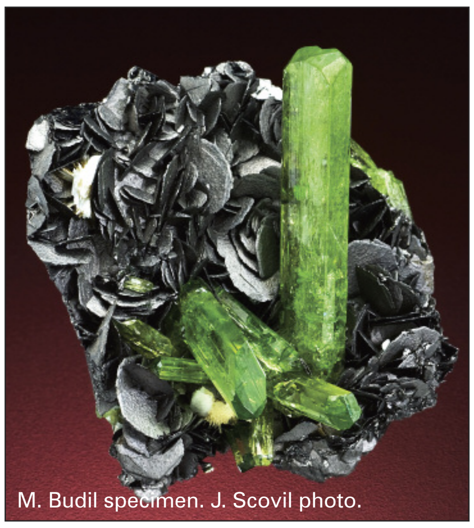
MINERALS

ISSUE #3 THE COLLECTOR'S NEWSPAPER 2011



M. Budil specimen. J. Scovil photo.

In this issue also:

Collector interview: Adalberto Giazotto (Italy)

This time our Collector Interview is with one of the best and most famous European collectors: Adalberto Giazotto from Italy. Adalberto has been building his collection for the last half a century. He has concentrated on large, if not huge, specimens of the highest possible quality. All collectors know how difficult it is to find a perfect, damage-free specimen, and we can only imagine how difficult it is to find huge specimens which are not only perfect, but aesthetic, too!

Read on page 21

Journal presentations: The Mineralogical Record

The Mineralogical Record is an international journal for mineral collectors – beginners to advanced, mineral museum curators, dealers in mineral specimens, and specimen-oriented mineralogists. Two-thirds of the subscribers are from the U.S. and Canada; one third are from Europe and other countries.

The magazine is issued six times a year (averaging roughly 750 pages per year, printed on glossy high-quality paper) ...

Read on page 19

S. Rudolph specimen. J. Scovil photo.

Editors:
Tomasz Praszkier (Poland)
Scott Werschky (USA)

Associated photographer:
Jeff Scovil (USA)

Contact:
tom@spiriferminerals.com

Golden calcites from Malmberget

Peter LYCKBERG

P. Lyckberg photo.

The author in the Butterfly Twin Pocket, 1989. Malmberget mine, Sweden.

INTRODUCTION

One of the least known finds of world class minerals in Europe was made in an iron mine in the polar region of northernmost Sweden two decades ago. The Malmberget mine located near Gällivare, Lappland, Sweden has produced a number of well crystallized minerals since the end of the 19th century. Since the 1980's, numerous exceptional specimens have been found, and the author was fortunate to participate in the extraction of many of the crystals. Credit for the preservation of specimens during several decades of mining goes to miner Kenneth Holmgren. Of course this was only possible because of the positive attitude toward collecting held by the mining company – LKAB.

In 1982 a pocket with exceptional green fluorites was found and then in 1988-89 two extraordinary pockets with golden calcite crystals were discovered. Specimens from these finds are very rare on the market and at the same time highly sought-after by mineral collectors around the world.

GEOLOGY

Northern Sweden has several of the world's largest and richest magmatic

Continiued on page 14

Benitoite Gem mine, USA

John VEEVAERT

J. Scovil photo.

Benitoite on natrolite, 3.7 cm high, Benitoite Gem mine. A. Seibel specimen.

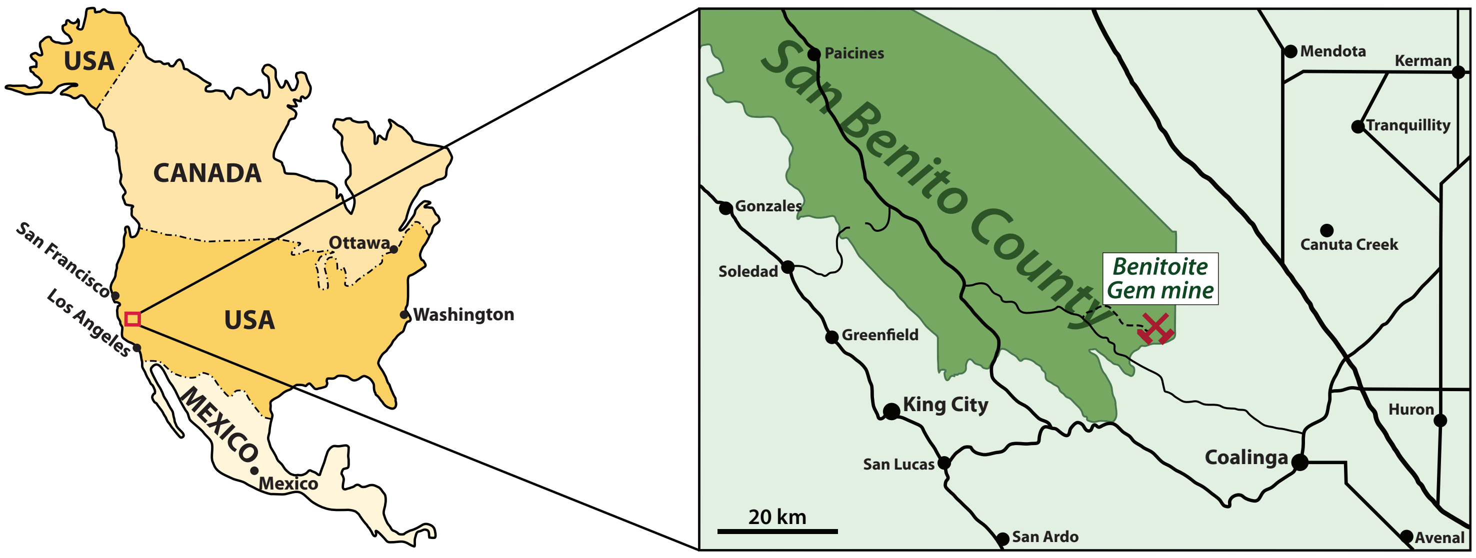
INTRODUCTION

Benitoite – almost every mineral collector desires to have a specimen of this unique blue mineral. Aside from a few small nearby deposits, only the Benitoite Gem mine has commercially produced gem quality benitoite and specimens of stunning beauty. Since its discovery in 1907, literally tens of thousands of benitoite and neptunite specimens have been produced. It is a slow and involved process to remove the encasing natrolite with various chemicals but the effort is well worth it to uncover the mineral heritage from one of the most unique mineral deposits in the world. The State of California recognized the significance of this distinctive mineral by declaring it to be the Official State Gemstone of California. On October 1, 1985 in Sacramento, California, the State legislature passed Assembly Bill No. 2357. The text was simple, but it was everything that everyone who knew anything about benitoite had ever hoped for. Section 425.3 is added to the Government code to read: *Benitoite is the official state gemstone of California.*

LOCATION

The Benitoite Gem mine, formerly known as the Dallas Gem mine, is situated near the southern tip of San Benito County about 30 km to the north and west of Coalinga, California. The town of King City lies about 45 km to the west of the mine. In a broader sense the mine lies about half way between San Francisco and Los Angeles. The stereotype of California usually involves visions of endless beaches, and lots of people. This section of California however, is considered remote by just about any standard imaginable. Few roads and no amenities that most people are used to can be found within 30 km in any direction. The only way to get near the mine, other than by a privately owned chip sealed road, is via a bumpy dirt road with several unimproved stream crossings. Travel in the winter time is nearly impossible due to snow and very slick, muddy roads. The mine is positioned just upslope of the San Benito River at an altitude of 1,380 meters.

The coastal mountains between San Francisco and Los Angeles are expansive and for the most part even today, empty of any human development other than ranches and a few small towns and roads which transect them. Imagine the difficulty in accessing this region in 1907, the year benitoite was discovered, when there were no roads and the only means of moving through the area was on foot. The vegetation in the area consists of very thick chaparral that is seemingly impossible to walk through yet that was the task set in front of James Couch as he left Coalinga to prospect the area in southern San Benito County for new mercury deposits in early February, 1907.



Map of USA with location of the Benitoite Gem mine, and inset showing detail of the mine area.

Plate from Louderback paper published in 1909. Photo of mine area one year after discovery. Arrows shows limit of mineralization.

HISTORY OF THE DEPOSIT

James Marshall Couch had been grubstaked by Roderick Dallas and Thomas Sanders with $50 worth of supplies and a horse. It was mid-winter when Couch set out, so there was likely some cold weather to contend with as he made his way into the headwaters of the San Benito River looking for traces of minerals eroding out of the adjacent hills. It is reported in several sources that he found a forested glade along the small river and made camp after having been prospecting for several weeks. This offered him a flat place with grass feed for his horse, and plenty of firewood for himself to keep warm during the long cold nights.

Mining in the Dallas Gem mine in 1908. Photo was published in Louderback's paper, 1909.

Accounts of the discovery report that on February 22, 1907 Couch climbed the hill across from his camp to look for possible outcrops to investigate. On his way up the slope he stumbled upon a small area literally littered with myriads of small dark blue crystals. He initially suspected the crystals to be diamonds or sapphires owing to the blue color and set about to collect a small hoard then raced back to Coalinga to announce his discovery. It is possible that the Native Americans who inhabited this region may have seen this deposit at some point in the distant past on a hunting trip but as far as Couch could tell no one had ever been to this spot before. Imagine this outcrop weathering for millennia with no one knowing of its existence and then being the first person to have ever seen this rich blue mineral laying in abundance on the ground! Credit for the discovery was taken by other people, primarily Roderick Dallas and another fellow by the name of Leland Hawkins, but sifting through the historical records suggests that Couch was the sole discoverer of the deposit.

It did not take long for the area to be legally claimed and mining to commence. The claim was given the name of Dallas Gem mine in recognition of the financial backing provided by Dallas for the operation. Still, none of the characters involved knew what it was that they were mining. Speculation centered on the crystals being sapphire or spinel or even some form of volcanic glass. Later in 1907 a small group of specimens found their way to Dr. George Louderback who was professor of mineralogy at the University of California, Berkeley. Louderback quickly recognized that this blue mineral was new to science. He also thought that the accompanying dark black mineral associated with the blue mineral, was also new to science. He set out to publish a preliminary note in July 1907 on the new species and tentatively called the blue mineral benitoite named after San Benito County and the San Benito River. He suggested that the black mineral be named carlosite after the nearby San Carlos Peak. Later in 1907 Louderback determined that carlosite was in fact neptunite – a mineral which had been discovered in 1893 in Greenland.

After securing more specimens and having a chance to actually go to the mine site Louderback commenced to formally describe the new mineral benitoite. Many people consider this one of the finest descriptions of a new mineral species ever written. It was published in 1909 with the chemical analyses being completed by Walter Blasedale. All of the hand-colored copies were quickly dispersed to universities and mineralogists around the globe.

Initial recovery of benitoite consisted of breaking open the encasing natrolite by sledge to find the gem nodules.

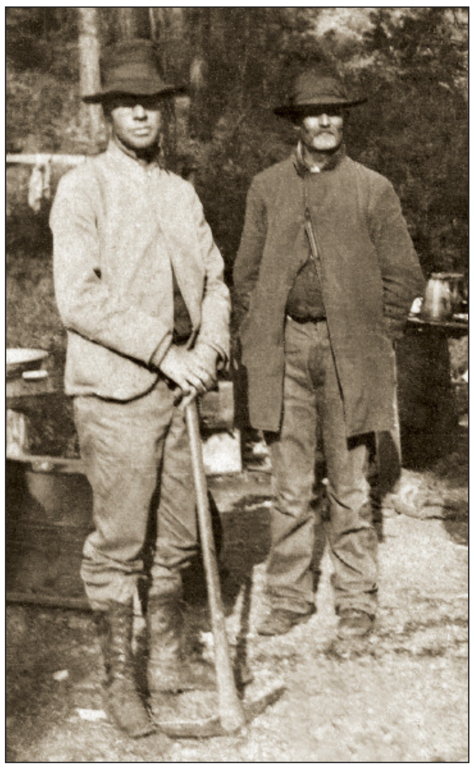


Photo taken in the Dallas Gem mine in 1907 showing Roderic Dallas (left), first owner of the mine, and James Couch (right), discoverer of the deposit. Photo courtesy of Collector's Edge.

Perhaps hundreds or even thousands of stunning specimens were lost through this method. It did not take long however, for the miners to learn that natrolite was soluble in various acids. It must have been quite a scene to see hundreds of kilos of natrolite veins in acid to expose

Cabin at Dallas Gem mine built during the summer 1907 for $35. Mine team with riffles and pistols. James Couch is second from the left. Photo courtesy of Collector's Edge.

Entrance to the 50 meters long adit in 1908. Note camp dog – Fritz. Photo courtesy of Collector's Edge.

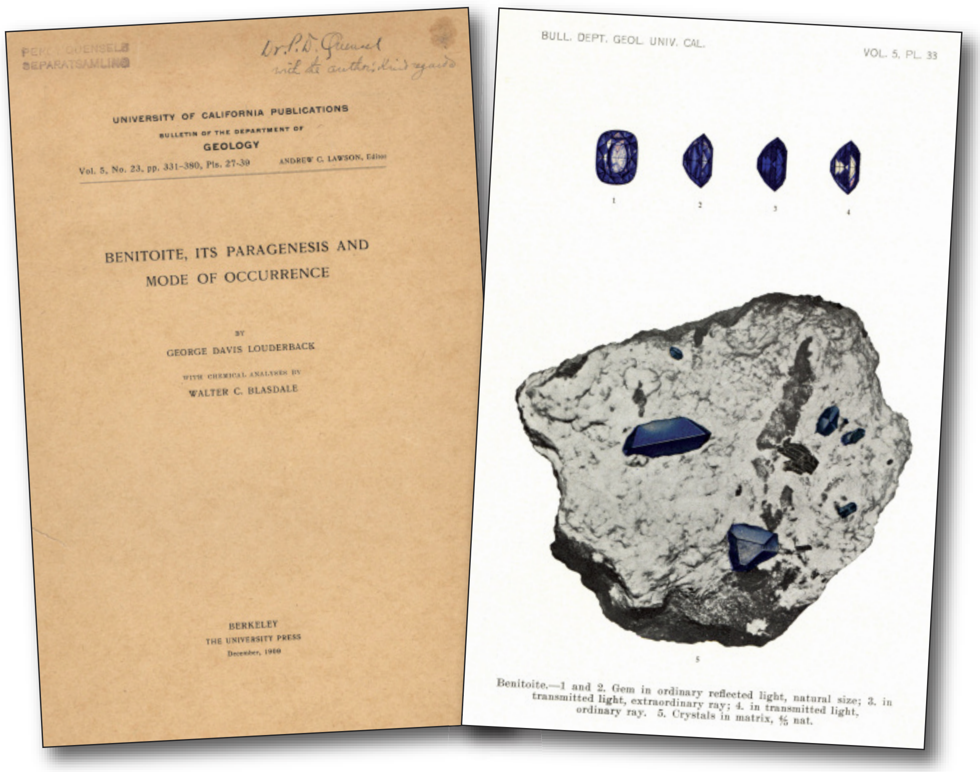
the enclosed benitoite crystals. Today, acids and other chemicals are used to prepare specimens and recover gem rough. However, greater care and effort are taken to clean aesthetic specimens by trimming excess matrix and protecting some of the natrolite which provides a striking contrast with both benitoite and neptunite.

The Dallas operation of the mine went on until 1910. At that time operations ceased and the mine was abandoned. Dallas, however, maintained the assessment work on the claim and was able to patent the ground securing permanent control over the deposit. From then until the 1960's the Dallas family leased to the property to various operators who recovered specimens and gem rough. Perhaps most noteworthy of this group were Pete Bancroft and Ed Swoboda who visited the mine several times between 1935 and 1938 collecting thousands of specimens. In the 1930s it was still no small task to get to this remote location. In 1935 they set out to visit the deposit after having been given directions to the locality from their high school teacher, Frank Gulick, who had actively collected at the deposit the year before in 1934. For an interesting view of the mine's history, check out the interview between Bancroft and Swoboda at: *www.bluecapproductions.com/benitoite*.

From the 1940s until 1967 the deposit was leased by several people with varying levels of production. Most notably Miller Hotchkiss in 1952, Clarence Cole from 1953 to 1967, and Josephine Scripps, sub-leased from Cole, in 1966. Their efforts were modest in terms of overall production.

