed any interesting fluorescent mineral displays. There has been precious little information as to their localities, with the notable exception of Fluorescent Mineral Society member Bruce Naylor, who several years ago compiled a general listing of fluorescent mineral displays. My presentation will attempt to update and add to his work for the western United States and for the Rocky Mountain region. It will provide information for the traveler with an interest in fluorescent mineral displays: their location, scope, approximate size, wavelengths of light, and other pertinent information.

In my research I have found that many of the better displays are located outside of the major cities in small, somewhat isolated towns. For instance some of the best displays I have seen (judged mainly for quality of specimens and in some cases for educational value) include the South Dakota School of Mines Museum in Rapid City, the Badlands Petrified Gardens in Kadoka (both in South Dakota), the Adams County Historical Museum in Brighton, Colorado, and right here in Socorro, New Mexico, at the New Mexico Bureau of Geology and Mineral Resources Mineral Museum contains specimens from at least as far back as the early part of this century (C.T. Brown Collection). Additions to the museum collections over time provide us a potential chronology for the production of fine specimens from the mine. The earliest documented specimens are typically massive vein fillings of native copper. A few early examples consist of arborescent growths of crystals. Later specimens commonly dominated by spinel and polycyclic twinning were produced from the 1970s to the early 1980s. A discovery in late 1993 had some nicely crystallized copper and cuprite and included some unusual forms. More recently a single specimen mined in March 2001 and recovered from an inactive concentrator stockpile yielded some spectacular crystalline specimens that sold in early 2002. Crystal forms include spinnel twins, dodecahedrons, and modified cubes. Commonly single specimens show differing crystal habits. Some finely crystalline copper “wool” is present on some specimens as a secondary crystallization. Additionally, many examples of good quality crystalline copper, reasonably priced, were found in the area. Additional discoveries are anticipated when mining resumes.

PART II, FIELD COLLECTING

SOUTHWESTERN COLORADO, 1970–2000: AN UPDATE, by John Sobolewski, 8501 Northridge Dr. N.E., Albuquerque, NM 87111

Although conventional 35 mm film cameras have a resolution of more than 2 orders of magnitude greater than today’s consumer digital cameras (1 billion pixels versus about 1–7 million pixels or picture elements), the difference in the pictures produced by each is increasingly

REFERENCES


THIRTY YEARS OF MINERAL COLLECTING IN THE SAN JUAN MOUNTAINS, SOUTHWESTERN COLORADO, 1970–2000: FIELD COLLECTING, by Tom Rosemeyer, P.O. Box 586, Ouray, Colorado 81427, rosemeyer@ocinet.net

(Location 5 on the index map)

Now that I have reached the age of 60 it seems like an appropriate time to look back at the last 30 yrs of mineral collecting in the San Juan Mountains of Colorado and all of the enjoyable and some not so enjoyable memories I have of securing mineral specimens for my collection.

My first mining-related job in the San Juans was in 1968 when I was employed as a mining engineer with the Cleveland Cliffs Iron Company in Summitville, Colorado. Cleveland Cliffs was sinking a shaft on an anargite-pyrite vein called the Missionary orebody and was planning to mine the deposit by underground methods. At this time the Vietnam War was in full swing, and I was drafted into the U.S. Army for the next 2 yrs. When I was honorably discharged in the summer of 1970, the Summitville project had already gone belly up, but I was determined to return to the San Juans. I landed a job with the Camp Bird mine at Ouray where they were just starting to mine a base metal replacement orebody in the Telluride Conglomerate. During the 1970s a number of important discoveries were made including anatase on quartz, large quartz crystals from a solution cavity in the Leadville Limestone, and a number of important finds in the Red Mountain mining district. In the early 1980s the Mined Land Reclamation Division of the Colorado Bureau of Mines initiated a program of sealing all accessible shut down mines, and it then became a race against time to collect and preserve minerals that would never again see the light of day. The 1990s saw a number of mineral finds including rare secondary lead-copper-zinc minerals, colorful silver sulfosalts, and more discoveries of anatase and additional discoveries of quartz in the Leadville Limestone. During the past 2 yrs only a few notable mineral discoveries have been made in the San Juans. This is not to say that the mountains are worked out but only that the elusive pocket is still out there waiting to be discovered.

DIGITAL PHOTOGRAPHY OF MINERALS, by John Sobolewski, 8501 Northridge Dr. N.E., Albuquerque, NM 87111

Although conventional 35 mm film cameras have a resolution of more than 2 orders of magnitude greater than today’s consumer digital cameras (1 billion pixels versus about 1–7 million pixels or picture elements), the difference in the pictures produced by each is increasingly

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November 2002, Volume 24, Number 4
Indigenous living

Researchers at the University of New Mexico and New Mexico Tech are studying caves in Carlsbad Caverns National Park because they represent unique environments at the interface between the microbial world and the realm of minerals. The researchers have discovered unique microorganisms that live deep in Lechuguilla Cave, dissolving limestone to release iron and manganese that are then oxidized as an energy source. The oxides accumulate into thick deposits on the cave walls, ceilings, and floors. Minerals include iron oxides (lepidocrocite, goethite, hematite) and manganese oxides (todorokite and lithiophorite), which may be the direct result of microbial activity. There are also more usual minerals whose origin is less certain, such as nardostadite (aluminum-hydroxide) and svanbergite (aluminum-strontium sulfate-phosphate). Another line of research involves some of the unusual mineral forms that decorate Carlsbad Caverns and Lechuguilla Caves, among others. These forms, called moonmilk, pool fingers, and U-loops, were deposited on and around microbial filaments deep in the caves.

Endnotes
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