

MOGOK!



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HISTORY, MINES AND MINERALS OF

The Mogok Stone Tract

MANDALAY DIVISION, BURMA

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Mogok has been famous for over two thousand years as the source of the world's finest ruby crystals, and it is also the leading locality for beautiful, collectible crystals of ruby-red spinel. This fame is widespread in the field of gemology, but mineral collectors may be less aware that Mogok has produced crystals of a wide range of other species including beryl, chrysoberyl, tourmaline, danburite, forsterite, fluorapatite, topaz, quartz and zircon, plus rare species like hibonite, johachidolite, poudretteite and serendibite. Mogok is also the type locality for painite and kyawthuite.

INTRODUCTION

Ruby is the *most precious* of all precious gems. Time-traveling back to the year 1905, we would find that “a ten-carat ruby . . . cannot be bought for much less than five thousand dollars” (Anonymous, 1905), and in 2015, a 25.59-carat Mogok ruby was auctioned at Sotheby’s for \$30 million, or \$1.17 million per carat (Cartier, 2016). And if, now duly agog, we go just one year farther, to 2016, we would learn that the finest “pigeon’s blood” red ruby gems from Mogok were selling for \$1.22 million per carat (Hughes, 2017). These prices exceed those for all but a very few very exotically colored diamonds (see Wilson, 2014), and far exceed prices for uncolored diamonds or even for the finest Colombian emeralds.

It has long been a commonplace in the gem trade that the world’s

finest gem-grade rubies are those from the Mogok Stone Tract, and that Mogok’s gem-grade sapphires are second in value only to those from the mines near Sumjam, Kashmir. There is, of course, an extremely extensive literature on the gemology, treatment, cutting and marketing of gem corundum from Mogok, and—as a kind of resonance of the glory of rubies—a myriad of further writings on Mogok geology (very complex), Mogok history (eventful, and a millennium or two long), and Mogok’s cultural context (rich and exotic). But the Mogok Stone Tract has not been very much written about from a mineralogical point of view. This is surprising, as the locality offers gem fanciers *and* mineral collectors some of the world’s best crystals of red spinel, topaz, aquamarine, peridot, zircon, fluorapatite and enstatite, and among its other collectible minerals there are mega-rarities such as painite, poudretteite, johachidolite, baddeleyite, serendibite and sinhalite, some of which can also be (and have been) turned into faceted gems. In short, Mogok is one of the most remarkable and prolific of all mineral localities worldwide, and although zealous people have worked it nearly continuously for at least the last thousand years, it is still today in robust operation and not too grudgingly yielding up treasures for mineral collectors and gem cutters alike.

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Figure 16. Burma Ruby Mines Ltd. Open pit operation near Mogok in 1912. Royal Geographic Society.

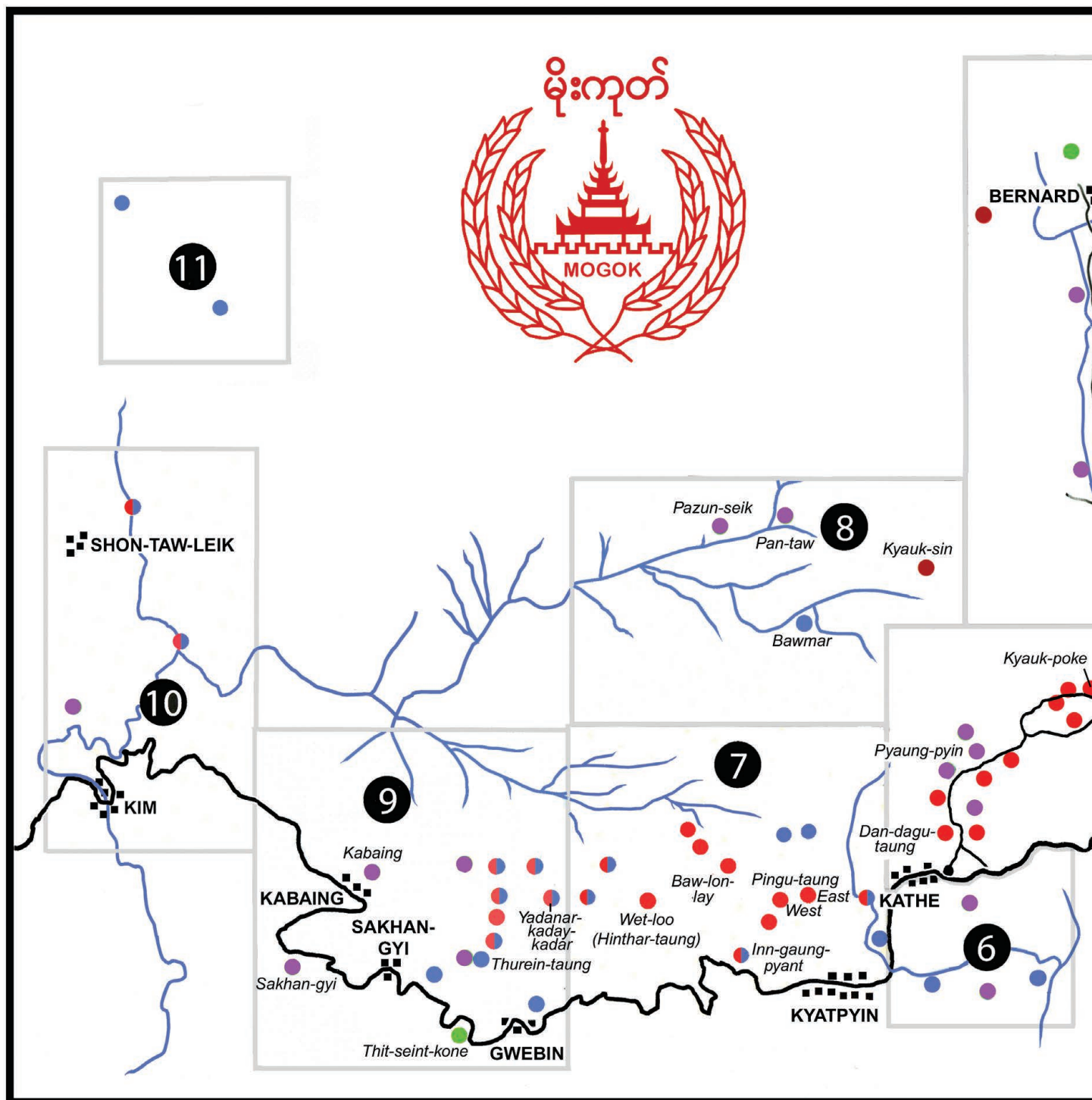


Figure 17. Engine station for ore being trammed down the mountain from ruby workings near Mogok, ca. 1901. Note the double set of rails, one for filled ore cars coming down and one for empty cars going up. Private collection.