In 1967 Elvis "Buzz" Gray and Bill Forrest leased the property. They were experienced operators and set about to rehabilitate the mine site and develop a logical mining plan for the deposit. Their efforts produced thousands of good specimens and considerable gem rough. It was also their effort to promote benitoite as a gemstone that raised the awareness such that California designated the mineral as the official gemstone of California in 1985. They bought the mine in 1987 from the Dallas family, and continued mining operations until 2000. Frequently seen at the mine was Fresno County Sheriff's Deputy Bob Kahl. Bob was there to lend some security to Bill and Buzz and also to help out as needed.

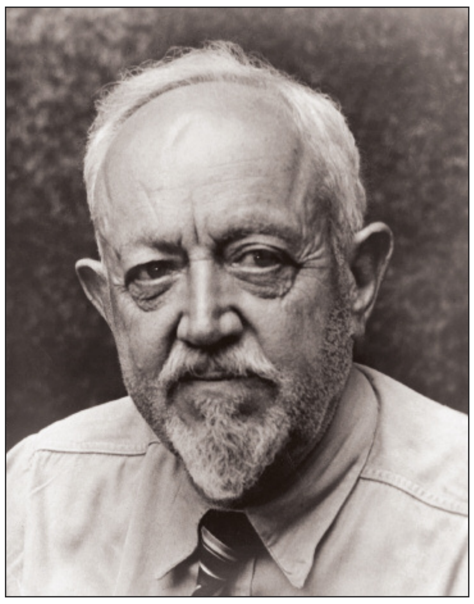
Stock certificate for 10 shares in the Dallas Mining Company dated on February 1907. Courtesy of Collector's Edge.



Cover and color-plate from principal work about benitoites "Benitoite, its paragenesis and mode of occurrence" by G. Louderback, 1909. Courtesy of J. Veevaert.

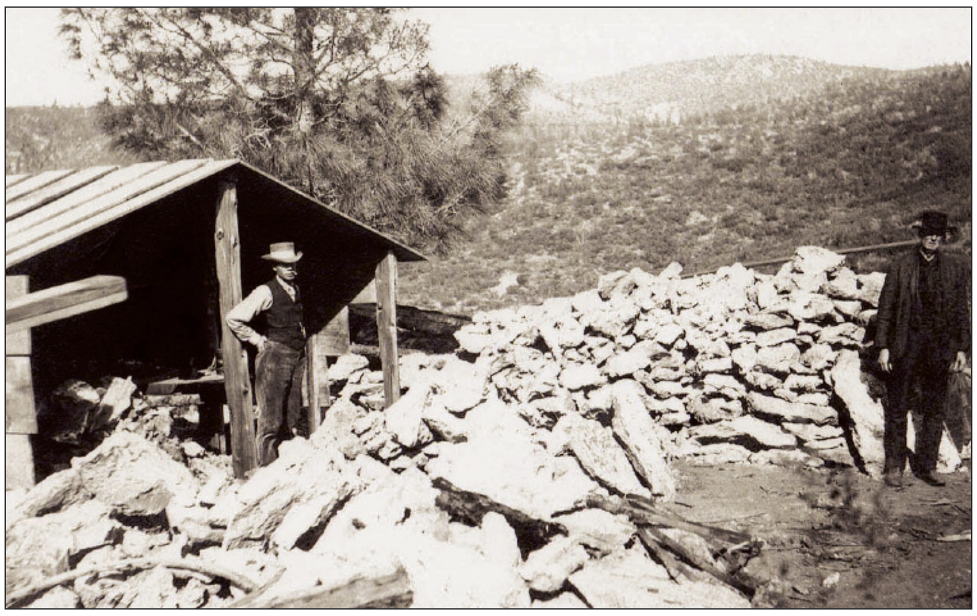
In 2001 Gray and Forrest sold the mine to The Collector's Edge of Denver, Colorado. Bryan Lees, the principal owner of the company, oversaw a complete and thorough mining of the remaining deposit. He exposed the original vein system and found that it had been completely worked out. His operation also ran the entire dump material through a custom jig system to separate gem rough. He then set out to process the colluvial and eluvial material that had eroded from the original deposit over the millennia. A conveyor belt also carried larger rocks off and each, while wet, was visually inspected for specimen potential. His operation produced many tons of specimen grade material and thousands of carats of gem rough. The mine site was completely rehabilitated according to Surface Mining and Reclamation Act standards in 2004.

Bryan Lees sold the mine to Dave Schreiner of Coalinga in 2004. Dave was determined to create a fee dig operation there, but has been hindered with environmental regulations set by the Environmental Protection Agency and Bureau of Land Management due to the presence of naturally occurring asbestos. Reckless all-terrain vehicle and motorcycle operators over the last 50 years have created enormous erosional problems as well, so the agencies established a closure of the area to all vehicular traffic allowing access only to private property owners and valid claim holders. For the past several years Dave has been trucking material from the mine to the Los Gatos Community park just outside of Coalinga and allowing people to screen the material for gem rough and specimen material. The opportunity to find specimen material or gem rough at the mine site does not currently exist unless groups access the mine via the private chip sealed road. Even then, the previous mining efforts by Collector's Edge left very little material behind.



Professor George Louderback, mineralogist who did the original descriptive work on benitoites in 1907.

Despite the effective mining techniques used by The Collector's Edge, a minor amount of productive material still remains. The mud adhering to much of the material is tenacious and nearly impossible to remove without repeated wetting and abrasion. This masking mud allowed considerable material to pass through the washing system undetected



Stockpile of benitoite-rich natrolite veins at the mine in 1908. At this time etching of specimens was not use, and not many specimens survived mechanical preparation... Photo courtesy of Collector's Edge.

Peter Bancroft at the Dallas Gem mine in 1938 with stock of benitoite specimens. Photo courtesy of Ed Swoboda.


Workings at the Benitoite Gem mine around 2000. M. Gray photo.


Mine workings in October 2003. J. Bean photo.


Extended workings at the mine around 2004. Collector's Edge photo.


Recent satellite image of the mine area after reclamation. Image bing.com.

and was eventually used in the reclamation work. Hence, some of this mineralized material will continue to be found through the action of rain and intense field collector interest. The mine, however, will never again produce at a commercial scale.

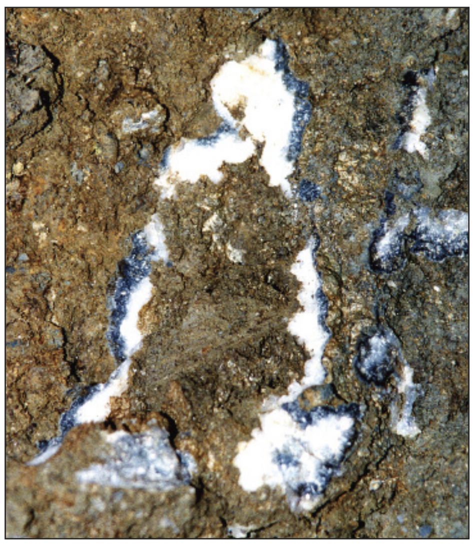
In 2008 John Veevaert of Weaverville, California (author) and Steve Perry of Davis, California negotiated purchase of the entire nine-plus ton of inventory of benitoite specimens, partially processed, and unprocessed run-of-mine material from The Collector's Edge. Rough, unfinished material has been made available for purchase by collectors to try their hand at cleaning their own specimens. Perry and Veevaert are also processing material for specimens and gem rough.

THE GEOLOGY OF THE AREA

The Benitoite Gem mine is located in the New Idria mining district situated in the southern end of the Diablo Range. The district has been prospected since the early 1850's for gold, mercury, chromium, asbestos and mineral specimens. The district covers a large body of serpentinite which was tectonically emplaced into surrounding sedimentary and metamorphic rocks in the Jurassic period. A subsequent plate collision put downward pressure on the serpentinite. However, being of a lighter density, portions separated and migrated upward through the overlying layers of rock. This established the foundation for a setting where these portions of serpentinite would experience the low temperature and high pressure metamorphism known as blue schist facies. During the mid Miocene the region was intruded by small igneous bodies, primarily of syenitic composition. This produced numerous calc-silicate vein systems throughout the district. It was one of these systems, altering the blue schist rock, that deposited the mineralization found at the Benitoite Gem mine.

ORIGIN AND STYLE
OF MINERALIZATION

The elements that comprise benitoite are thought to have been mobilized from the host rock and deposited during the late stage cooling of hydrothermal fluids in calc-silicate veins fracturing the wall rock of blue schist blocks. Other nearby benitoite deposits have a similar setting bearing out the hypothesis. Previous geologic investigations have suggested that the benitoite mineralization was subsequent to the formation of the blueschist. Their analyses place the age of the blueschist at between 100 and 160 million years of age and the benitoite present in the cross cutting calc


Unique photo showing benitoite-rich natrolite vein in situ. Collector's Edge photo.


Big boulders with natrolite and benitoite veins. M. Gray photo.

Photo sequence showing stages of preparation from rough rock to finished specimen, size 7.5 cm. Specimen and photos J. Veevaert.

silicate veins at approximately 12 million years. All benitoite in situ at the Benitoite Gem mine is confined to blueschist blocks altered by hydrothermal veins. The last phase of mineralization consisted of a pulse of natrolite that deposited within the vein system. The vein-filling natrolite is found to encase most, but not all, of the minerals deposited in the earlier phases. The upper zone of the Benitoite Gem mine has a large concentration of albite veins and is devoid of natrolite. It is in this upper zone that rich, deep blue and lustrous crystals of benitoite were found commingled with milky white albite.

Most of the natrolite veins are less than 2 cm thick. The minerals of interest at the mine are confined to the vein systems and frequently are attached to both vein walls. This creates an obvious problem during specimen preparation as one side of the vein has to be mechanically removed to permit a chance at producing a specimen.

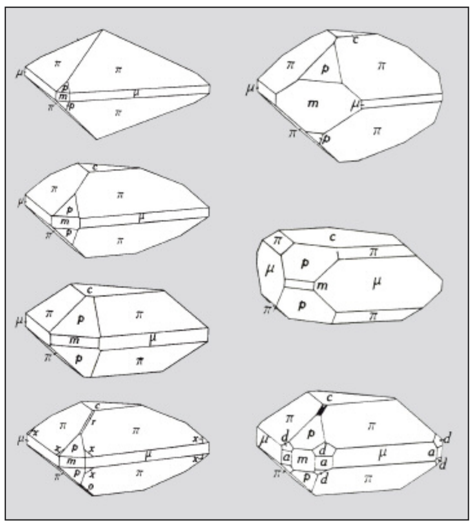
Though the lower level portions of the vein system were typically filled with natrolite, some pockets were left intact. These pockets typically display blocky natrolite crystals and in some cases neptunite and benitoite crystals are still exposed. The size of these pockets is generally quite small, rarely exceeding 2 cm in size. As mentioned earlier, the upper zone is devoid of natrolite. All minerals found in that zone tend to be hidden only by clay minerals which can be easily removed with water. Although pocket zones were still not large, and mineralization was much more scattered in the upper zone, the crystal quality of benitoite and joaquinite is much higher not having been subjected to the natrolite-bearing solutions.

MINERALS FROM
THE BENITOITE GEM MINE

Benitoite (TL) – $BaTiSi_3O_9$

Benitoite is the primary mineral of interest from this deposit. It is a ring silicate and crystallizes in the hexagonal crystal system. Early in the theoretical development of crystallography it was hypothesized that there was a class of the hexagonal system that would produce trigonally shaped crystals. The discovery of benitoite provided the mineral world with the first species known to crystallize in the ditrigonal-dipyramidal class of the hexagonal crystal system. This class is referred to as the "Benitoite Type" in Dana. Twinning of benitoite occurs as 180 degree rotation about the c-axis (0001). An equidimensional twinned crystal is referd to as a "Star of David" owing to its perfect six sided star. Twinning has only been found in benitoite crystals included with crossite. Complete crystals of this form are very rare.

Benitoite is found in two classes at the mine – as euhedral, floater crystals heavily included with amphibole minerals (commonly referred to as "rockies"), and as crystals firmly attached to the vein walls. It is from rocks of the latter class that the best gem benitoite has been recovered. The crystal faces of benitoite were selectively etched during the natrolite phase of mineralization. Rare examples of crystals exist with all brilliantly lustrous faces, but in most benitoite the c face and prism faces retained their luster while the pyramidal faces be-



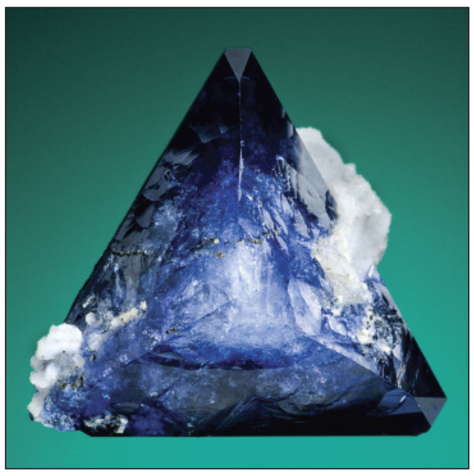
Crystallographic drawings showing the various crystal habits and forms of benitoite. From Louderback, 1909.

came duller due to etching during the natrolite mineralization. The average crystal sizes for non-included benitoite is between 0.5 and 1.0 cm. Crystals over 2 cm across are considered large and any crystal over 3 cm across is consid-

Group of benitoite crystals showing different forms, size up to 4.5 cm. B. Gray specimens. J. Scovil photo.

ered to be very large (and exceedingly rare). Crystals with crossite inclusions can be quite large at up to 5-6 cm across but the crystal form is typically mottled in crystals greater than 2-3 cm.

Not all benitoites are the same color. While the more popular color is a rich sapphire blue with a hint of violet, benitoite may also be clear, white, pink, reddish brown or greenish-gray colors as well. The origin of the color of benitoite has not been completely determined as of yet. The chemical compound does contain traces of iron, hence it has been proposed that color may be due to the Fe^{2+}:Ti^{4+} or the Fe^{2+}:Fe^{3+} intervalance charge transfer. Joan Mamarella (personal communication 1997) suggests in her thesis that the blue color is derived from the titanium in the blue portions of the crystals being paramagnetic while the titanium in the white portions are diamagnetic. Benitoite is also frequently found as gray to greenish colored crystals with very dense inclusions of crossite. The vast majority



Superb, lustrous (probably free growing) benitoite crystal, 2.5 cm wide. J. Sigerman specimen. J. Scovil photo.

of crossite included crystals are floaters with complete terminations on both ends. Some crystals of benitoite appear red to dark maroon due to inclusions of minute neptunite crystals. Pink crystals of benitoite have been found at the Mine Numero Uno situated several kilometers from the Benitoite Gem mine. The origin of this color is unknown.

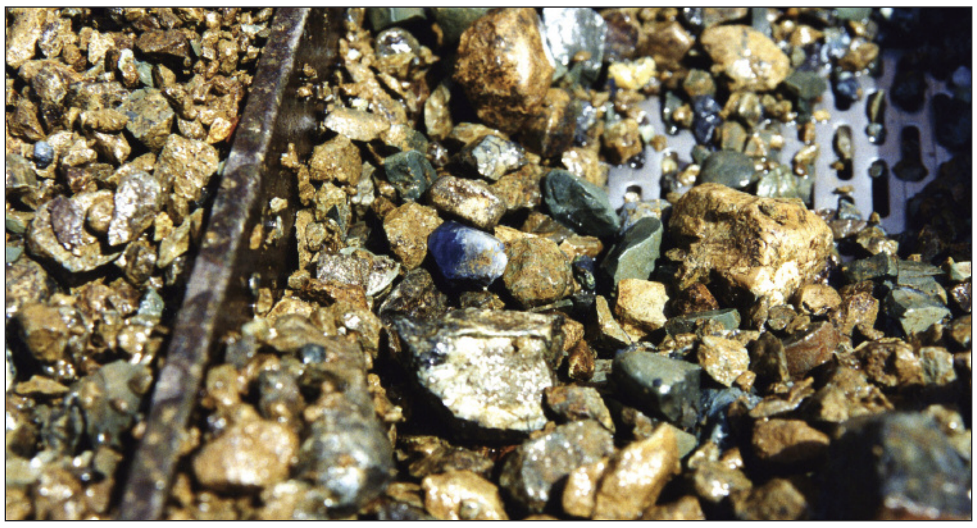
Benitoite crystal, 1.2 cm wide. M. Chinellato specimen and photo.

