

## January 2008 Mineral of the Month: Barite

"The barites from Stoneham are lovely, delicate, blue, prismatic-to-tabular blades . . . The locality is currently closed, so the supply of these fine, flat blades of blue barite is gradually fading from the marketplace."—Bob Jones, *Rock & Gem*, June 2006

### PHYSICAL PROPERTIES

Chemistry: BaSO<sub>4</sub> Barium Sulfate, often containing some strontium or lead.

Class: Sulfates

Subclass: Anhydrous Sulfates

Group: Barite

Crystal System: Orthorhombic

Crystal Habits: Most often thin-to-thick, tabular crystals in intergrown clusters, sometimes with projecting, crest-like edges; less commonly prismatic; also granular, massive, fibrous, stalactitic, radiating, earthy, and in rosette, laminated, and globular-concretion forms; occasionally as crossed twins.

Color: White, gray, colorless, or shades of yellow, gold, brown, red, and blue.

Luster: Vitreous, pearly

Transparency: Transparent to translucent

Streak: White

Cleavage: Perfect in one direction, good in a second, and distinct in a third

Fracture: Uneven, brittle

Hardness: 3.0-3.5

Specific Gravity: 4.3-4.6

Luminescence: Usually fluoresces yellow or orange under long-wave ultraviolet light; sometimes phosphoresces greenish- or bluish-white.

Refractive Index: 1.634-1.648

Distinctive Features and Tests: Best field indicators are tabular crystal form and unusually high density for a light-colored, transparent-to-translucent mineral.

Dana Classification Number: 28.3.1.1



Figure 1.  
Barite crystal.

### NAME

Correctly pronounced BARE-ite, this month's mineral takes its name from the Greek *barys*, meaning "weight," a reference to its considerable density. The British spelling is "baryte," but the pronunciation is the same. Because of its wide distribution and many uses, barite has had many alternative and regional names, including "astapia," "baryntine," "barytite," "barytes," "boulonite," "calk," "calstronbarite," "dreeelite," "schoharite," "tiff," "yellow spar," "blue spar," "heavy spar," "barite sulfate," and "barium spar." Apart from the British "baryte," barite also appears in European mineralogical literature as "barit" and "barita." Strontium-rich barite varieties are known as "barian celestine," "celestobarite," and "barytocelestine." A lead-rich variety is called "plumbobarite"; "calcareobarite" is a calcium-rich variety. "Bologna stone" and "Bolognian spar" refer to a radiating phosphorescent variety.

### COMPOSITION

By coincidence, we first featured barite in January 2002, from another classic American location, the Palos Verdes Peninsula, Los Angeles County, California—believe it or not, L.A. county has not been completely built over! Barite crystals have been collected there at the now-abandoned Livingston Quarry and at many nearby sites. Some collectors say the best place to look is at the base of the cliffs below this quarry. Our specimens five years ago looked nothing like this month's—they were comprised of small, simple tabular,

## ***January 2008 Mineral of the Month: Barite***

close-growing crystals, tan in color, with a growth of sugary-white barite crystals on top. Fluorescence and phosphorescence were noted in both color crystals. Naturally, we were delighted when offered this large lot of pretty blue blades of excellent quality from another classic American locality to send you this month!

Barite's chemical formula  $\text{BaSO}_4$  indicates that it contains the elements barium (Ba), sulfur (S), and oxygen (O). The molecular weight of barite is made up of 58.84 percent barium, 13.74 percent sulfur, and 27.42 percent oxygen. The simple barite molecule is made up of a single cation (positively charged ion) and a single anion (negatively charged ion). The cation consists of a barium ion [ $\text{Ba}^{2+}$ ] with a +2 charge. Barite's anion consists of a single radical (a group of atoms that acts as an entity in chemical reactions). This is the sulfate radical [ $(\text{SO}_4)^{2-}$ ], in which a single sulfur ion is surrounded by four oxygen atoms positioned at the corners of a tetrahedron. Each of the four oxygen ions has a -2 charge, while the sulfur ion has a +6 charge. This creates a collective -2 charge for the sulfate radical, which balances the +2 charge of the barium cation to provide the barite molecule with electrical stability.