Figure 20. The stereograph caption reads: “For centuries the Burmese have resorted to searching for and digging out of the gravel of the old river bed the precious rubies with which it is so extraordinarily enriched. Some of it, especially where it is mixed with earth, can best be handled by washing. This is the process that is going on here. Those baskets on the long, balanced poles are used to take up the washed gravel from the pit. The gravel is then sorted and the prizes—often overlooked by inexperienced eyes—are seized, to be carried to the cutters and polishers.” Keystone View Company (1904), Underwood & Underwood image no. 3827. Günter Grundmann collection.



Figure 21. U Hmat (1841–1916), the “Ruby King” of Mogok, with his primary wife Daw Nyeint and 11 (of 14) children. He began mining rubies and sapphires in Mogok in the late 1870s and by 1881 had become very rich and famous. He sold rubies to the king every year, and eventually was officially designated as “King Thibaw’s chief ruby miner.” Nearly all important gems passed through his hands, and he set the prices. After the British annexation of Burma in 1886 he was allowed to continue his mining enterprises, and was awarded a gold medal and a special title for “Distinguished Civilian Service.” He was also a prominent philanthropist, building pagodas, monasteries and roads. The girl with the parasol is wearing jeweled earrings, bracelets, a head-dress and a long necklace worth \$100,000 (in 1904). The photograph is No. 29 from a collection of 36 stereoscopic views of Burma, one of a series published in 1904–1905 as part of the Underwood & Underwood Travel Library.



Zone 1. Bernardmyo

Ah-chauk-taw
Htin-shu-taung
Lay-tha-anee-taw
Lay-tha-apyaw-taw
Le-Taw
Htan-saing
Pyaung-gaung
Zalat-taung
Panlin-Injauk
Lay-Bauk
Htin-shu-myaing

Zone 2. Chaung-gyi

Lisu-konzan
Gurkha-konzan
Chaung-gyi-ah-le-ywa
Mana-Lisu
Wa-hkan-sho
Kyauk-wa

Zone 3. Pein-pyit

Pein-pyit-le-taw
Pyant-gyi
Anyant-taung
Ko-miles-le-taw

Manc/Thet-kachan
Hta-yan-sho
Kyini-taung
Myaw-taung
Oak-saung-taung

Zone 4. Mogok Valley

Dattaw (Dattaw-pyant,
mid, upper)
Ohn-bin-ywe-htwet
Le-U-le-taw
Shon-bay-lay, Shon-
ban-gyi

Nga-yant-inn (Pan-sho,
Padan-sho)
Le-U-thet-kachan
Shon-daw-myaing
Myaw-pyet
Ho-mine-sho
Lay-bin-sin
Ohn-gaing
Lin-yaung-chi
Shwe-daing
Shwe-pyi-aye
Mintada
Ha-pha-lar-sho
Yebu-thapanbin-kyar