Benitoite is very strongly dichroic such that when placed in the proper orientation it looks either colorless, blue, or rich violet-blue in color. Benitoite has a high birefringence, higher than that

Twinned benitoite crystals up to 3.3 cm. B. Gray specimens. J. Scovil photo.


System for washing and sorting gem crystals from dumps. Collector's Edge photo.


Buzz Gray operating the washer to remove mud. M. Gray photo.




Bryan Lees watching for specimens and gem rough on conveyor belt. Next step was hand sorting gem crystals and fragments after washing. Last photo shows freshly collected gem crystals. Collector's Edge photos.


Benitoite gemstones (to 1.66 cts) showing different colors. B. Gray coll. J. Scovil photo.


Benitoite gemstones up to 1.43 cts. Collector's Edge specimens. J. Scovil photo.

Benitoite crystals with 1.43 ct gemstone. Collector's Edge specimens. J. Scovil photo.

Benitoite gemstones up to 5.53 cts. B. Gray specimen. J. Scovil photo.

of diamond. Hence, cut stones come alive with fire from refracted light. The blue color of benitoite is not affected by any treatment such as heat or irradiation, although the colorless sections of a benitoite crystal have been changed to orange when heated (Bill Forrest personal communication 2002).

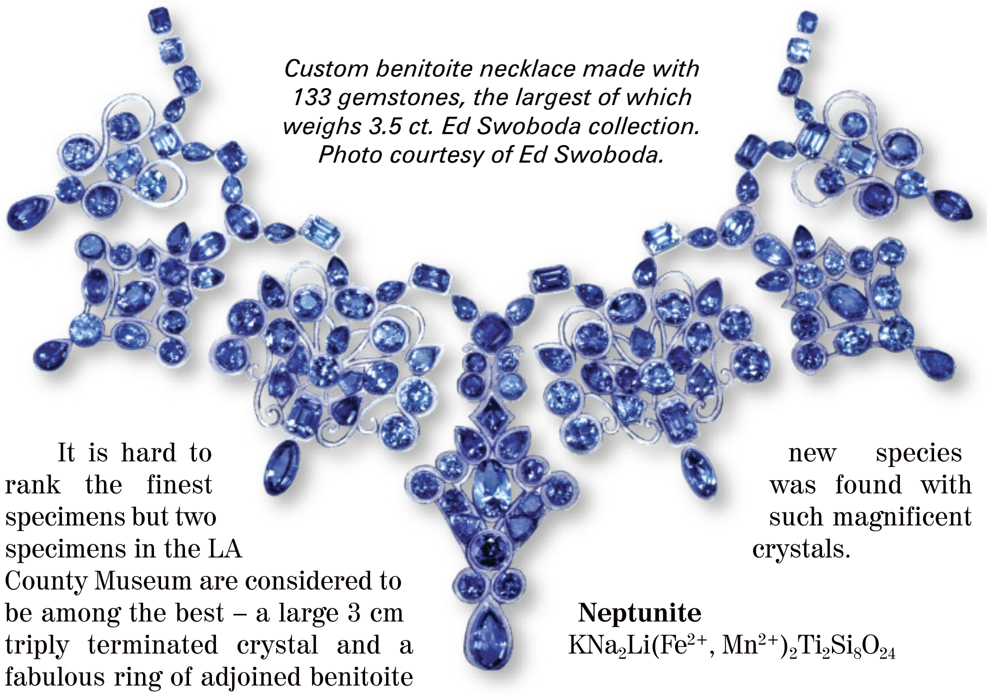
Benitoite is strongly reactive under short wave ultraviolet light radiation. It fluoresces a very bright, opaque, sky blue color. The fluorescence appears to be stronger in crystals with crossite inclusions than crystals of gem quality. Some crystals fluoresce a dull reddish orange color under long wave ultraviolet light. The strong reaction under short wave UV light is a very useful exploration tool for locating specimens

Gemmy benitoite crystal 8 mm wide. AM Mizunaka specimen and photo.

at the mine, and for prospecting. The natural fluorescence is also important as it adds to brilliance of finished gemstones in sunlight.

The primary use of benitoite is as specimens for mineral collectors and use as an ornamental gemstone. Though not well suited for use in rings due to its hardness of only 6.5, it is dazzling in pendants, earrings and necklaces. The vast majority of finished gems are under 0.5 carat weight. Gems over 1 carat are rare and gems over 2 carats are considered very rare. The largest known piece of rough recovered was a 34 carat piece found by the current owner Dave Schreiner shortly after he acquired the mine from The Collector's Edge, Inc. It produced a finished stone of over 8 carats and several smaller stones. The largest known faceted benitoite is owned by Mike Scott and is a 15.42 ct stone. The prices of finished gemstones have skyrocketed in recent years. As a gemstone, benitoite is orders of magnitude scarcer than diamonds, emeralds or rubies. High quality finished stones of one carat with good clarity and color will command prices of $3,000 or more. Stones of two carats can bring $8,000-$10,000. Values should continue to appreciate in the future as supply is limited and additional commercial production is not feasible.

Benitoite crystal with gemstones. Collector's Edge specimens. Van Pelt photo.



Custom benitoite necklace made with 133 gemstones, the largest of which weighs 3.5 ct. Ed Swoboda collection. Photo courtesy of Ed Swoboda.

It is hard to rank the finest specimens but two specimens in the LA County Museum are considered to be among the best – a large 3 cm triply terminated crystal and a fabulous ring of adjoined benitoite crystals. A smaller specimen in the author's personal collection is considered one of the finest with the three species – benitoite, neptunite and joaquinite arranged in an aesthetic position. It was dubbed the "Sushi Plate" by Bryan Lees of Collector's Edge.

Most new minerals discovered in the last 100 years have been as a result of some unusual diffraction pattern in an X-Ray analysis or as some microscopic crystals that could only be appreciated under a scanning electron microscope. Benitoite caused an immediate sensation with its large well-formed crystals accompanied by equally striking crystals of neptunite and joaquinite. There have been few occasions in the history of mineral discoveries where a new species was found with such magnificent crystals.

Neptunite

$KNa_2Li(Fe^{2+}, Mn^{2+})_2Ti_2Si_8O_{24}$

The Benitoite Gem mine has produced the world's finest known crystals of neptunite. It is by far the most abundant mineral aside from Natrolite in the deposit. Neptunite is about ten times more plentiful than benitoite. The principle habit is prismatic though some stubby crystals are known. At a macro scale neptunite appears to be jet black in color. It is actually a deep red color which is seen at certain angles in large crystals or in micro crystals where light can pass through it. It also

Stibiotantalite pendant with benitoites, 4.5 cm high. B. Gray coll. J. Scovil photo.

appears reddish brown in color when heavily included with crossite. Neptunite forms two types of twins. The most common is a twin on (301). The rarest twin is that found on (001). There are probably no more than eight or nine of these known. Crystal sizes for neptunite range from micros to an average of 2-3 cm. Crystals as large as 10 cm are known. Large plates to 1 meter across exist of neptunite crystals exposed from natrolite.

Joaquinite–Ce (TL) – $NaFeBa_2Ce_2(Ti,Nb)_2[Si_4O_{12}]_2O_2(OH,F) \bullet (H_2O)$

Joaquinite was first discovered at the Benitoite Gem mine. It is by far the most complex mineral found in terms of chemistry. Two other species have been delineated which include strontiojoaquinite and barrio-orthojoaquinite. In the latter two, niobium and cerium are absent. The strontium to barium ratios determine which species it is. Most of the joaquinite found at the deposit are 3 mm or less in size and have a honey to cinnamon color. Several crystals are known to exceed 4 mm. Joaquinite, a monoclinic mineral, was originally thought to crystallize in the orthorhombic system. However, later work determined that twinning on 001 created the orthorhombic crystal shape.

Jonesite (TL)
$Ba_4(K,Na)_2[Ti_4Al_2Si_{10}O_{36}] \bullet 6H_2O$

Jonesite was discovered in 1957 by Francis Jones. It was later described in 1977 as a new species. It is by far the rarest mineral found at the deposit. It forms small colorless crystals up to 3 mm in length but usually far smaller as single bladed crystals or as sprays. The crystals form in the orthorhombic crystal system.

Previous literature suggested that jonesite was not found in situ with benitoite. It was the view of previous authors that jonesite formed at the expense of benitoite since both species contain barium, titanium and the Si_3O_9 complex. The author has several specimens and knows of others that show a commingling of benitoite and jonesite together. So their emplacement in the vein system appears to have been concurrent.

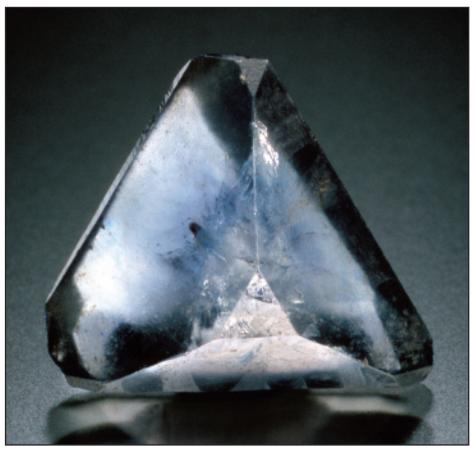
Natrolite – $Na_2Al_2Si_3O_{10} \bullet 2H_2O$

Natrolite is ubiquitous throughout much of the deposit. It was deposited in the last pulse of mineralization in the vein system and is only rarely encountered in crystals. Where the veins did not entirely fill with natrolite, stubby, prismatic crystals are found. The crystals are invariably milky white and opaque. Gray to green colored natrolite crystals exist which are heavily included with actinolite or crossite. Much of the well crystallized natrolite in collections labeled as coming from the Benitoite Gem mine is in fact from several other nearby deposits.

Other minerals

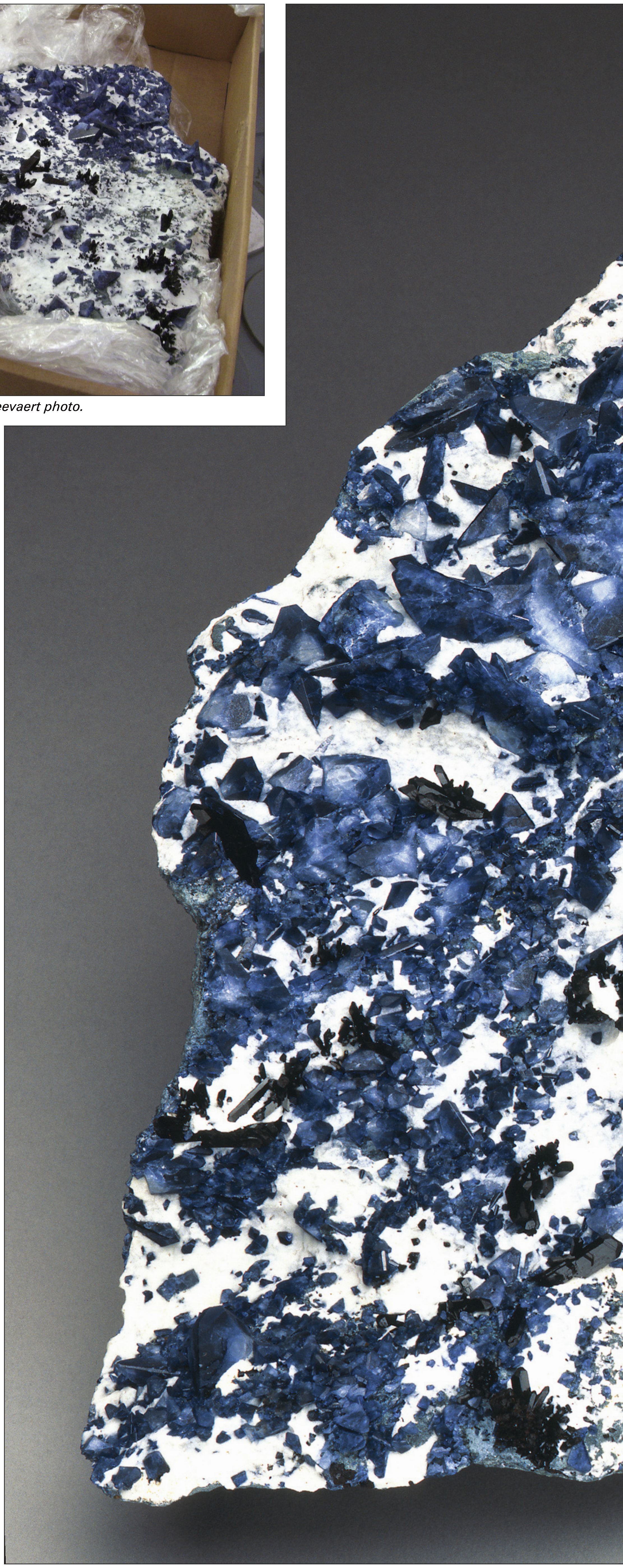
In addition to the above named species, the most commonly encountered minerals at the Benitoite Gem mine include the copper sulfides djurleite and chalcocite. Other noteable species include: apatite, albite, manganese oxides, silica pseudomorphs presumed to be after serandite and analcime. Several oddities are also known including boatite

Photo of giant specimen shown at right. J. Veevaert photo.

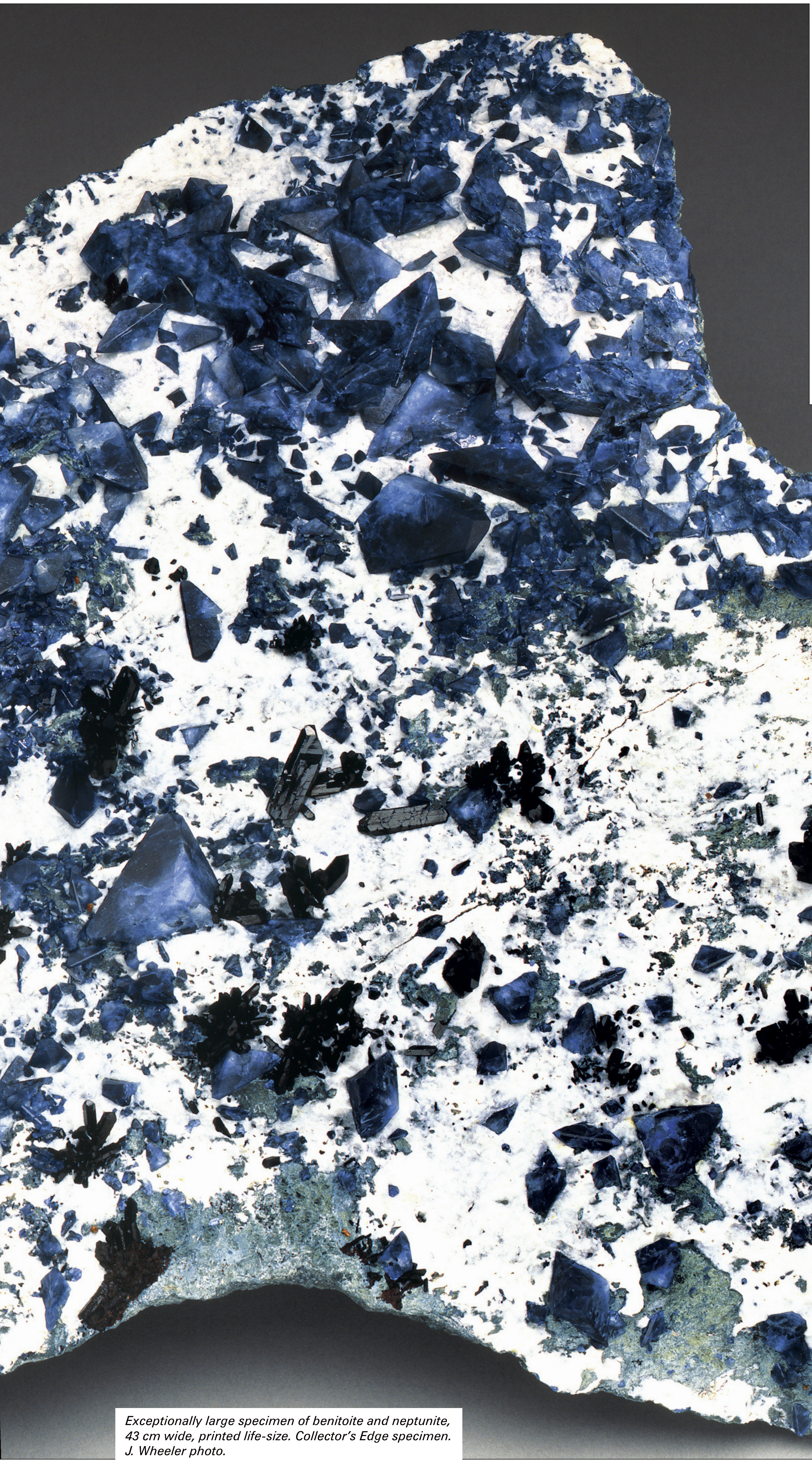


Gemmy floater benitoite 1.4 cm wide. R. Kennedy specimen. J. Scovil photo.