Ye-bauk-thayer
Yebu-kalar-gon
Yebu

Zone 5. Marble Arc

Kyi-taung
Kadoke-tat
Kyauk-saung
Bawpadan
Kyauk-poke
Myeme
Kolan
Kyauk-sar-taung

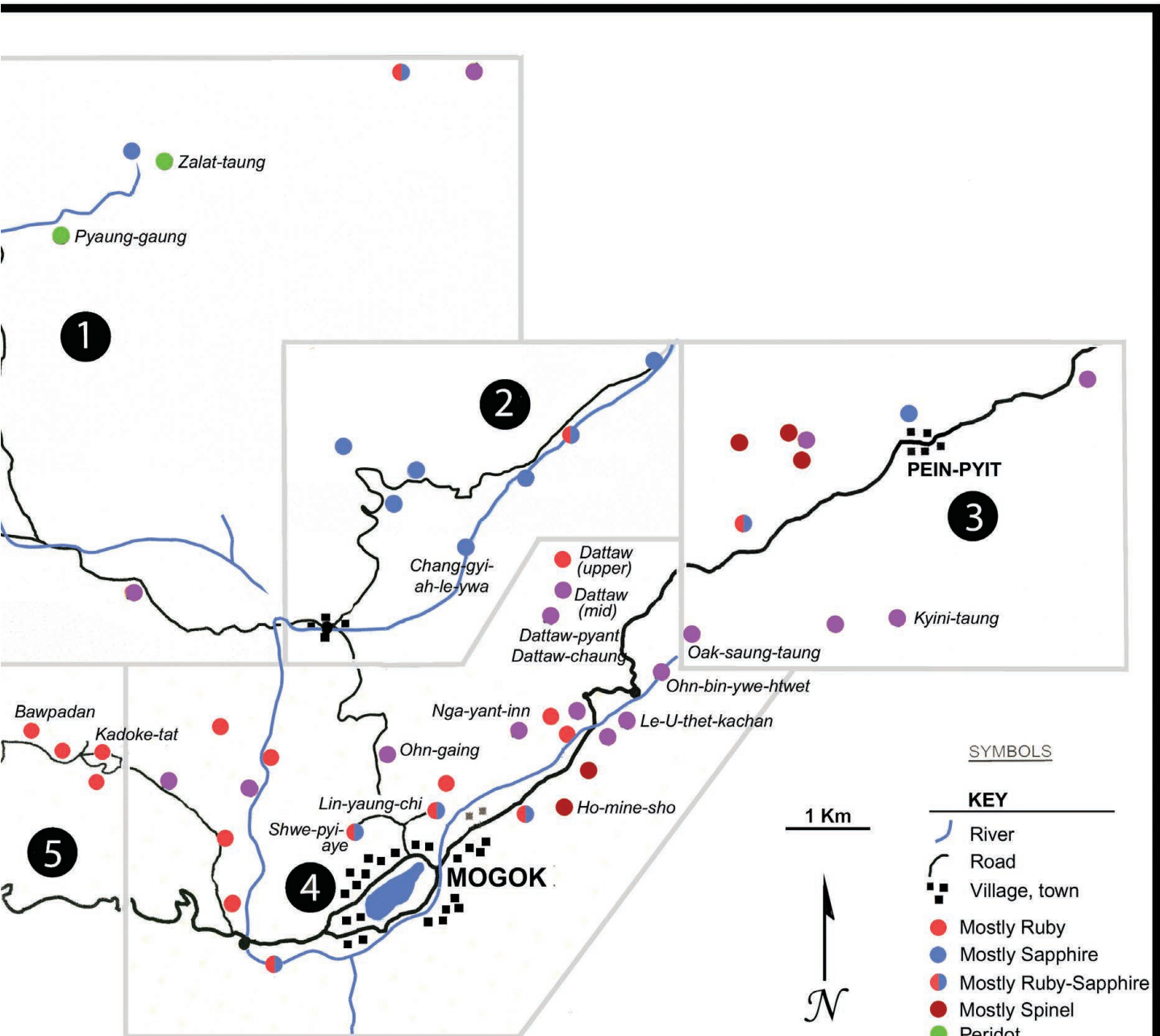


Figure 47. The gem mines of the Mogok Stone Tract have been divided geographically into 11 zones by Themelis (2008). Localities mentioned in the text are indicated on the map; all major mines in each zone are listed below.

Than-tayar
 Pyaung-pyin-ahnout
 Sin-thé-gyant
 Sin-thé-byant
 Win-hta-yan
 Chit-their-taung
 Kyauk-saung-Kyatpyin
 Yankin-taung
 Dan-dagu-taung
 Ohn-bin-Kyatpin

Zone 6. Kathè (South)
 Lu-hta-pyant
 Kyauk-pauk-Kyatpyin

Tasgaung-nann-daing
 Wun-bé-inn

Zone 7. Kyatpyin (Central)
 Ye-U-gyi, Ye-U-lay
 Pingu-taung (east)
 Inn-gaung-pyant
 Pingu-taung-pyant
 Pan-ma
 Gyoung-U-bar
 Baw-lon-lay
 Baw-lon-gyi

Pingu-taung (West)
 Wet-loo
 Sinkwa
 Pos-kon

Zone 8. Kyatpyin (North)
 Bawmar
 Pan-taw
 Kyauk-sin
 Pazun-seik
 Nam-peik

Zone 9. Kyauk-pyat-that
 Yadanar-kaday-kadar
 Thurein-taung
 Tha-gyi-loo
 Myaing-gyi
 Sate-inn-loo
 Ah-tet-inbyae
 Auk-inbayae
 Ah-sein-taw
 Man-taw-bin
 Kyauk-pyat-that-atay-pyant
 Gwebin, Gwebin-chaung

Thit-seint-kone
 Sakhan-gyi
 Kabaing

Zone 10. Kin
 Kin-kolan-bauk
 Kin-shu-taw
 Kin-kyauk-leik

Zone 11. On-dan
 On-dan-pyant
 Hanamataw-lay



Figure 56. Aquamarine beryl crystals to 4 cm, with a variety of habits and features, from Mogok. William Larson collection (Arkenstone); Mark Mauthner photo.



Figure 57. Aquamarine beryl crystals to 8.5 cm, from the Sakhan-gyi mine, Mogok. William Larson collection (Arkenstone); Mark Mauthner photo.



Figure 66. The DeLong star ruby (100.32 carats), found at Mogok in the 1930s and sold in 1937 by Martin Ehrmann to Edith Haggin DeLong, who donated it to the American Museum of Natural History.

rarely the host corundum crystal is twinned, and in this case there is a twelve-rayed star.

Sometimes a ruby or sapphire can be fashioned into a *cat's eye*, a cabochon-cut stone with a single bright line running down its curved surface. To this cat's-eye effect the term "chatoyancy" has been applied, but chatoyancy by definition is caused by tiny inclusions, whereas in Mogok cat's-eye rubies and sapphires the effect of chatoyancy is created by "internal total reflection of two sectors of crystals inclined to each other at 11°" (Themelis, 2008).

Some Mogok rubies show dichroism, exhibiting a change in color when incident light rays impinge on them from different angles. The careful gem cutter can enhance the effect, producing faceted stones whose dichroic colors vary from dark to pale red, from red to bluish red, or even from pure red to almost blue or purple.

Another change-of-color phenomenon is the "alexandrite effect," named, of course, for the chrysoberyl gem alexandrite. The alexandrite effect may sometimes be seen in both natural and synthetic corundums which can display a low-saturation blue-green color in daylight or cool fluorescent light, and a purplish red color under incandescent light. Color-change sapphires from Mogok appear greenish blue in daylight and reddish pink in incandescent light.

Trapiche rubies and sapphires seen occasionally on the gem market display oriented inclusions as spokes emanating from a center. In one type of trapiche stone, three full-length spokes divide the stone into six sectors; in a second type there are six implicit sectors each sporting a six-rayed star of included material.

Inclusions in Mogok Corundum

The general subject of *inclusions* in gem corundum from Mogok is quite complex. There are, among other varieties, simple fluid inclusions; two-phase (fluid and gas or solid and fluid) inclusions; and three-phase (fluid, gas and solid) inclusions. Inclusions of rutile



Figure 67. Ruby crystal in marble matrix, 16 cm, from the Kadoke-tat mine, Mogok. Federico Barlocher collection and photo.

needle-crystal "silk" are common; inclusions of exsolved böhmite needle crystals restricted to twin planes and other lamellae are also common; and there are crystal-shaped voids ("negative" crystals) as inclusions.

Rubies commonly have included "guest" crystals of apatite, titanite, spinel, pargasite, pyrite, calcite, monazite, garnets and many more. But as rubies originate in metamorphosed carbonate rocks



Figure 90. Large Mogok ruby crystals in marble matrix (nicknamed “Big Mama”), held by Wimon Manorotkul, who at that time was working for Pala International. It weighs 10,041 carats. Michael Scott collection, now in the White Rose Foundation Collection; Richard W. Hughes photo.



Figure 93. Ruby crystal on matrix, 8.5 cm, from the Kyauk-poke mine, Bawpadan area, Mogok. William Larson collection; Robert Weldon photo.



Figure 97. Sapphire crystals to 4 cm from Mogok. William Larson collection (Arkenstone); Mark Mauthner photo.



Figure 98. Ruby zone inside a sapphire crystal, 5 cm, from Mogok. Mim Mineralogical Museum collection, Beirut; Augustin de Valence photo.



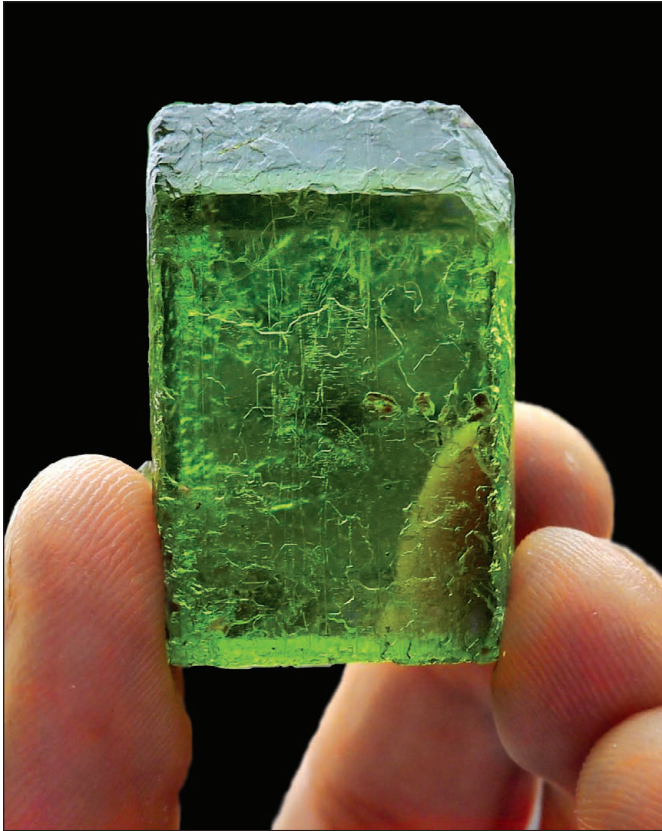


Figure 133. Forsterite (peridot) crystal, rectangular habit, 4.5 cm, from Pyaung-gaung, Mogok. Gene Meieran collection; Federico Barlocher photo.



Figure 134. Forsterite (peridot) crystal, rectangular habit, 3.8 cm, from Pyaung-gaung, Mogok. Gene Meieran collection; Jeff Scovil photo.



Figure 135. Forsterite (peridot) crystal (two views), unusually sharp, 4.1 cm, from Pyaung-gaung, Mogok. William Larson collection (Arkenstone); Jeff Scovil photo.



Figure 181. Pink spinel crystals, 2.4 cm, from Kyauk-sin, Mogok. William Larson collection (Arkenstone); Mark Mauthner photo.

Figure 182. Double spinel crystal (parallel, not a twin), 1.3 cm, from Mogok. Michael and Nicole Carre collection; Jeff Scovil photo.



Figure 183. Rare dodecahedral spinel crystal, 1.1 cm, from Ohn-bin, Mogok. William Larson collection (Arkenstone); Mark Mauthner photo.

Figure 184. Spinel crystal cluster, 2.2 cm, from Mogok. François Lietard specimen; Jeff Scovil photo.



Crown Jewels, is really a Mogok spinel, and at about 170 carats it is the largest known faceted gemstone of that mineral.

The very best ruby-red spinel is actually quite rare; more commonly the sharp, simple octahedral crystals and spinel-law twinned crystals in marble are rose-red, hot pink, brownish red, purplish red, orangish red, blue, purple, gray-blue, grayish violet, greenish gray, black, and many intermediate hues. This wide color variability might represent more than just varieties of spinel, but perhaps also other species of the spinel group of cubic oxides of general composition XZ_2O_4 —Themelis (2008) mentions magnesioferrite, gahnite and hercynite, plus varieties of these, as

Figure 196. Topaz crystal on feldspar (under incandescent and longwave ultraviolet light), 5.6 cm, from Mogok. Al and Sue Liebetrau collection; Jeff Scovil photo.



Figure 197. Blue topaz crystal, 4.5 cm, from the Pan-taw mines, Mogok. William Larson collection (Arkenstone); Mark Mauthner photo.



Figure 198. Colorless topaz crystal, 5.1 cm, from Sakhan-gyi, Mogok. Martin Zinn collection; Jeff Scovil photo.



Figure 205. Two parallel topaz crystals, 12 cm, from the Sakhan-gyi mines, Burma. Tiziano Bonisoli collection; Federico Barlocher photo.



Figure 206. Topaz crystal on quartz crystals, 5 cm, from Mogok. Rudolf Watzl (Saphira) specimen; Christi Cramer photo.

Table 1. (continued).