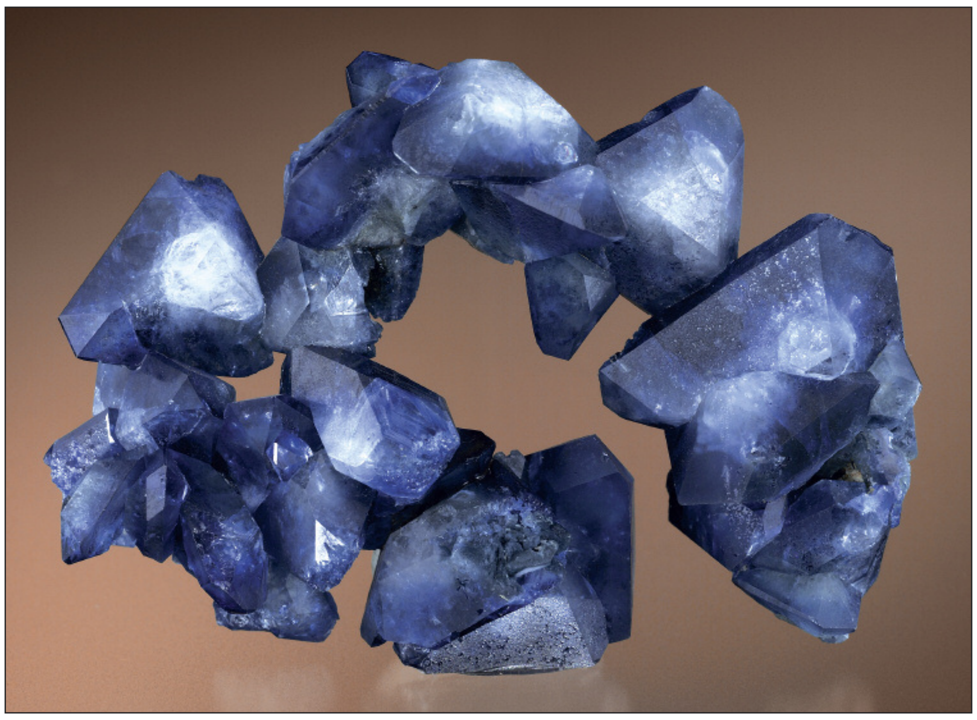
21 cm wide specimen covered by benitoites. Crystal Classics specimen and photo.



Benitoite with joaquinite crystals, 7.5 cm high.
J. Veevaert specimen and photo.



Exceptionally large specimen of benitoite and neptunite, 43 cm wide, printed life-size. Collector's Edge specimen. J. Wheeler photo.


The "Wreath", one of the best known benitoite specimens, 6 cm wide. Natural History Museum of Los Angeles County specimen. H. and E. Van Pelt photo.


Gem benitoite crystals, 2.3 cm wide. Collector's Edge specimen. J. Scovil photo


Benitoite crystals to 3.4 cm. Mineral Search specimen. J. Scovil photo.


Benitoite, specimen 2.1 cm high. R. Kennedy specimen. J. Scovil photo.


The famous Josie Scripps benitoite, 18 cm wide. W. Larson specimen.


Benitoite specimen, 3.5 cm wide. K. Ward specimen. J. Budd photo.


Gemmy benitoites, 4.7 cm wide. B. Gray specimen. J. Scovil photo.

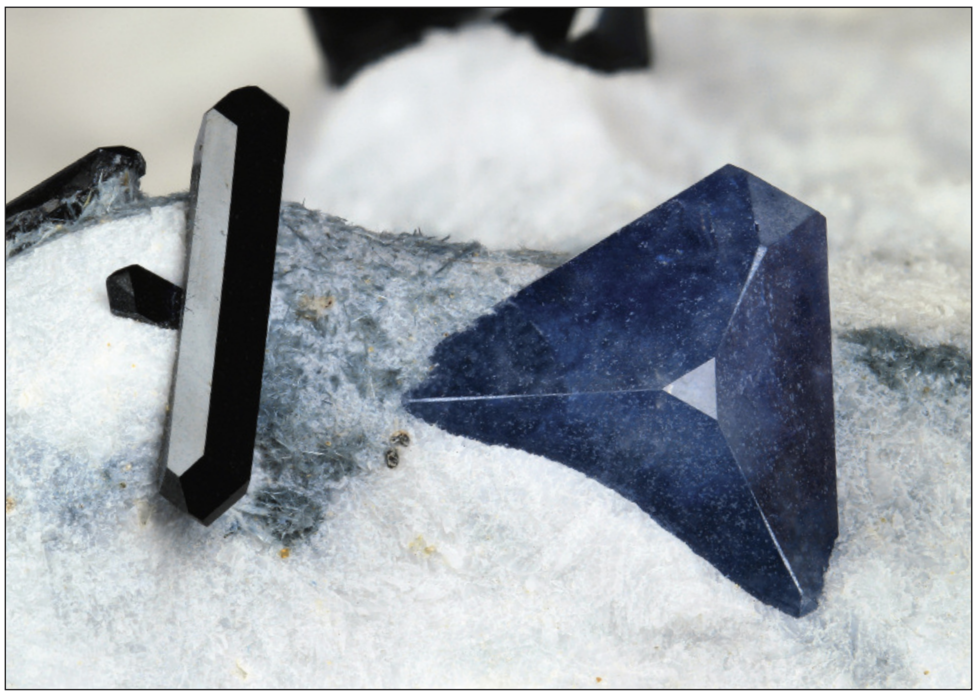

Benitoite specimen, 4 cm wide. S. Rudolph specimen. J. Budd photo.


Gemmy benitoites, specimen 15.5 cm wide. W. Larson coll. W. Minorotkul photo.


Benitoite crystals to 2.1 cm. B. and E. Moller specimen. J. Scovil photo.


Benitoite with neptunite combinations to 6.2 cm. B. Gray specimens. J. Scovil photo.

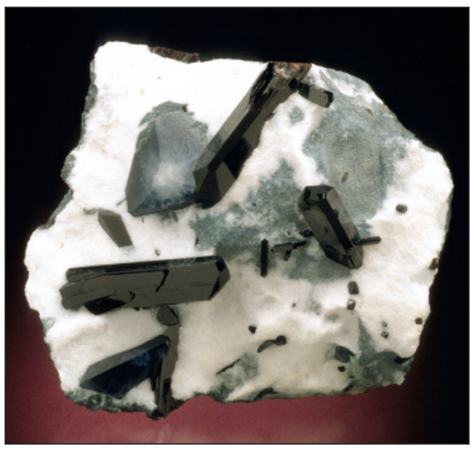
Neptunites with benitoites and joaquinites, specimen 8.4 cm wide. California State Mining and Minerals Museum specimen. J. Scovil photo.



Benitoite (1.2 cm wide) with neptunite and natrolite. M. Chinellato specimen and photo.

Superb specimen with benitoite and a 4.3 cm doubly terminated neptunite. Specimen 10.1 cm wide. J. Veevaert specimen and photo.

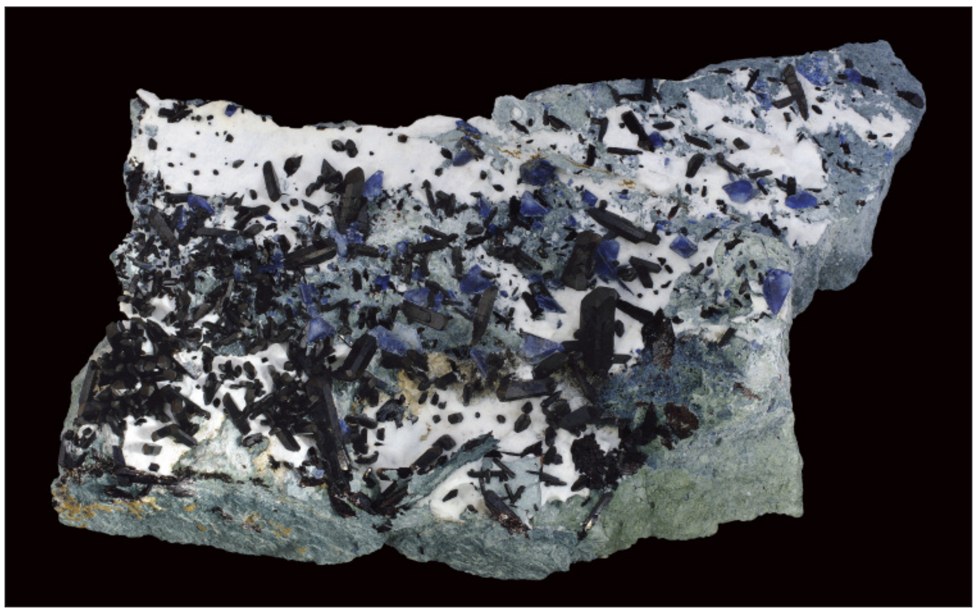
The famous "Sushi Plate" with benitoite, neptunite and superb twinned joaquinite. Specimen 4 cm wide. J. Veevaert specimen. J. Scovil photo.



Benitoite with neptunite, 6.8 cm wide. Mineral Search specimen. J. Scovil photo.

Benitoite with neptunite 3.2 cm wide. J. Veevaert specimen. J. Fisher photo.

Benitoite with large neptunite crystals, specimen 13.6 cm high. J Gibbs specimen. J. Scovil photo.



30 cm wide specimen with benitoite and neptunite. A. Giazotto specimen and photo.

Neptunite twinned on (301), 3.4 cm high. M. Gray specimen. J. Scovil photo.

Neptunite crystals with the more common (301) twinning. Specimens to 6.8 cm. B. Gray specimens. J. Scovil photo.

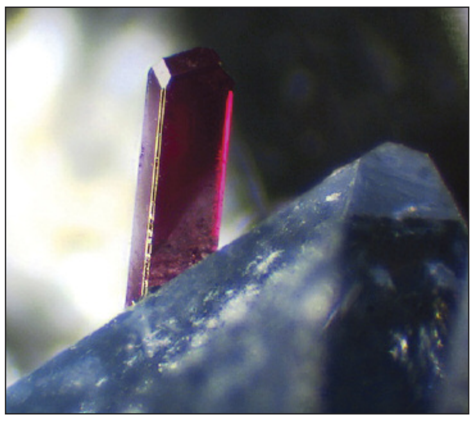
Neptunite, 9.5 cm high. D. and M. Bristol specimen. J. Budd photo.

Neptunite crystals, 2.8 cm wide. Arkenstone specimen. J. Scovil photo.

Neptunite twinned on (301), 2.8 cm wide. W. Larson specimen. J. Scovil photo.

Neptunite crystals with natrolite, 6.3 cm wide. F. Benjamin specimen. J. Scovil photo.

Neptunite exhibiting rare twinning habit on (001). Twin is 2.2 cm high. J. Veevaert specimen. J. Fisher photo.



Gem neptunite crystal 0.9 mm high on benitoite. L. Mattei specimen and photo.

Neptunite crystals on natrolite matrix, 12.5 cm wide. J. Veevaert specimen and photo.

Neptunite, specimen 6 cm high. J. Rosenthal specimen. J. Scovil photo.

Neptunite, 3.7 cm high. J. Rosenthal specimen. J. Scovil photo.

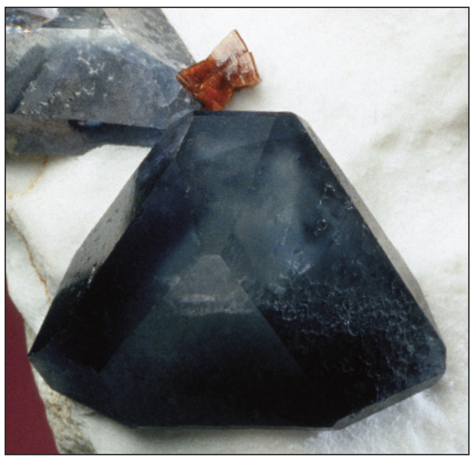
Roderic and Lyda Dallas donating a huge neptunite specimen to the University of California at Berkeley, ca 1940's. Photo in courtesy Collectors Edge.


Apatite crystals to 4 mm in natrolite. J. Veevaert specimen and photo.

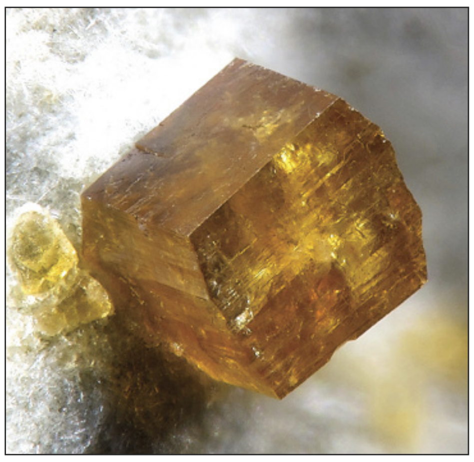

Jonesite crystal cluster, 1.2 mm wide. C. Rewitzer specimen and photo.

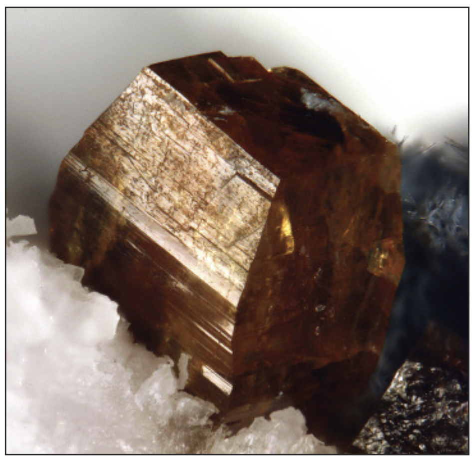

Jonesite crystal cluster, 4 mm wide. J. Veevaert specimen and photo.

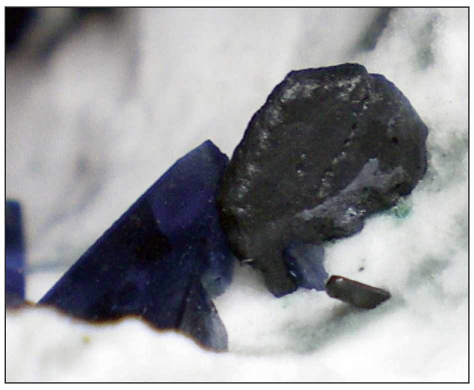

Natrolite crystals to 1.9 cm. J. Veevaert specimen and photo.

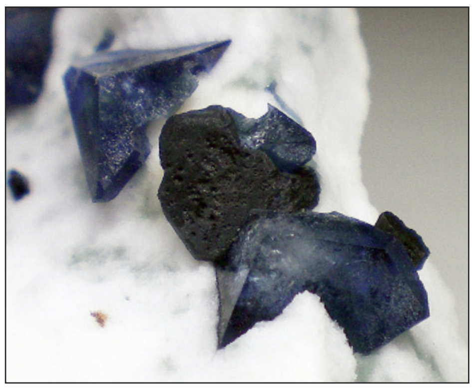

Joaquinite with benitoite. Field of view 3 cm. B. Gray specimen. J. Scovil photo.

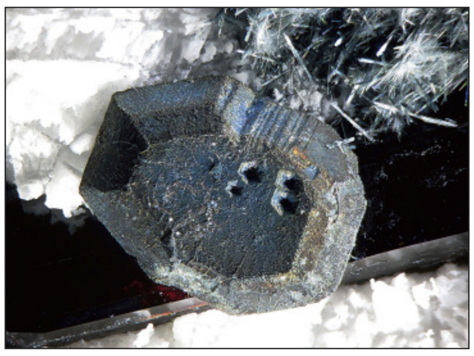

Joaquinite crystal, 2 mm long. C. Rewitzer specimen and photo.