Schorl	$\text{NaFe}_3^{2+}\text{Al}_6(\text{Si}_6\text{O}_{18})(\text{BO}_3)_3(\text{OH})_3\text{OH}$	Topaz	$\text{Al}_2\text{SiO}_4(\text{F,OH})_2$
Serendibite	$\text{Ca}_4(\text{Mg}_6\text{Al}_6)\text{O}_4[\text{Si}_6\text{B}_3\text{Al}_3\text{O}_{36}]$	Tremolite	$\square\text{Ca}_2\text{Mg}_5\text{Si}_8\text{O}_{22}(\text{OH})_2$
Sillimanite	Al_2SiO_5	Uvite	$\text{CaMg}_3(\text{Al}_5\text{Mg})(\text{Si}_6\text{O}_{18})(\text{BO}_3)_3(\text{OH})_3\text{OH}$
Sodalite Subgroup		Vesuvianite	$\text{Ca}_{19}(\text{Al,Mg,Fe})_{13}\text{Si}_{18}\text{O}_{68}(\text{O,OH,F})_{10}$
Spessartine	$\text{Mn}_3^{2+}\text{Al}_2\text{Si}_3\text{O}_{12}$	Wadeite	$\text{K}_2\text{ZrSi}_3\text{O}_9$
Spodumene	$\text{LiAlSi}_2\text{O}_6$	Wollastonite	CaSiO_3
Talc	$\text{Mg}_3\text{Si}_4\text{O}_{10}(\text{OH})_2$	Zircon	ZrSiO_4
Thorite	$(\text{Th,U})\text{SiO}_4$	Zirconolite-3T	$\text{CaZrTi}_2\text{O}_7$
Titanite	CaTiOSiO_4		

ferrohögbomite-2N2S, and monazite-(Ce)—see those entries. The deposit has also produced black, medium-lustrous, rounded, slightly radioactive crystals of zirconolite-3T to 1.5 cm. Some of these crystals were marketed on a website in 2013, their locality given there as “Kyauk Tha Mountain”; however, a note on Mindat (mindat.org/loc-204009.html) clarifies that “Kyauk Tha Mt. does not exist. It was a misinterpretation of ‘Kyauk Tha village,’ which itself was a misnomer for Kyauk Pya village.”

ABOUT BURMESE LOCALITY NAMES

Burmese is a Sino-Tibetan language, written in an alphabet descended from the Brahmic script of ancient India. It is an *abugida* or pseudo-alphabetic segmented writing system in which consonant-vowel sequences are written as single units, each unit based on a consonant coupled with a secondary vowel notation (in contrast to a full alphabet having separate letters for vowels, and an *abjad* in which vowel indications are absent). Burmese reads left to right, but unlike Western languages there are no spaces between words.

In this article we have adopted the locality naming transliteration method used by Themelis (2008), in which hyphens are inserted

between individual syllables or syllable groups that are represented by one or two characters in Burmese. *Taung*, for example, equals “hill” or “Mountain,” so the name Hinthar-taung, is equivalent to “Hinthar Hill.” Collectors should feel free to substitute English geographical terms in their labeling, a practice which can make some Burmese locality names a bit more comprehensible and easier to remember. Other useful terms include:

Tat = “fortress” (so *Kadoke-tat* = “Fort Kadote” mine)

Kyauk = “rock” (so *Kyauk-poke* = “Weathered Rock” mine)

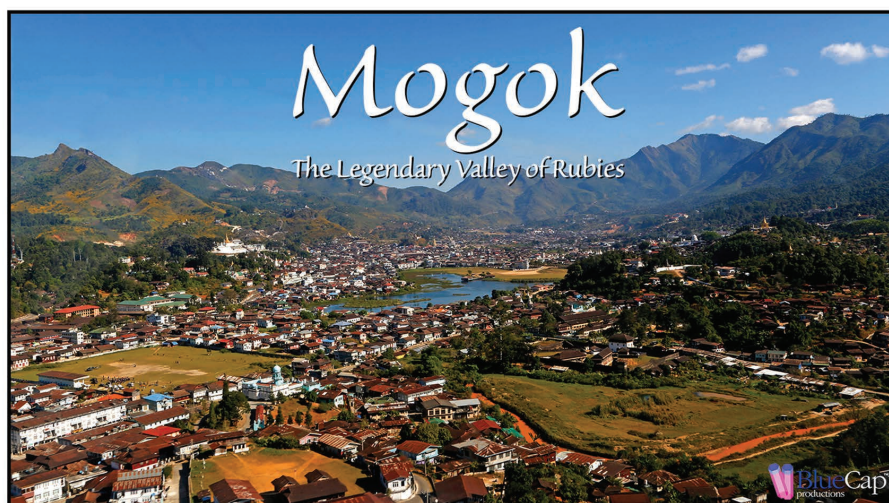
Sin = “elephant” (so *Kyauk-sin* = “Elephant Rock” mine)

Pingu = “spider” (so *Pingu-taung* = “Spider Hill”)

Other variations are less easy to determine, as they may be rooted not in Burmese but in one of the other 100 or so languages and dialects spoken by Burmese and Mogok residents. These mainly represent four major language families (Sino-Tibetan, Austro-Asiatic, Tai-Kadai, and Indo-European). Burmese, the official language of Burma, is spoken by only about 65% of the population. And, of course, the original meanings of some proper names have been lost in the entropy of time. Editorial and transliteration conventions can vary as well. For example, one often sees the town of Pein-pyit

A VIDEO SUPPLEMENT TO THIS ARTICLE is also available.

Newly completed for the Mineralogical Record by Bryan Swoboda:



Link: <https://MineralFilms.com/Mogok-MinRec>

Available free to Mineralogical Record Subscribers now (for sale to the public in March)

A professionally produced, 1-hour 18-minute documentary with visits to the mines and marketplaces of the Mogok Stone Tract, guided by Federico Barlocher

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Uvite tourmaline group, 2.5 cm, from the Brumado mine, Bahia, Brazil -- pictured in the May-June 1992 What's New in Minerals report on minerals that were available at the 1992 Tucson Gem and Mineral Show. Wendell Wilson photo.





Figure 1. Architect's rendering of the new Colorado Convention Center in Denver.



FROM THE MINER'S PROGRESS (1853)

Denver Show 2021

by Thomas P. Moore

[September 10–September 19]

“No one ever steps in the same river twice, for it's not the same river and he's not the same man.”