Joaquinite crystal, 0.9 mm wide. C. Rewitzer specimen and photo.


Joaquinite crystal, 1 mm tall. E. Lackner specimen and photo.


Djurleite crystal with benitoite. Crystal size 0.7 mm. J. Veevaert specimen and photo.


Djurleite crystal with benitoite. Crystal size 0.8 mm. J. Veevaert specimen and photo.


1.2 mm djurleite crystal with neptunite. C. Rewitzer specimen and photo.

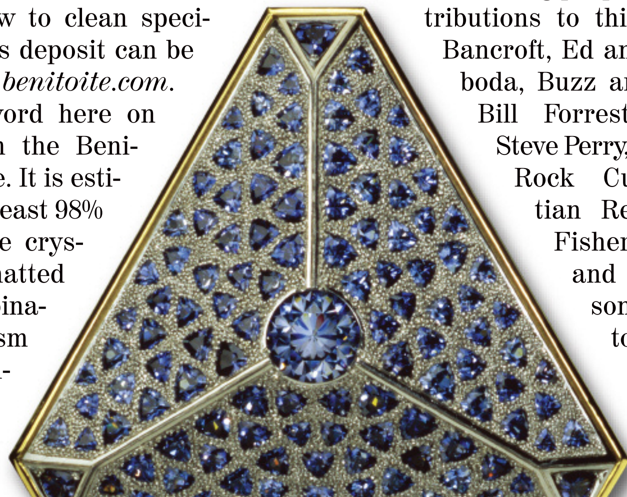
and a unique specimen of wire silver exsolved from a djurleite crystal.

SPECIMENS

Most of the early efforts to recover benitoite was done mechanically and was focused primarily on the recovery of gem rough. This resulted in countless quantities of specimens that were battered and not suitable for collections. Once the use of acids was employed to remove the natrolite the quality of specimens increased exponentially.

So, what does it take to get a cleaned specimen of benitoite and/or neptunite? Attractive specimens of this beautiful mineral assemblage just don't happen – they are the result of many hours spent carefully removing the encasing natrolite to provide an aesthetic finished specimen. The process involves several steps all of which are time consuming and require a bit of artistic aptitude. One thing to keep in mind during the process is that removing matrix is a one way procedure. Once it is removed it cannot be put back. Too much removal is as detrimental to the finished specimen as leaving too much. Several steps including the application of an etch inhibitor, soaking in acid, and rinsing are necessary to remove enough of the natrolite so as to present an aesthetic specimen. More information on how to clean specimens from this deposit can be found at *www.benitoite.com*.

A final word here on benitoite from the Benitoite Gem Mine. It is estimated that at least 98% of all benitoite crystals have a matted luster. The pinacoid and prism faces will almost always be lustrous. The pyramidal faces, however, will not. That is just the way Mother Nature created these things. Completely lustrous crystals are rare. The other thing to remember is when something has sat around for millions of years some fracturing is likely to occur. The vast majority benitoite crystals were fractured though eons of natural processes. That is why the best quality benitoite specimens command large prices. They are, unfortunately, the exception to the rule.


Faceted benitoite broche in the shape of a benitoite crystal, 5.7 cm wide. M. Gray specimen. J. Scovil photo.

ACKNOWLEDGMENTS

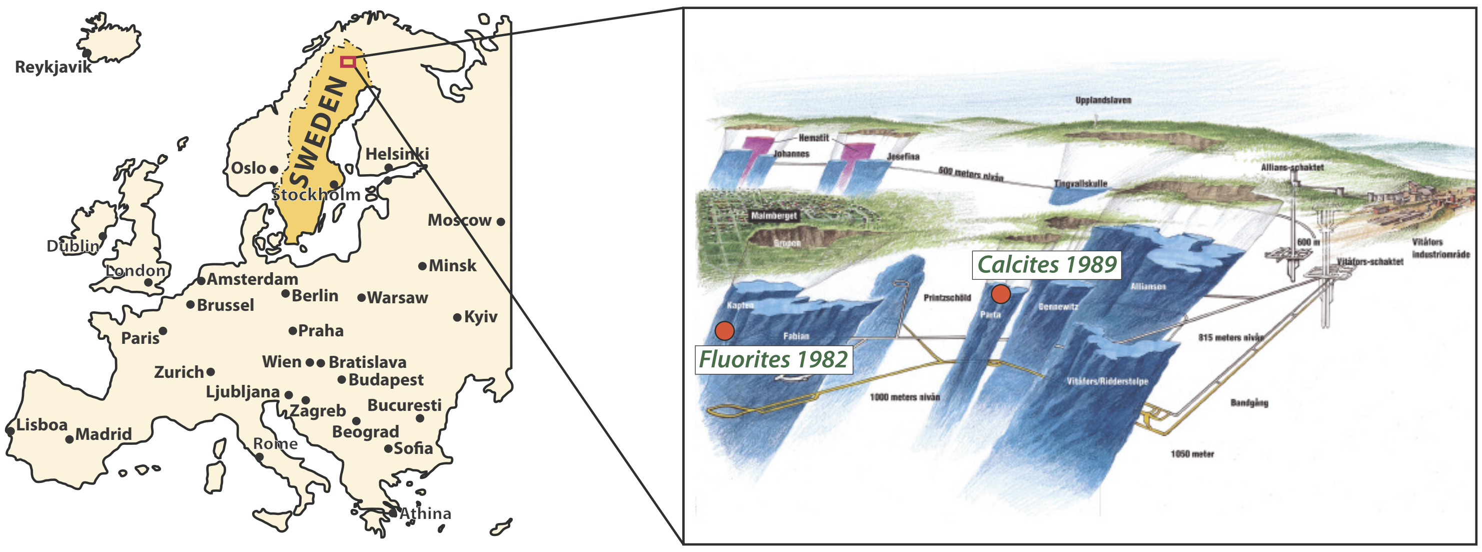
The Author would like to thank the following people for their contributions to this paper: Pete Bancroft, Ed and Bryan Swoboda, Buzz and Mike Gray, Bill Forrest, Bob Kahl, Steve Perry, Rick Kennedy, Rock Currier, Christian Rewitzer, Jesse Fisher, Bryan Lees and Richard Jackson of the Collectors Edge, Tony Peterson, the L. A. County Museum of Natural History, Elmar Lackner, Harold and Erica Van Pelt, Luigi Mattei, AM Mizunaka, Joan Mamarella, Jeff Scovil, Henry Barwood, Joe Budd, Matteo Chinellato and special thanks to Wendell Wilson.

John VEEVAERT
Trinity Minerals, USA
e-mail: john@trinityminerals.com

Golden calcites, of the Malmberget, Sweden

Peter LYCKBERG

Vikings "helmet" and tablecloth in Swedish flag motif. Two specimens and cut stone are among the best from the find. P. Lyckberg specimens and photo.



Map of Europe outlining the region around the Malmberget mine. Insert of modified cross-section shows mine location, main ore-bodies and sites of fluorite and calcite finds described in the text. Drawing by LKAB.

Continiued from page 1

magnetite deposits. The magmatic origin of these large sheet like ore bodies has only been confirmed by geologists within the last 30 years. The largest of these iron ore deposits occur at Kiruna, Malmberget and Svappavaara. The Malmberget (Ore Mountain) deposit differs from the others due to the presence of well crystallized mineral species. The euhedral crystal growth can be attributed to metamorphism and associated skarn mineralization as well as tectonic movement which all combined to form extensive cavity systems that were ideal loci for crystal development during late stage mineralization.

The Malmberget deposit is hosted by Precambrian volcanics which were subjected to at least two metamorphic events yeilding gneisses. The gneisses were intruded by sheet-like magmatic apatite-magnetite bodies. Intrusion of the magnetite bodies was followed by granitic and pegmatitic intrusions which overprinted skarn mineralization on the magmatic deposit. Late stage hydrothermal fluids were probably responsible for abundant solution cavities that were then filled by fluorite, calcite, hematite, and stilbite crystals. Folding related to metamorphism modified the initial sheet-like magnetite body into semi-irregular, discontinuous bodies occurring over a 6 km long zone. The main ore zone consists of 14 separate ore bodies, with several smaller bodies lateral to the main zone.

One of the open pits at the edge of Malmberget town. Main shaft and dumps from recent mining activity is seen at the upper left horizon. LKAB photo.

HISTORY

Malmberget Mountain rises above the deep forests of the polar region of northern Lappland. Magnetite deposits were known here as early as the 17th century. Mining at that time was sporadic due to sparse population of the Lap (Sami) people whose primary existence centered around reindeer herding. Early transportation of ores to the coast was done on sledges pulled by reindeer.

In 1888 a railroad was completed from the coastal town of Luleå up to the mining area which allowed for the start up of large scale mining. The mine was initially operated as an open pit. As easily accessed ores were depleted at the surface, underground mining commenced. Underground mining is presently down to the 1000 m level. As of 2006 more than 500,000,000 metric tonnes of ore have been produced, placing it second only to Kiruna in production.

Beautiful crystals and rich pockets were known from the early days of mining, but surprisingly few specimens were preserved. A few old specimens can be seen at the Museum of Natural History in Stockholm, and there are records of exchanges with overseas museums. Additionally, specimens were sold by the mining company. As early as the 1960's the mining company was open to tourists (a policy still in effect today), and souvenir specimens were made available to visitors. My first exposure to minerals from Malmberget come from samples collected by my grandparents who toured the mine in 1966.

LHD mine vehicle underground in the Malmberget mine corridors. LKAB photo.

SWEDISH MINERAL SHOWS AND A FEW MALMBERGET SPECIMENS IN 70'S

Sweden's first mineral show took place in 1977 in the old traditional mining center of Kopparberg in the south-central part of the country. There were still many working mines at that time. Miners and collectors came from all over Sweden, and a few people brought specimens from northern Lappland. One miner brought a whole flat of almost perfect groups of scalenohedral, light yellow to light honey colored calcite crystals. They were collected from a long pocket located in the roof of an access tunnel at Malmberget. These crystals were at the time, the finest ever from Sweden. Later in the 1970's, some average to very fine specimens appeared at shows, but only in very small quantities. These were principally fluorapaites, stilbites, calcites, hornblendes, pyrites and byssolite.

As a young teenager, I had no luck trying to buy a single crystal as the whole flat was already reserved for "a big dealer" from Stockholm. The dealer bought the whole lot as an investment, and stashed them away (it was decades later when they finally made it to market!). From that day on, the search has been on to find superb Malmberget calcite specimens…

Collecting one of the pockets in the Malmberget mine. B. Morgenstern photo.

FLUORITE POCKETS OF 1982

In 1982 an exceptional find of emerald green fluorite octahedrons was made in a meter sized pocket at the top of a tunnel in the Baron ore body. A second pocket was later found in the wall near the discovery pocket. The first pocket yielded fine large green octahedrons in association with quartz, orange

Large specimen of fluorite with stilbite from the Emerald Pocket, 15.7 cm wide. P. Lyckberg specimen. J. Scovil photo.

stilbite, chalcopyrite (in complex comb-spheroidal aggregates), calcite, specular hematite, and chlorite. All together, there were five fluorite-bearing pockets ranging in size from very small to about two meters long. The best pocket was named the Christmas Tree Pocket due to the vibrant colors of green fluorite with red hematite, white quartz, and golden stilbite. Only a handful of exceptional pieces were collected up to 15 cm in size with 2-3 cm crystals. No more than 20 smaller pieces of good quality were also collected. The green color of these fluorites is unique, and specimens from these pockets are considered by many to be some of the finest fluorites known!

Fluorite with stilbite and hematite-coated quartz from the Christmas Tree Pocket, largest fluorite is 2.5 cm. P. Lyckberg specimen. J. Scovil photo.

THE FIRST CALCITE POCKET
– THE GEM POCKET

During a visit to Malmberget miner Kenneth Holmgren's house in 1988, a broken fragment of gem-clear, scalenohedral calcite with golden color was shown to me. The color and quality were much better than pieces seen at the Kopparberg show almost 10 years earlier. When asked "*when, and from what part of the mine had it been recovered?*", the miner was a bit reluctant to answer. Even though the find was rather recent, the miner didn't recall exactly where he found the specimen.

After a long search among part of the 600 km of drivable tunnels in the mine, Kenneth showed me a magnetite rock face in a ramp tunnel, and said "*there it is!*". I was not convinced of the location because there were no calcite veins, pods or even small fragments visible in this part of the tunnel! A small excavation had been blasted out to widen the tunnel for parking, erasing all sign of the calcite pocket. Upon detailed examination, the area didn't look at all promising, but who knows what may hide within this black orebody on the other side of the rock wall?

Iconic calcite specimen from the Butterfly Pocket, 13.6 cm high. P. Lyckberg specimen. J. Scovil photo.

Fluorite with stilbite from the Emerald Pocket, 6.7 cm cm high. J. and G. Spann specimen. J. Scovil photo.

On the left side of the "parking spot" there was a 15-20 cm wide fissure in the solid magnetite making up the tunnel wall. The vertical fissure was filled with coarse grained magnetite "sand" and showed absolutely no signs of crystallization.

Taking turns digging out the magnetite "sand" filling this fracture, the walls still didn't show any signs of crystallization. No magnetite, no apatite, and no calcite seen with more than 1.5 m of pocket emptied out! We we just about to the point where we could not reach any further up into this deep pocket, and suddenly a bit of calcite started to show. A 25x20 cm flower of golden calcite became exposed... a view never to be forgotten shining in the light of the mining lamp! Imagine seeing flawless, razor sharp, gemmy scalenohedrons, of an unimaginable golden color and luster contrasted with the black magnetite ore! The cluster consisted of approximately 30 crystals 5-12 cm in length, the center having a depression i.e. lacking the perfect crystals. Immediately the pocket was named "guld/gul kalcit hålan" (the Gem Pocket). Even today these are considered among the finest golden calcite scalenohedrons ever found.

The difficult position of the calcite cluster necessitated serious work to recover it complete and undamaged on matrix. That first evening, only one group of two crystals and one single crystal were brought up to the surface. They came sliding down a sand slope 2.5 meter into the pocket while we were working to widen the fissure to facilitate future recovery of the magnificent specimen.

The mine has to be evacuated each evening due to huge production blasts at midnight. In order to protect the minerals, the Gem Pocket was backfilled with magnetite sand after covering the flower with soft cloths. No traces of recent work were left. Sadly, I had to leave at this exciting point in order to attend an obligatory test at the University.

During the next week Kenneth dug a 3 m long and 70-80 cm wide tunnel through solid magnetite with the idea of accessing the flower face on. He was then going to drill around it with a diamond drill in order to remove the specimen intact. The last day he was so tired that he left the specimen unprotected at the wall. Unfortunately, he mentioned this find to a completely inexperienced miner who went down with his father and simply knocked the crystals off the wall! Upon hearing this terrible news, the miner was contacted and asked to hold the crystals for me. After coming back to the mine it turned out that miner

Calcite crystal from the Butterfly Twin pocket Pocket, 12.3 cm high. P. Lyckberg specimen. J. Scovil photo.

Kenneth Holmgren inside the Butterfly Twin Pocket. P. Lyckberg photo.

had already sold most of the flower parts. What was really annoying was that not only did the miner have no claim to the piece having not discovered it nor done all the work to expose it for easy and safe collecting, he had also promised to keep the crystals for us, the original discoverers. Over the ensuing years I have been buying back the pieces from this lost specimen.

Calcite crystal on matrix, 3.3 cm high. P. Lyckberg specimen. J. Scovil photo.

Twinned calcite, 11.2 cm wide. P. Lyckberg specimen. J. Scovil photo.

When work was again started looking for extensions of the calcite pocket, it appeared to be in fact a system of small narrow pockets with occasional calcite crystallization. Another miner, Roland Bäckström, known for his instant ignition and competing with Kenneth, blasted the rock face to smithereens. It was depressing to see thousands of calcite shards littering the floor. Some of them were certain to have been parts of world-class specimens worthy of any museum collection; unfortunately, not much survived.

Surprisingly, a very large (17 cm), flawless, gem quality scalenohedron of calcite survived the blast. It was found in a small, thin fissure growing from one wall just touching the other wall. This gemmy calcite is the finest of its kind and resides in the author's collection. All together less than a dozen exceptional crystals were saved while all the others had broken terminations or were broken in half or worse. Regrettably, no images were made of the Gem Pocket in situ.