The pre-Socratic Greek philosopher Heraclitus (544 BC–483 BC) is said to have uttered or written the sentence quoted above, though you might prefer his non-metaphorical statement of the same idea: “Nothing is permanent except change.” Well, we who follow the international mineral trade now find that, even while what's-new-in-minerals keeps giving way, as it always has, to whatever is even newer—as water continuously displaces water—it is the river channels themselves, the *shapes* of the mineral shows, that are being re-carved these days, profoundly changing indeed. In 2020 the Covid pandemic squashed the accustomed Denver Show (and all other major shows), and now Denver 2021 has turned out to be entirely different—in venues, organization, administration, and hence in general ambiance—from all earlier Denver shows. Moreover there are indications and premonitions that Munich in 2021 and Tucson in 2022 will also be “different” in ways not yet fully known. Nothing is permanent except change, and whether you're “the same” man or woman you were before the pandemic is nobody's business but yours, of course, but if you're accepting of change and if you're an optimist you will probably have to say that all of this metamorphosis in the mineral shows is a healthy, *good* thing

Before 2021 the main-action scenes for serious mineral collectors in Denver were (1) Dave Waisman's small, “elite” Fine Mineral Show at the Marriott hotel in Golden, and (2) the Denver Gem & Mineral Show (the “Main Show”) at the Denver Merchandise Mart. What you might call secondary show scenes included (3) a group of sprawling, partially outdoor, shows around the Coliseum building beside the freeway, and (4) the fairly new Colorado Fossil & Mineral Show at the Crowne Plaza Hotel near the airport, successor to Marty Zinn's old show at the Ramada on Bannock Street.

What I've called the two secondary show scenes were after all little changed in 2021. The Coliseum cluster of shows took place



Figure 16. Fluorapatite, 8.7 cm, from the Mawi pegmatite, Nuristan (or Dara-e-Pech, Kunar), Afghanistan. Bryan Lees (*Collector's Edge Minerals*) specimen; Jeff Scovil photo.



Figure 17. Fluorapatite, 2.7 cm, from the Mawi pegmatite, Nuristan, Afghanistan. Safaa Yu (*Mintang LLC*) specimen, now in the Chris Stefano collection; Chris Stefano photo.

Figure 18. Fluorapatite crystal cluster, 4.2 cm, from the Mawi pegmatite, Nuristan, Afghanistan. Bryan Lees (*Collector's Edge Minerals*) specimen; Chris Stefano photo.



At the Colorado Mineral & Fossil Fall Show at the Crowne Plaza, *Wendy's Minerals* (wendysminerals@hotmail.com) had about 250 sky-blue, lively-looking specimens of the rare aluminum hydroxide species **gibbsite**, from a pocket opened in July 2021 somewhere near Wenshan, Yunnan Province, China. Gibbsite is never seen as macrocrystals; instead it forms mammillary masses and coatings of wan white or dullish blue-green hue, or else is seen scattered as colorless microcrystals on other species. Older finds near Wenshan have produced good blue mammillary gibbsite, but these new examples present sparkling coatings of tiny bright blue crystals over gossany matrix, with patches of darker blue azurite here and there. Specimens from miniature to large-cabinet size could be had from Wendy Yuan for \$200 to \$1,000 (but forget about thumbnails: for \$80 I scooped up the only one still unsold from what Wendy said had once been a fair supply).

At some unnamed locale in Anhui Province, China, a single pocket, cleaned out sometime in early 2021, yielded about a dozen

Figure 19. Aragonite, 20 cm, from Helmand Province, Afghanistan. Bryan Lees (*Collector's Edge Minerals*) specimen; Chris Stefano photo.



Figure 20. Aragonite on azurite, 7.5 cm, from Helmand Province, Afghanistan. Bryan Lees (*Collector's Edge Minerals*) specimen; Chris Stefano photo.

Figure 21. Calcite (twins), 12.5 cm, from Anhui Province, China. Geoff Krasnov (*Geokrazy Minerals*) and Isaias Casanova (*IC Minerals*) specimen; Chris Stefano photo.



specimens showing large, opaque brown, fishtail twins of calcite surrounded by equant, conventionally transparent and colorless calcite crystals on matrix. The big fishtail twins are not only lustrous and sharp-edged but are tinted a uniform latte-like hue by unknown inclusions and are softly spectacular-looking. The partnership of Geoff Krasnov of *Geokrazy Minerals* (geokrazy.com) and Isaias Casanova of *IC Minerals* (icminerals.com) had a single specimen of this Chinese calcite on hand at Denver (shown here: price \$20,000),

antiquarian and modern, featuring fluorite), and Harvard (fluorite specimens and cut gems).

In that same buzzing Denver Room, fine display-presentations on other themes were mounted by, among others, Patrick Meyer (a tall case full of gem crystals, most notably fabulous “tsavorite” grossular from the Merelani mines of Tanzania), Rick Kennedy (self-collected Virgin Valley, Nevada opal), the Colorado Mineral Society (85 aquamarine crystal “candles” from Mount Antero), the Hutchinson family (best finds from the 2020–2021 field collecting season), Jim and Michael Hooten (self-collected minerals and fossils), and a memorial case for the late Luke Westervelt Jr. (Colorado amazonite).

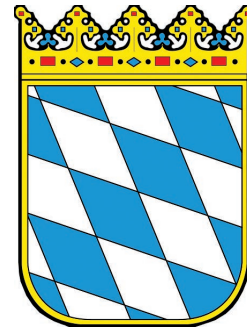
Meanwhile, downstairs, in the plush carpeted lobby outside the main dealers’ hall, there were just a few very special displays in large recessed glass cases, distracting and temporarily mesmerizing fair numbers of shoppers otherwise intent on visiting the major dealers next door. I have already mentioned Gene Meieran’s case of gem “trilliants,” but gemstone lovers could not fail to gawk, either, at the Harvard case showing the famous, late 19th-century “Hamlin necklace,” with huge gems of Maine tourmaline set in gold, together with numerous color-zoned elbaite crystals from Mount Mica, Maine.

Former Harvard curator Dr. Carl Francis, now relocated to Maine and in charge of the Maine Mineral & Gem Museum, was on hand to give little talks to groups (among them, encouragingly, groups of curious schoolchildren) concerning three cases put in by the museum on the theme of “space rocks.” In these talks Carl was aided by detailed placards which told the stories of the big specimens of iron meteorites, chondrites and meteorites of intermediate composition, all on very effective display. The star of the space-rocks show, reposing alone in its own case, was a Mars rock more than a foot across which is, as the sign put it, “the largest known piece of Mars on earth”—igneous, and of a sort of rusty gray hue, as we’d expect. (Mars meteorites are pieces of Mars that were blown into space by asteroid impacts and drifted through the interplanetary gulf to fall on earth as meteorites. No expensive Mars Mission needed, thank you very much.)

But the display in the lobby which drew most attention of all from gawkers was the Sweet Home Mine Rhodochrosite Reunion Display, in a great black-lined inset case which brought together for the first time since the late 1990s the four most famous products of Bryan Lees’ Sweet Home mining project of 1991–2004 (see, of course, the special Sweet Home mine issue of the *Mineralogical Record*, July–August 1998). Reunited here were the great “Alma King” rhodochrosite, now in the Denver Museum of Nature and Science; the “Alma Rose” rhodochrosite, now in the Rice Northwest Museum of Rocks and Minerals, Hillsboro, Oregon; the “Alma Queen” (formerly known as the “Bancroft” rhodochrosite), now in the Houston Museum of Natural Science; and the sumptuous “Kathryn’s Necklace” of faceted Sweet Home rhodochrosite, commissioned by Bryan Lees for his wife Kathryn. Bryan often stationed himself by this case to comment upon the fabulous objects within and to answer questions about his mining crews’ work—past and present—in the Sweet Home mine, on the hillslope above Buckskin Gulch near Alma, Park County, Colorado.

On the Saturday of the show, Bryan Lees also gave a talk to an auditorium full of people on “Rhodochrosite—Colorado’s State Mineral,” and this was just one of 14 talks given by many speakers in that auditorium throughout the show. Most of these concerned the theme mineral of the show (e.g. Peter Megaw on Mexican fluorite, Dave Bunk on Colorado fluorite, Phil Simmons on New Mexico fluorite, Jared Freiberg on Illinois fluorite, Ryan Bowling on Alpine fluorite), but there were also learned lectures on other topics, and a panel discussion, called “A Royal Gathering,” wherein directors of some major museums discoursed on their mineralogical holdings.

In short, Denver 2021 was a large, diverse, full-blown, major mineral show in a brand-new expanded setting which bids fair to expand further in future years. It was also a large taste of welcome liberation after more than a year of pandemic shutdown. Yes, everybody still had to wear masks in the indoor venues, and the need for some “social distancing” still had to be kept in mind . . . but just wait until next year. Indeed, just wait for Munich 2021 and Tucson 2022, from which locales I’ll be reporting next.



Munich Show 2021

by Thomas P. Moore

[October 20–October 24]

To open this report by stating the obvious: it was wonderful, *wunderbar, herrlich*, great, liberating, etc., to be returning to Munich in 2021, the more so since I’d missed doing so in 2020, the Covid pandemic having shut down the Munich Show along with so many other worthy worldwide proceedings during that year. Here, though, I won’t dilate further on the thrill and nostalgia of coming once more into the *Marienplatz*, in the heart of downtown, in the russet chill of late October, to head for my familiar hotel: I’ve described all of this before, and have enthused on the general charms and attractions of Munich often enough before. It seems better this time to echo the theme of Change which begins the preceding report on the 2021 Denver Show and sketch what, for better or worse, was *different* this time, not so much about timeless Munich but about the “Munich” which constitutes the second-greatest annual mineral show in the world.

This time, for one thing, my daughter Alexey and her friend James came with me, partly to help in setting up the *Mineralogical Record* stand at the show and tearing it down on the final day, but mostly (in James’s case) as an eager tourist who’d never been to Europe before, and (in Alexey’s case) to step as a grownup into that Heraclitean river of change invoked in the Denver report. She was born in Germany and lived there until she was 12, and now she is 42, and in Munich she met up again with an old playmate whom she’d not seen since both of them were about 8. Interminably they laughed and chattered, murdering each other’s languages, and I listened approvingly while Alexey, without even trying too hard, recovered significant bits and sounds of her long-dormant German while our party dined on excellent Indian food at a *new* restaurant that had not been there, near the hotel, just two years before. Another, somewhat bemused participant in these festivities was *Mineralogical Record* editor Chris Stefano, also a newbie in Europe. Chris did a fine job of running the *Mineralogical Record* table at the Show while also taking photos of specimens for this report (as did Mark Mauthner—thank you, Mark), and afterwards he went on to tour the Freiberg museums.

Likewise the Show itself had changed—being only slightly diminished from past years while remaining no less an enormous, wondrous event for the mineral-minded. In past years there have



Figure 36. Kolwezite pseudomorphs after cuprite on cobalt-rich calcite, 5 cm, from the Kakanda mine, Democratic Republic of the Congo. Christophe Gobin specimen; Chris Stefano photo.

Figure 37. Native copper, 6.5 cm, from the Kalukuluku copper mine (formerly known as the L'Etoile du Congo or "Star of the Congo" mine near Lubumbashi), Katanga, Democratic Republic of Congo. Frederic Escaut specimen; Chris Stefano photo.