After such an impressive find, one can imagine the rumors that started among the locals. Miners talked with friends, who spoke with other friends, and pretty soon a large cave was found with even bigger gemmy calcites! Unfortunately, the rumors being totally untrue, were better than the calcites! On a positive note, the rumors did spur the miners to search the tunnels for more crystals.

SECOND CALCITE POCKET
– THE BUTTERFLY TWIN POCKET

Discovery of the Gem Pocket prompted Kenneth to think of other places in the mine that might have specimen potential. Years earlier, while loading rocks from a blast on the upper level of the

Calcite crystals in situ. *P. Lyckberg photo.*

same ramp as the Gem Pocket, Kenneth had noted a lot of calcite splinters in the muck. There was too much work to get done to permit exploring for crystals, so all Kenneth could do was casually make note of the presence of numerous calcite pockets. Now Kenneth was desperately searching both the mine, and the memories in his mind for that place with the potential of more golden calcites. He finally located the pocket high up on the wall, close to the ceiling approximately 50 m vertically above the Gem Pocket. This pocket didn't have such pristine gemmy crystals, but there were very large scalenohedrons occurring in the pocket which turned out to be the upper extension of the same fissure zone as the Gem Pocket. The outer part of the pocket had been sprayed, and partially covered by shotcrete (concrete blown up on to mine walls and surfaces for safety and ground control). Luckily the entrance to the pocket was very narrow and bending, thus preventing complete covering of the opening by the shotcrete.

Kenneth was able to peek some 2 meters into this pocket where he saw 10 to 30 cm long, transparent golden crystals hanging from the roof in one corner of the pocket. On the bottom of the pocket there was a strange knob of golden calcite scalenohedrons, some of them were much larger and very gemmy.

After making this discovery, Kenneth immediately called me up. I almost jumped out of my chair from the description of 10 cm flat calcite crystals looking like butterflies sitting between scalenohedrons! A detailed explanation over the phone about the unique nature of these crystals resulted in a plan to remove half a meter of rock below the pocket before even attempting to remove any specimen. Kenneth was to pay special attention to protect these "butterfly twins" and remove the specimens in as large and intact pieces as possible. Many nervous phone calls were made, between dreams of what the crystals might look like in person!

Following the recommendation to remove a big part of the wall rock below the pocket, Kenneth succeeded in removing three large specimens, all of them with several large butterfly twins growing upon calcite scalenohedrons. It shuld be noted here that most of the large butterfly twins grew at the bottom of the pocket. In fact, most of the twins were found on a single, half meter sized balllike specimen at the bottom of the pocket. Removal of these pieces was complicated by exceedingly hard rock below the pocket.

The largest and finest specimen removed (known now as the "Lyckberg Calcite" - *eds.*) consists of a ball like aggregate 45x45x35 cm covered with golden calcite scalenohedrons. In between the scalenohedrons are 12 gemmy golden butterfly twinned calcites up to 12.5 cm wide. It looked like a school of butterflies are just landing on a flower-clad meadow. It was mined from the pocket located 5 m high on a vertical wall, and 1.5 meters inside a narrow fissure leading to the pocket. After hours of removing the hard matrix under the specimen Kenneth suddenly got it loose. This extraor-

Calcite crystal on matrix, 3.3 cm high. P. Lyckberg specimen. J. Scovil photo.

dinary specimen was so heavy that he, an exceptionally strong man, said after having lifted it with his arms fully extended that he felt it was so heavy that he would never be able to lift it again.

When Kenneth was asked "*How in the world you did you manage to*

One of the best specimens from the find – so called "Lyckberg Calcite" – photographed with Peter's son David when he was 3 months old. P. Lyckberg specimen and photo.

Calcite specimen known as the "Rocket", 10 cm high. P. Lyckberg specimen. C. Hager photo.

lower the specimen from the cavity entrance several meters up on the wall?", he replied simply "*When I reached the vertical wall I turned around and walked down the wall holding the specimen in my arms and put it into the back of the truck*". It is amazing what can be done with the adrenaline of discovery and success!

Amazingly, the specimen placed on the truck bed survived not only the long ride up out of the mine, but also the temperature shock of coming from a heated underground mine straight out into the -30°C polar climate of January, 1989.

Group of crystals on magnetite ore from the Gem Pocket, field of view 8 cm. P. Lyckberg specimen and photo.

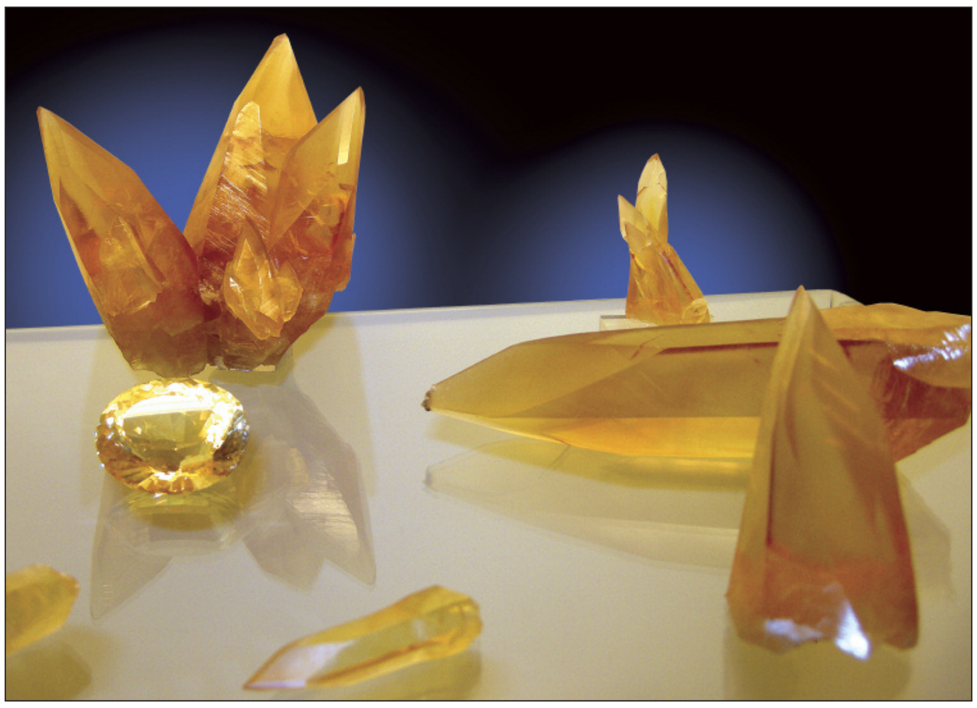
With the news of the fantastic specimen, I flew to Lappland to see this marvelous pocket, photographing it, and to try and recover additional specimens. The pocket was more impressive than the first. Only sections of the walls had large deep colored calcites, while other parts had smaller light yellow crystals. High humidity caused the lens of the camera to get foggy all the time but despite this, some clear images were luckily captured of this remarkable calcite pocket.

Crystals were completely clean in the pocket and as fresh as having been formed "yesterday". Calcite is a very frgile and soluable mineral, and it is fortunate these crystals survived such a long geologic history. That the calcites survived blasting during the mining process is nearly miraculous. Major tunneling was only 2-3 meters from the pocket. Some of the larger crystals found in the pocket had been broken off from matrix long ago and recrystallized over the broken surfaces. The largest butterfly twin collected reached over 16 cm!

During additional exploration around main cavity a second smaller pocket was found at the back, left end of the main pocket. A couple of large calcite twins were growing on the bottom of this pocket, one of which is now in the Museum of Natural History in Vienna.

As one can imagine, the discovery of such a pocket started the rumor mill turning, which in turn spurred other miners to search for crystals. It also led to intense traffic of visitors, dealers, and collectors not only from Sweden, but also Norway, Germany, USA, and Japan. A couple of inexperienced collectors with sledgehammers and without permission ended up breaking crystals in order to remove more specimens. The result was saddening, because no more exceptional specimens were recovered. Sloppy collecting led to destruction of the ceiling which probably ruined as many as 300 nice golden calcites!

Upon returning later to the pocket the view was really depressing. The pocket was filled with calcite shards and basically nothing left of the hundreds of specimens possible to recover from the walls. One of these destroyed specimens, a single perfect butterfly twin with both wings raised as to take off among the gemmy scalenohedral crystals might have been a candidate for the best of species specimens.



A portion of the author's Malmberget calcite display. Crystal laying on its side at the right is the biggest known from the Gem Pocket – 17 cm long. P. Lyckberg specimens and photo.

COMPLETING SPECIMENS

A few butterfly twins were missing from the major specimens and through detective work and searching over the years many have been located and restored to original positions on matrix. There are still two butterfly twin calcite crystals missing which should be placed back onto their matrix. Any reader who knows of such crystals is encouraged to notify me of their whereabouts.

In fact, I've been actively searching for any good specimens I can find from Malmberget. At the Munich show in 2010, I was able to purchase back a great speicmen that I had sold to a collector/dealer friend from America in January, 1991. The collector had sold it to another collector (at a great profit), and with the economic downturn it was once again available, much to my surprise and joy! I have great pleasure in repatriating specimens from Malmberget!

ACKNOWLEDGEMENTS

The author wishes to thank the following people for their contributions to this paper, whether it be by supplying specimens, providing access to the mine, or general support in any fashion: Klara Petterson, the LKAB Mining company and its staff, miner Kenneth Holmgren and his family, beloved father and mother Lars and Berit Lyckberg, my brother Anders Lyckberg, my wife Nadia, miner Stefan and lastly Bill Morgenstern.

Peter LYCKBERG
BP 2785, L-1027 Luxembourg
e-mail: lyckberg@pt.lu

The biggest twin collected from the Butterfly Twin Pocket – 16.4 cm! P. Lyckberg specimen. J. Scovil photo.

Calcite twin on matrix – the specimen which came back to Peter in 2010 after 20 years! Specimen 17 cm wide. P. Lyckberg specimen. C. Hager photo.

Journal presentations: The Mineralogical Record

Dear readers,

In this issue of Minerals, we start a new column – Journal presentations. In each issue we will present one magazine for mineral collectors. At the end we we would like to cover them all! The goal of this column is to help readers select which magazine(s) might best address their particular interests in addition to helping the magazines to promote themselves.

In this issue we start with The Mineralogical Record, certainly one of most well known magazines dedicated to our hobby!

Tom & Scott

GOAL

The Mineralogical Record is an international journal for mineral collectors – beginners to advanced, mineral museum curators, dealers in mineral specimens, and specimen-oriented mineralogists. Two-thirds of the subscribers are from the U.S. and Canada; one third are from Europe and other countries.

Cover of the first issue of The Mineralogical Record published in 1970.

FOCUS

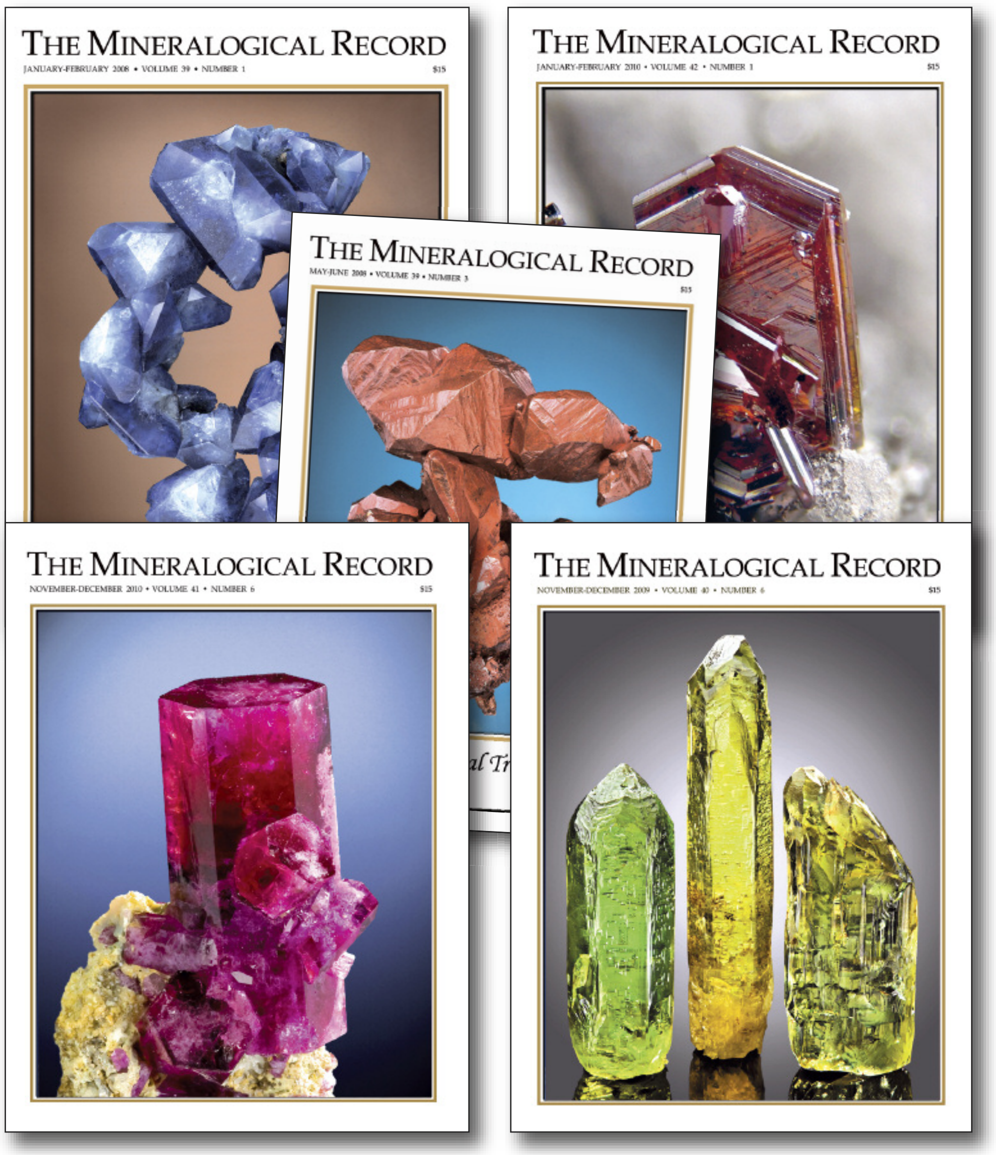
The magazine is issued six times a year (averaging roughly 750 pages per year, printed on glossy high-quality paper). It is generally considered to be one of the most authoritative and widely respected mineral collector's journal in the world. In-depth articles deal primarily with important worldwide mineral localities (old and new), and the historical aspects of mineral collecting, mineral dealing and mineralogy. Reviews of public and private mineral collections, market reports from contemporary mineral shows, book reviews, and oversized special issues and special supplements devoted to mineral-rich countries, states, districts, and famous individual localities are all included. All of these articles and features are illustrated by abundant top quality color photography of fine mineral specimens, from micromount-size to cabinet specimens.

HISTORY AND EDITORS

The Mineralogical Record was founded in 1970 by John S. White, who was at that time a curator in the Mineral Sciences Department of the Smithsonian Institution. After seven years as editor and publisher, White stepped aside for a new editor, Dr. Wendell E. Wilson. Since it's inception, the Mineralogical Record has grown steadily in quality and prominence, thanks to the contributions of over 700 authors, photographers, artists, advertisers and donors. It has become a collective labor of love on the part of the entire mineralogical community worldwide. In 2001, Thomas P. Moore joined the editorial staff, and has since made significant contributions of his own to the magazine. In 2009 Thomas M. Gressman joined the staff as Associate Publisher, and he will shortly be joined by Dr. Günther Neumeier.

QUALITY

Today The Mineralogical Record continues to set the standard for quality content for the serious mineral collector, and each copy is carefully preserved and collected in its own right by faithful subscribers around the world. The importance of the magazine was formally recognized in 1982, when The Mineralogical Record became the first (and is still the only) journal ever to be honored with the naming of a new mineral species (minrecordite), and again in 1994, when it became the first (and is still the only) journal ever to win the prestigious Carnegie Mineralogical Award. Editor-in-chief and publisher Wendell Wilson (after whom wendwilsonite was named) also received the Carnegie Mineralogical Award, in 2001.



Covers of some recent issues of The Mineralogical Record.

EXTRA ISSUES

At the Mineralogical Record, book publishing has always been an important adjunct to magazine production. Important titles include *Fleischer's Glossary of Mineral Species*; Peter Bayliss's *Glossary of Obsolete Mineral Names*, with over 30,000 entries; Quintin Wight's *The Complete Book of Micromounting*; Bob Jones *A Fifty-Year History of the Tucson Show*; thirteen volumes in the *Antiquarian Reprint Series*; and numerous others. At the same time, the Mineralogical Record Library has grown to become one of the finest antiquarian and general mineralogy libraries in the United States, a resource drawn upon regularly by the editors and authors.

WEB PAGE

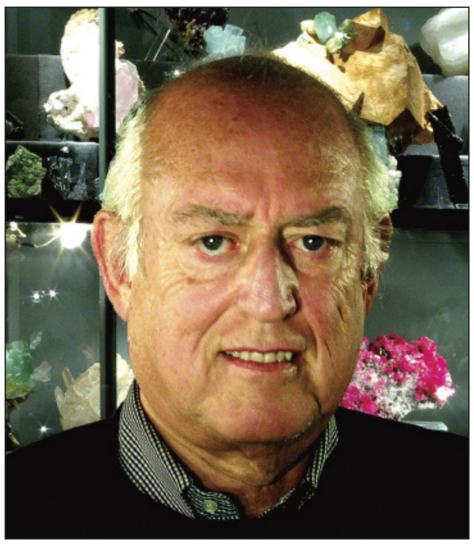
www.MineralogicalRecord.com, contains various free-access databases, including an archive of over 1,500 biographies of historical to modern mineral collectors and dealers, a bio-bibliography archive of over 1,500 authors of mineralogical works (from 1469 to 1919), an on-line "museum" of mineral artworks by over 50 artists, a photo-registry of stolen specimens, an on-line journal (*Axis*, "an eclectic journal of mineralogy"), a regular column about news in the mineral world, and a complete listing of the contents of every issue ever published (some of which are still available for purchase).

SUBSCRIPTION

A 1-year subscription costs $62 (US) and $70 (outside the US). You can subscribe through the website.

The Mineralogical Record logo.

Collector interview: Adalberto Giazotto (Italy)



Adalberto Giazotto – famous Italian collector of huge specimens.

This time our Collector Interview is with one of the best and most famous European collectors: Adalberto Giazotto from Italy. Adalberto has been building his collection for the last half a century. He has concentrated on large, if not huge, specimens of the highest possible quality. All collectors know how difficult it is to find a perfect, damage-free specimen, and we can only imagine how difficult it is to find huge specimens which are not only perfect, but aesthetic, too!

Spodumene, quartz and lepidolite, 45 cm wide, from Mawi, Afghanistan. Giazotto specimen. J. Scovil photo.

In Adalberto's collection one can see some of the world's best examples of many rare species (for example, ajoite and phosgenite) as well as extraordinary specimens of much more common minerals such as tourmalines, beryls, quartz, and barites. All of them are spectacular for their size and quality. Many of these specimens have attained "iconic"status as you see in the incredible 10 kilogram gem beryl from Southern India.

Adalberto's professional career track has put him at the top of his field as a research physicist. He is the father of the Virgo Project, a Gravitational Wave Detector utilizing a Michelson interferometer with 3 km long optical cavities.

Under normal circumstances, the lucky visitor could see the entire collection in the house where Adalberto and his wife Lidia live near Pisa in NW Italy. However, for the next five years the collection is on public exhibit at the Natural History Museum, Florence University.

Tomasz Praszkier (Minerals): *Your collection is famous for extra large and high quality specimens – why have you focused on such large pieces?*

Adalberto Giazotto: It is a matter of rarity, large and perfect with a harmonic crystal structure and a definite geometrical shape is what I consider top. Smaller specimens do not have the strength of visual impact comparable with larger ones. Perhaps the more powerful combination of quality and size is about 25-30 cm.

Adalberto's favorite specimen! A monster Messina, RSA ajoite-included quartz, 60 cm high, and about 60 kg! Giazotto specimen and photo.

TP: *In addition to size, which specimen features are important for you when choosing new pieces for your collection? How tolerant are you about imperfection problems which are especially difficult in big specimens?*

58 cm plate of rhodochrosite, Sweet Home mine, USA. Giazotto spec. J. Scovil photo.

AG: This is a difficult question because it is a matter of details; it is clear that integrity is the first parameter. I support strongly the concept that properly restored exceptional specimens are totally acceptable, see Pederneira tourmalines as an example. Sometimes the geometry is so outstanding that it deserves only some clever restoring of bruised crystals to create an exceptional specimen. My way of thinking about crystals is very religious, we are in front of an object created millions or billions of years ago with a perfect structure despite the horrible effects due to the exceedingly high entropy of the surrounding matter. Crystals are outstanding in itself, even if unavoidable events have bruised or broken some part of it. I do consider it totally stupid to give such a weight to integrity at 10x magnification. I am convinced that very good specimens will be found less and less frequently in the future, and at that point imperfection will certainly be more accepted.

TP: *You are a long time collector. When did you start collecting, and when did you obtain your first important specimen?*

AG: My love for minerals started when I was 3, on the banks of the river Dora in the Alps where I saw small brilliant pyrite crystals.

I started to collect at about 9, and I obtained the first important specimen at about 27.

TP: *Can you tell us the story of obtaining the first important specimen? Do you still have it?*

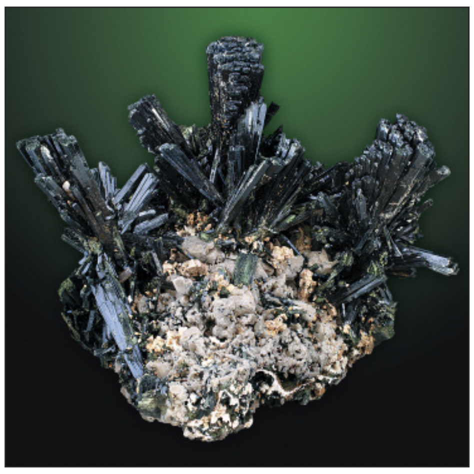
AG: Yes I still have it, it is the large specimen of Demantoid garnet No. 45 from Val Malenco. It belonged to Pio Mariani, a dealer close to Milan, who collected large beautiful specimens. I still remember that in the evening, at that time I was living in Rome, I phoned him asking if the demantoids had arrived; at his positive answer I took my small red Fiat 500 and during night I reached Milan, I bought the specimen which was the top in the lot, and I returned immediately to Rome. About 1100 km. I think that this specimen is one of the best existing from Val Malenco.

TP: *Do you ever go field collecting?*

AG: Only when I was around 12. I was collecting quartz crystals in Valey, a glacial valley in the Alps close to Gran Paradiso Mountain.

TP: *How is this possible that during fifty years of serious mineral collec-*

40 cm high specimen of sulphur on aragonite from Cozzodisi mine, Sicily, Italy. Giazotto specimen. J. Scovil photo.



Aegirine, 50 cm wide, Mount Malosa, Malawi. Giazotto specimen and photo.

Amethyst, 50 cm wide, Anahi mine, Bolivia. Giazotto specimen. J. Scovil photo.

ting you haven't frequented the "field" to collect minerals yourself?

AG: Perhaps it is an ensemble of reasons such as claustrophobia, too much studying physics, and making high energy experiments at particle accelerators in different places in the world. I was always worried by accidents and I thought it to be a bit unnecessary to die for crystals.

TP: *Have you ever made special buying trips around the world, or combined mineral acquisitions with travels for your professional activities?*

AG: Of course, whenever I was reaching some new place for my work, Universities, conferences, etc., I tried to contact dealers in my free time. When I was living in England it was given to me, very kindly, a room at Electron Sinchrotron NINA in Daresbury (Cheshire) were I stored a huge amount of specimens from the Florence Mine like blue fluorites on pink dolomite, kidney ores, brilliant quartz crystals on hematite, etc. This mine was only a few kilometers from the Laboratory. The same in Australia were I found some Columbites from the Spargoville mine.

TP: *Mineral specimen prices have increased dramatically over the years. Has that affected your acquisitions? Are the majority of your good specimens from past or from more recent acquisitions? Looking at the mineral market over the last fifty years, do you see a big increase in specimen quality or only an increase in prices?*

AG: Many of my best specimens are from recent acquisition, recent means after 1986, Yes, quality and prices have grown up together.

TP: *How many specimens do you have in your collection? Is this a static number, or has your collection evolved, and if so, in what way?*

AG: I have about 1200 specimens, of which 540 are on exposition in Florence.

Gem topaz, 13 cm high, 4.5 kg, from Mogok, Myanmar. Giazotto specimen and photo.

No, I do not consider the number an important parameter, and I am always glad to exchange and upgrade specimens.

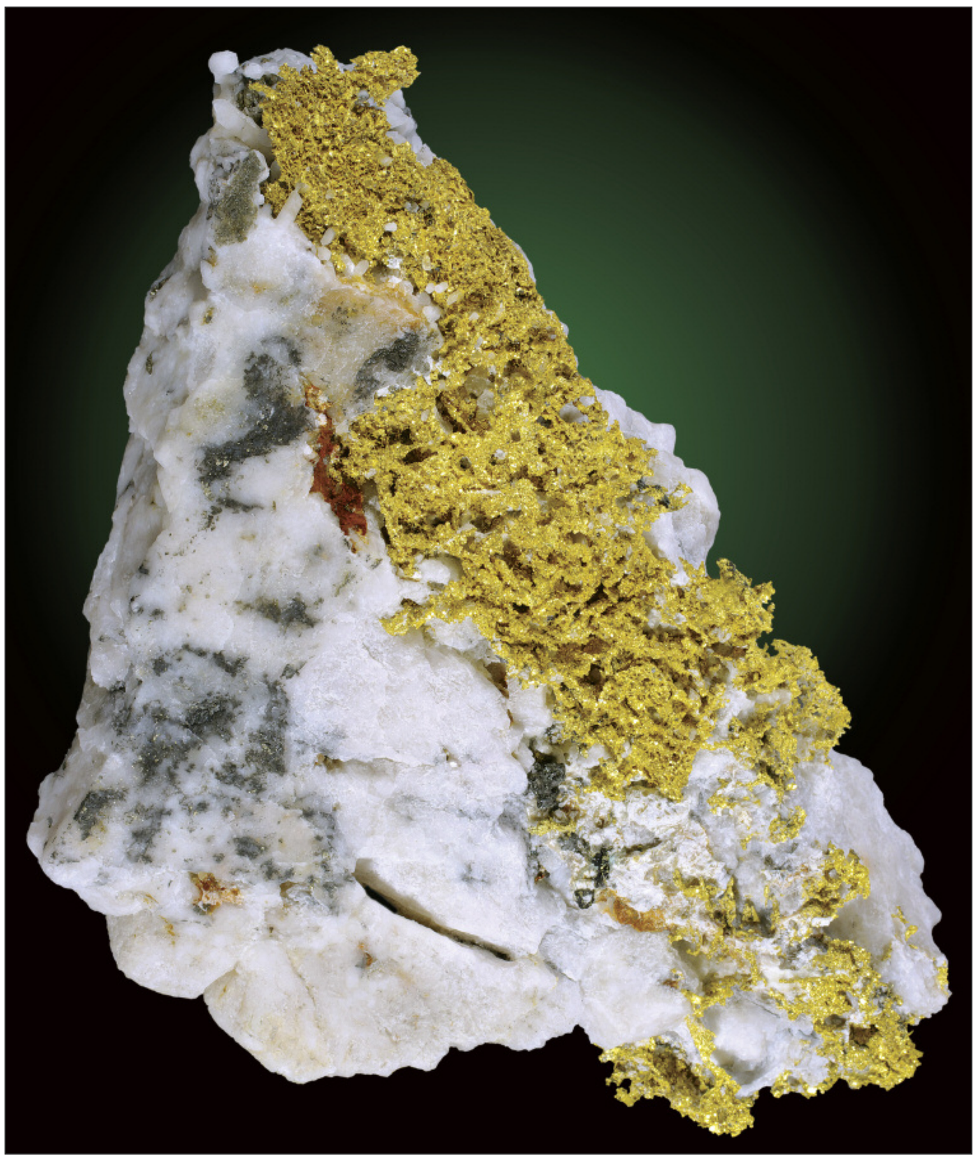
TP: *If you have to select one favorite specimen from your entire collection, which one would you pick and why?*

AG: Perhaps the Ajoite N. 1438, it is an unbelievable specimen; but I have in mind many others which are more or less equivalent. It would be a very difficult choice. The Ajoite 1438 represents the best specimen extracted from the Messina mine in SWA. In 2008 a mine

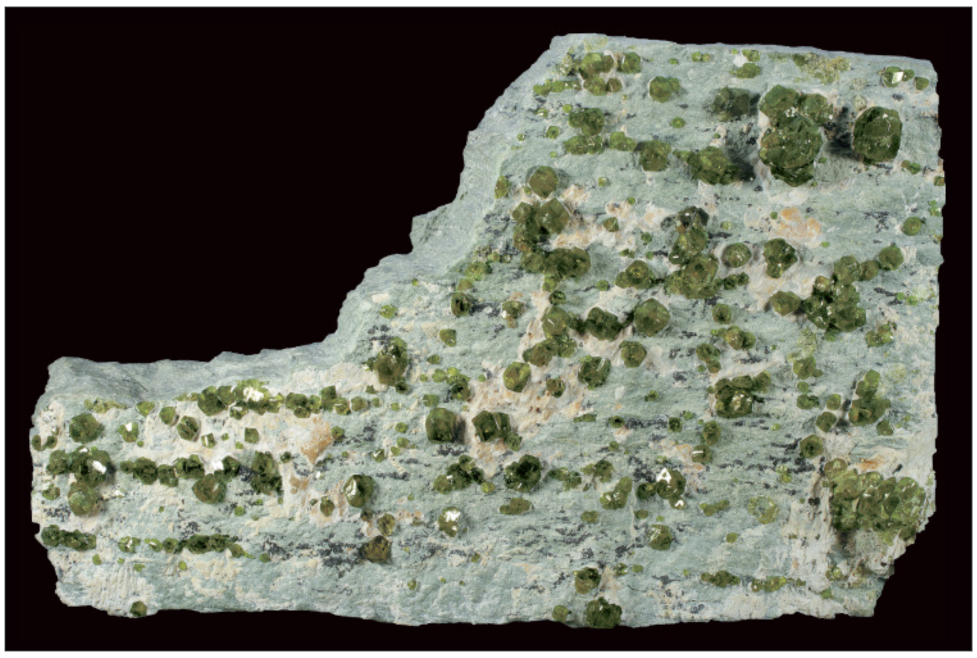
Fluorite, 40 cm wide from Erongo, Namibia. Giazotto specimen and photo.

Smoky quartz with amazonite, 28 cm high, Lake George, Colorado, USA. Giazotto specimen and photo.

70 cm wide specimen of fluorite on quartz from La Viesca mine, La Collada, Asturias, Spain. Giazotto specimen and photo.



Native gold, 23 cm high from Brusson, Aosta, Italy. Giazotto specimen and photo.



40 cm wide plate with demantoids from Sferlun, Val Malenco, Italy. Giazotto specimen and photo.

Barite, 38 cm wide, Monte Masu, Sardinia, Italy. Giazotto specimen and photo.

Apatite, 11.1 cm high, Pansqueira, Portugal. Giazotto specimen. J. Scovil photo.