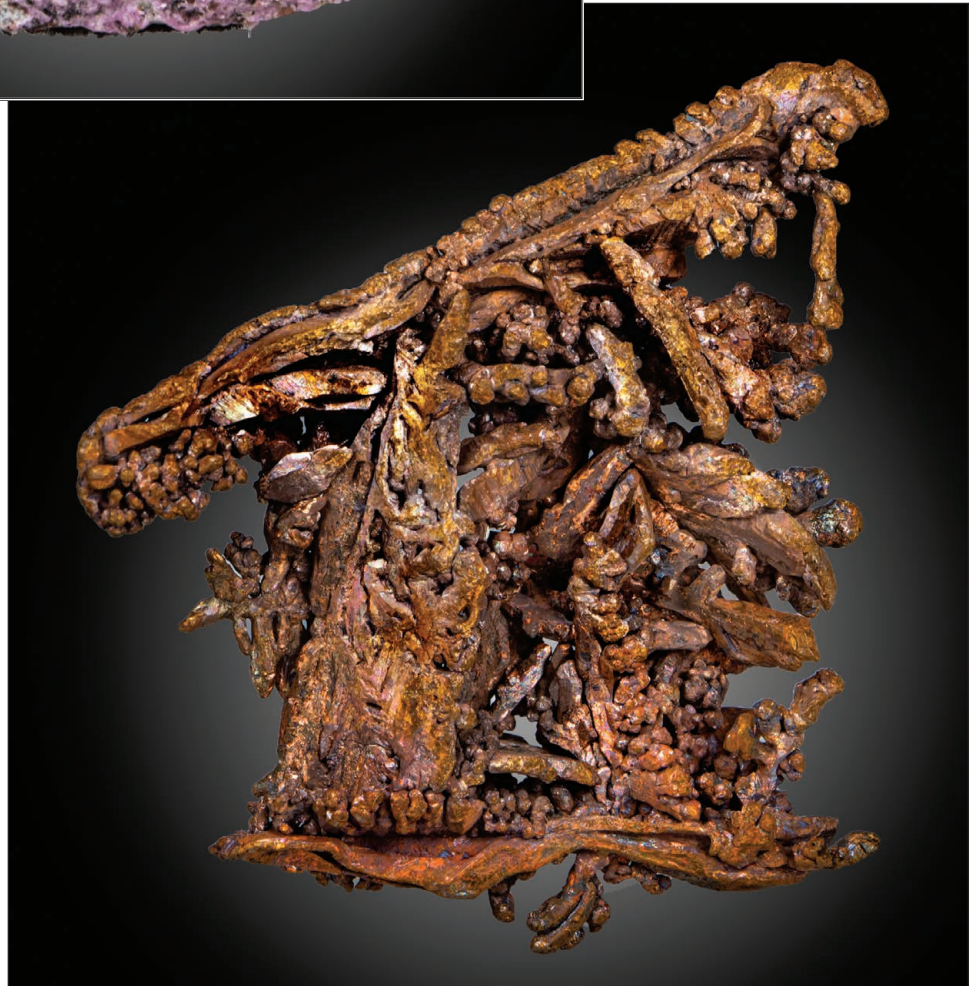




Figure 41. Viitaniemiite crystals, 8 cm, from the Chappu mine, Braldu, Shigar Valley, Skardu district, Gilgit-Baltistan, Pakistan. Ghulam Mustafa (*Fine Art Minerals*) specimen; Chris Stefano photo.



Figure 43. Calcite crystal group, 8.5 cm, from Gunung Keriang, Alor Star, Kedah State, Malaysia. *Spirifer Minerals* specimen; Mark Mauthner photo.



Figure 42. Heulandite crystal colored red by hematite, on matrix, 8.5 cm, from near the town of Ashish, Jalgaon district, Maharashtra, India. Mohammad Kamran (*Kohinoor Gems*) specimen; Chris Stefano photo.



THE MUSEUM DIRECTORY

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Tel: (406) 496-4159
E-mail: JMetesh@mtech.edu
Assistant Curator: John Foley
Tel: (406) 496-4414
E-mail: jfoley@mtech.edu
Website: <http://www.mbm.mtech.edu/museum/museum.asp>
Montana Bureau of Mines and Geology
Montana Tech of U. of Montana
1300 W. Park St.
Butte, MT 59701
Hours: June 15 to September 15:
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Website: www.tellusmuseum.org
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Tel. (770) 606-5700 Ext. 401
E-mail: joses@tellusmuseum.org
Director of Curatorial Services:
Amy Gramsey
Tel. (770) 606-5700 Ext. 405
100 Tellus Drive
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E-mail: kcole@stetson.edu
234 East Michigan Avenue
DeLand, FL 32723
[mailing: 421 N. Woodland Blvd.,
Unit 8401]
Website: www.stetson.edu/gillespie/
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Fallbrook Gem & Mineral Society Museum

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E-mail: fgms@sbcglobal.net
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E-mail: benitoitebandit@gmail.com
Assistant Curator: Gina Palculich
E-mail: theyellowhouseca@yahoo.com
123 W. Alvarado St. Ste. B
Fallbrook, CA 92028
Hours: 11 AM–3 PM Thurs., Fri., Sat.
or by special appointment
Specialties: San Diego County, California
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Mines Museum of Earth Science

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E-mail: rflafler@mines.edu
Operations Director: Daniel Schlegel, Jr.
Tel: (303) 283-2071
E-mail: dschlegel@mines.edu
Curator: Ed Raines
Tel: (303) 384-2041
E-mail: eraines@mines.edu
Website: www.mines.edu/academic/geology/museum.com
Tel: (303) 273-3815
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Curator: Angela Piller
Tel: (503) 647-2418
E-mail: curator@ricenorthwestmuseum.org
Website: www.ricenorthwestmuseum.org
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Tel: (906) 487-2572
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THE MUSEUM DIRECTORY

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E-mail: murowchickj@umkc.edu
Richard J. Gentile, Professor Emeritus
E-mail: gentiler@umkc.edu
Website: <https://cas.umkc.edu/geosciences/opportunities/geosciences-museum/>
Department of Geosciences
University of Missouri-Kansas City
5110 Rockhill Road
Kansas City, MO 64110
816 235-1334 geosciences@umkc.edu
Sutton Geosciences Museum (new location)
Miller Nichols Library, 3rd Floor
800 East 51st Street
Kansas City, MO 64110
Hours: 9-5 weekdays when classes are in session
By appointment-- call 816 235-1334
Specialties: Missouri minerals, cephalopods, petrified wood, worldwide minerals

California State Mining and Mineral Museum

Curator: Darci Moore
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Fax: (209) 966-3597
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Mailing: P.O. Box 1192
Mariposa, CA 95338
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Oct. 1-April 30, open 10-4, closed Tuesdays
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Executive Director: Kathy Shannon
Tel: (432) 683-4403
E-mail: kshannon@petroleummuseum.org
Website: www.petroleummuseum.org
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New Mexico Bureau of Geology & Mineral Resources Mineral Museum

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Director and Sr. Mineralogist:
Dr. Virgil W. Lueth
Tel: (575) 835-5140
E-mail: Virgil.Lueth@nmt.edu
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E-mail: Kelsey.McNamara@nmt.edu
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