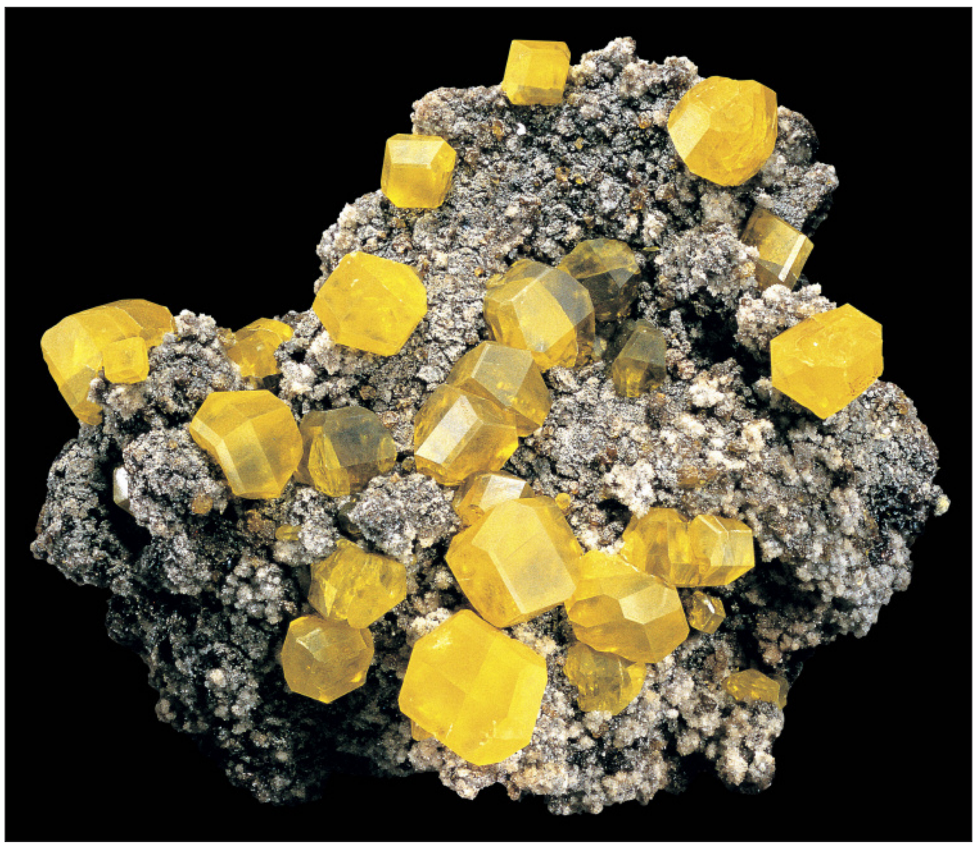
Brazilianite, 13 cm wide, Galiléia, Brazil. Giazotto collection and photo.

Tourmaline, 20 cm, Nelum Valley, Pakistan. Giazotto specimen and photo.

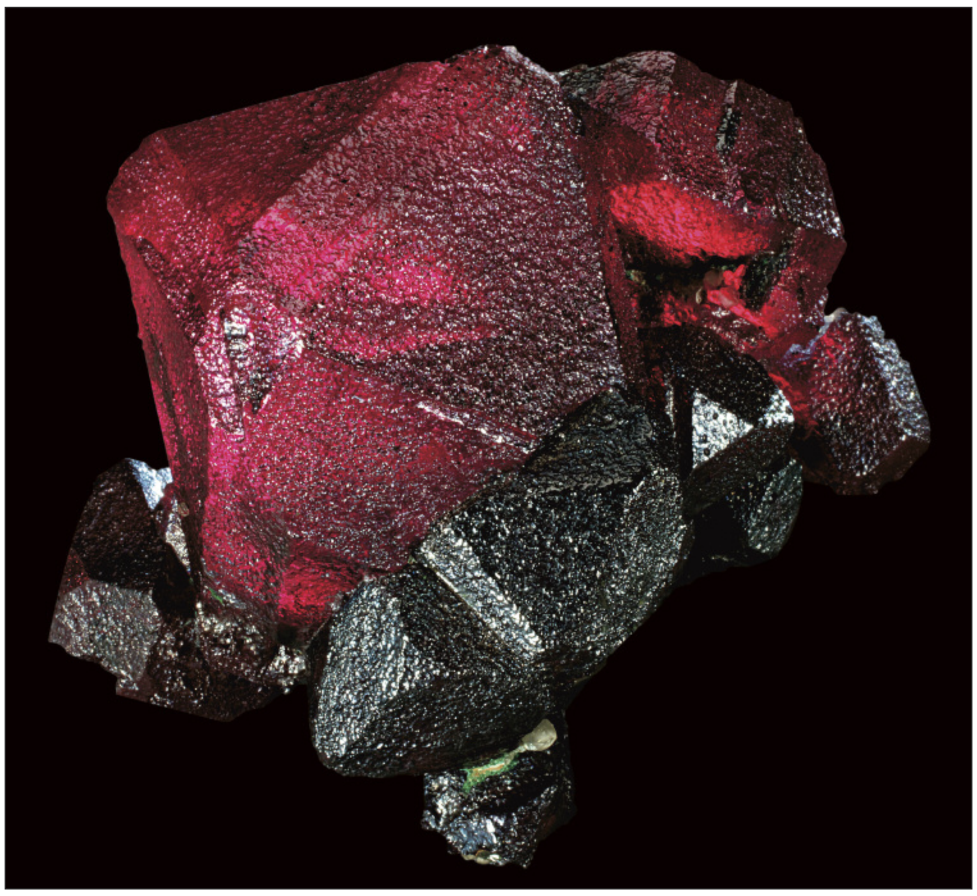
Amethyst, 28 cm high,Vera Cruz, Mexico. Giazotto specimen and photo.

Quartz variety prase, 20 cm wide, Serifos, Greece. Giazotto specimen and photo.

Scheelite and cassiterite on muscovite, 25 cm high, Xuebaoding, China. Giazotto specimen. J. Scovil photo.

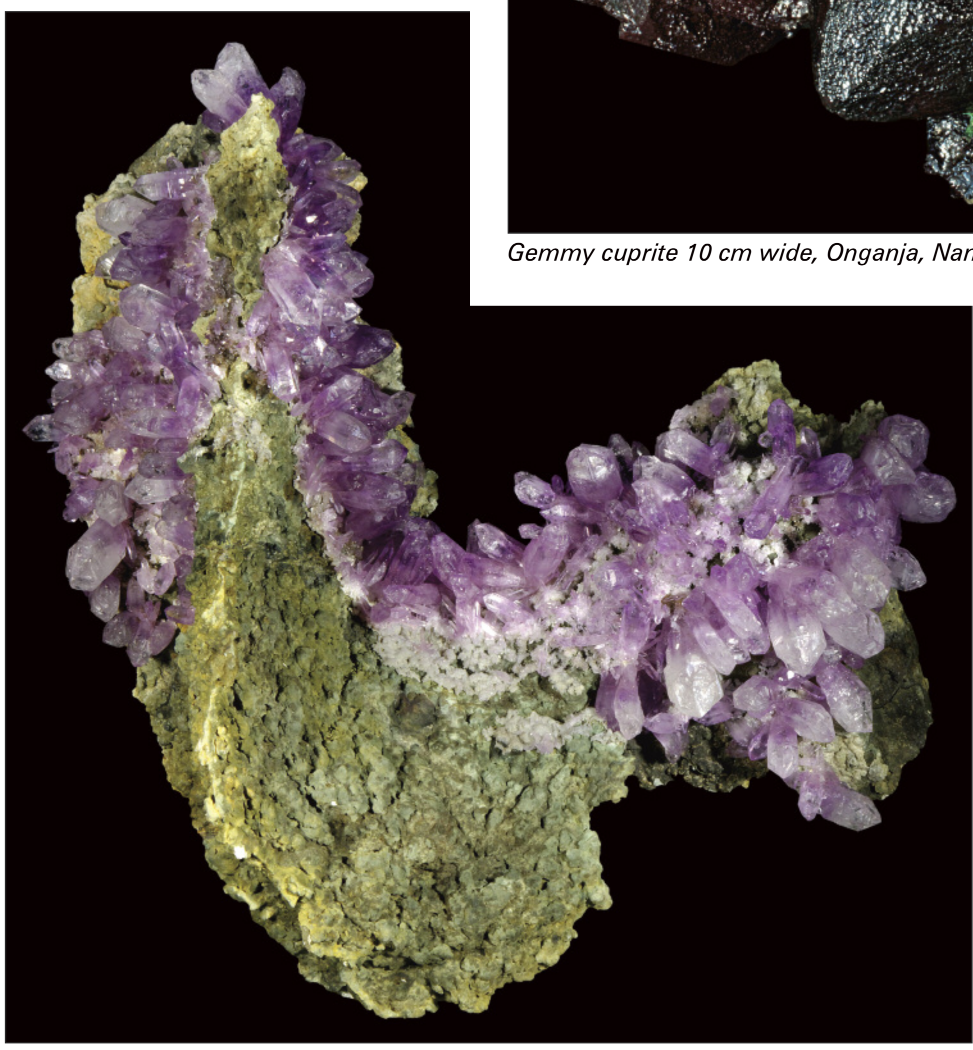


Iconic specimen of sulphur on aragonite, 25 cm wide, Cozzodisi mine, Sicily, Italy. Giazotto specimen. J. Scovil photo.



Gemmy cuprite 10 cm wide, Onganja, Namibia. Giazotto specimen and photo.

Spessartine with smoky quartz, 41 cm wide,Tongbei, China. Giazotto specimen. J. Scovil photo.



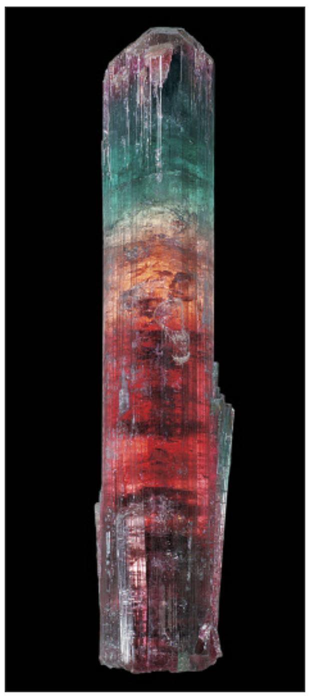
Amethyst, 60 cm high,Vera Cruz, Mexico. Giazotto specimen and photo.

Tourmaline, 30 cm high, Paproc, Afghanistan. Giazotto specimen and photo.

48 cm monster – tourmaline with feldspar and quartz, São José da Safira, Brasil. Giazotto specimen. J. Scovil photo.

Aquamarine with muscovite, 32 cm high, Nagar, Pakistan. Giazotto specimen. J. Scovil photo.

Tourmaline, 41.2 cm high, Pederneira mine, Brazil. J. Scovil photo.



Tourmaline, 28.5 cm high, Coronel Murta, Brazil. Giazotto specimen and photo.

Heliodor, 34.2 cm high, Volodarsk Volynskii, Ukraine. Giazotto collection. J. Scovil photo.

Tourmaline, 22.5 cm high, Cruzeiro mine, Brazil. Giazotto collection. J. Scovil photo.

Gypsum on aragonite, 24 cm wide, Cozzodisi mine, Sicily, Italy. Giazotto collection. J. Scovil photo.

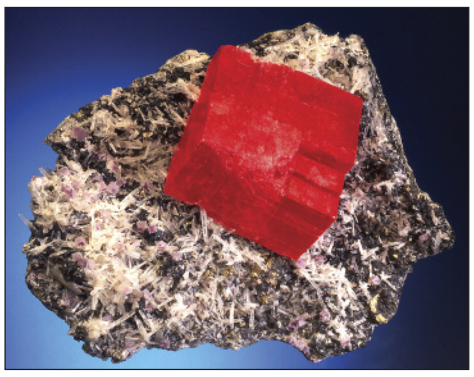
Tourmaline, 27 cm high, Cruzeiro mine, Brazil. Giazotto collection. J. Scovil photo.

Famous aquamarine "Emperor of India", 32 cm high, 9.8 kg, Paplam Patti, Karur, India. Giazotto collection and photo.

Morganite, 25 cm wide, Urucum mine, Brazil. Giazotto collection and photo.

Brazilianite, 13 cm wide, Galiléia, Brazil. Giazotto collection and photo.

Kunzite, 30 cm high, Resplendor, Brazil. Giazotto collection and photo.



Rhodochrosite, 21.6 cm wide, Sweet Home mine. Giazotto coll. J. Scovil photo.

Heliodor, 19 cm, Fitampito, Madagascar. Giazotto specimen. J. Scovil photo.

Tourmaline with quartz, 55 cm high, Pederneira mine, Brazil. Giazotto photo.

Fluorite with quartz, 21 cm wide, Planggenstock, Switzerland. Giazotto specimen. J. Scovil photo.

Tourmaline, 30 cm high, Paproc, Afghanistan. Giazotto specimen and photo.

lorry fell into a hole in the road which turned out to be the entrance to a large geode filled with Ajoite specimens. The quality of Ajoite inclusions in quartz was outstanding, much better than those found in the previous Ajoite

Morganite with albite, 38 cm wide, Urucum mine, Brazil. Giazotto specimen. J. Scovil photo.

discovery also at the Messina Mine many years ago. This specimen (60 kg) was left in place because it was too big and recovery extremely difficult because it was hanging from the geode ceiling. When the geode's smaller specimens were all recovered, then the recovery of the last large one started. The miners put car tires under the specimen and slowly crushed the surrounding rocks until the specimen fell head down on the soft rubber, without any damage. The miners called this specimen the "Fallen Angel". As it is possible to admire from the pictures, the elegance and the power of this specimen are outstanding.

TP: *There are many tourmalines and beryls (especially morganites) in your collection. Are these your favorite minerals?*

AG: Yes, these crystals are beautifully colored, with very appealing matrices and combinations of other pegmatitic minerals very appealing too. Gem crystals can also be cleaned easily because they are very hard, and therefore much better preserved.

TP: *You are a famous physicist and father of the Virgo project. Can you tell us in simple words about your work, scientific interest, and Virgo?*

AG: Thank you for the "famous" that I do not deserve. With this project we are trying to detect for the first time Gravitational Waves (GW) with purpose of starting a new way of observing Universe i.e. by means of GW instead of Electromagnetic Waves. Observations with GW is crucial because it is the only way we have for observing Big Bang at times close to zero time, at times close to the so called Planck's time (10^{-44}s); there is no other way. In conclusion, we aim to create a new astronomy.

TP: *Even though your collection is very valuable, you decided to show it to the public. This is a commendable task that is unfortunately not very common among collectors. Can you tell us about the special exhibition in Firenze? Is it temporary, or will it stay there for long time?*

AG: It was a very fortunate chain of events and in particular the will of Giovanni Pratesi, President of the Natural

Fluorite on calcite, 35 cm wide, La Collada, Spain. Giazotto specimen and photo.

The "Cristali" exhibition in the La Specola building of the Natural History Museum, Florence University. J. Scovil photo.

History Museum of Florence University, who pushed for having "*Cristalli*" at *la Specola*. Public viewing is very varied, ranging from young people in schools, to tourists. The reaction to what they see is left written in books at the show entrance, a typical one is "*now I know that God exists*". People ignore the existence of this kind of Nature and when they see it, they are very shocked. It is not permanent, but I guess that Cristalli will be there for more years to come.

TP: *Many of us have thought, "What will happen to my collection when I pass?". Your collection has special museum and scientific value. Have you made plans for the collection after your death (of course we wish you 150 years!)?*

AG: Thank you, I deserve it… Seriously though, it is a difficult question. Perhaps I will consider selling it before my final destination, or cutting it in quarters for my four children, but I'll never donate it to some institution. Who knows?

TP: *In addition to the exhibition of your collection in Firenze, we understand it is also available on-line for those who cannot travel to Italy. Are all specimens from your collection shown there?*

AG: Yes, look at *www.giazotto.com*, my old site, recently updated, contains more or less all Cristalli's specimens plus others I have at home.

TP: *A few years ago an exceptional book about your collection was published. Can you tell us about this project?*

AG: Yes the book is Cristalli, done together with Giovanni Pratesi and Federico Pezzotta with photographs from Jeff Scovil and myself. The book contains pictures of my collection with the purpose of showing large, high quality specimens, and also for showing the "artistic" contents of them.

TP: *Adalberto, thank you very much for the interview and good luck with new acquisitions to your collection. We hope you find that 30 cm phosphophyllite on matrix!*

Interview: August 2011

Adalberto Giazotto with his famous aquamarine "Emperor of India". J. Scovil photo.

We joined forces to bring you more great specimens directly from the mines !
J. Scovil photo.
Tom (Spirfer Minerals) with self collected specimen in Rogerley, UK.
www.SpiriferMinerals.com
Spirifer Minerals (Poland)
www.spiriferminerals.com
e-mail: tom@spiriferminerals.com
tel. +48 507 038 876
&
Miner's Lunchbox (USA)
www.minerslunchbox.com
e-mail: scott@minerslunchbox.com
tel. +1 775 829 6881
Scott (Miner's Lunchbox) in Jalgaon quarry, India.
Find us at the mineral shows, on the internet, or in the field!