The large and complex sulfate class of minerals has nearly 200 members, each of which has one or more metallic elements bound to one or more sulfate radicals. In the sulfate radical [ $(\text{SO}_4)^{2-}$ ], the two negative charges are distributed evenly across the four oxygen ions, enabling the radical to bond with many different metal cations to form a broad variety of lattice configurations. These configurations can accommodate many different anions, such as hydrogen and halogen ions and hydroxyl, carbonate, and nitrate radicals. Many sulfates are hydrous with attached molecules of water; many are also rare. Although their properties vary widely, sulfates are generally light in color, transparent to translucent, soft, and fragile. Many occur in well-formed crystals at numerous localities, making the sulfides class one of the most commonly represented in collections. Common sulfate group minerals that we have featured include anhydrite [ $\text{CaSO}_4$ ] in June 1998, celestine [ $\text{SrSO}_4$ ] in December 2000 and November 2005 (in this country celestine, the official name, is usually called celestite), creedite [ $\text{Ca}_3\text{Al}_2(\text{SO}_4)(\text{OH})_2\text{F}_6 \cdot 2\text{H}_2\text{O}$ ] in October 1999, glauberite [ $\text{Na}_2\text{Ca}(\text{SO}_4)_2$ ] in January 2005, gypsum [ $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ] in May 2001 and October 2005, hanksite [ $\text{KNa}_{22}(\text{SO}_4)_9(\text{CO}_3)_2\text{Cl}$ ] in January 2006, jarosite [ $\text{KFe}_3(\text{SO}_4)_2(\text{OH})_6$ ] in November 2000, and thenardite [ $\text{Na}_2\text{SO}_4$ ] in August 1999.

Barite, with its closely packed crystal lattice in which ten oxygen ions surround and shield each barium ion, exhibits no metallic properties. Atomic bonding explains many of barite's other physical properties. Barite has two types of bonding: strong covalent bonding in which electrons are shared, and much weaker ionic bonding. The covalent bonding occurs almost entirely between the sulfur and oxygen ions within the sulfate radical. Most inter-lattice bonding, however, is ionic. Ionic bonding is the force that holds positively charged, distinctly metallic ions together with negatively charged, distinctly nonmetallic ions or radicals. In barite, the barium ion with its positive divalent charge is attracted to the negative divalent charge of the sulfate radical. Although ionic attraction is omnidirectional, the effective lattice strength is modified by the basic orthorhombic crystal shape. Minerals that are chemically complex or that have complex bonding often crystallize in the orthorhombic system, which has three mutually perpendicular axes of different lengths, an arrangement that is readily apparent in barite's tabular crystals. Because of the inherently weak nature of ionic bonding and the unequal axial lengths of its orthorhombic structure, barite exhibits perfect cleavage in one direction, good cleavage in another, and distinct in a third. Weak ionic bonding also explains barite's softness (Mohs 3.0-3.5) and brittleness.

Barite's Dana classification number 28.3.1.1 first identifies it as an anhydrous sulfate or anhydrous acid sulfate (28). The subclassification (3) next defines it by the general formula  $(\text{A}^{2+})\text{XO}_4$ , in which "A" can be the divalent ions of barium, strontium ( $\text{Sr}^{2+}$ ), or lead ( $\text{Pb}^{2+}$ ), and "X" is the sulfur ion  $\text{S}^{6+}$ . Barite is then classified as a member of the barite group (1), as the first (1) of three members:

## ***January 2008 Mineral of the Month: Barite***

|           |                   |   |
|-----------|-------------------|---|
| Barite    | Barium Sulfate    | BaSO <sub>4</sub>   |
| Celestine | Strontium Sulfate | SrSO <sub>4</sub> (Usually labeled as Celestite in the United States) |
| Anglesite | Lead Sulfate      | PbSO <sub>4</sub>   |

These barite-group members all crystallize in the orthorhombic system and differ chemically only in their metal cations. Because of similar electrical charges and generally similar ionic radii, all three of these cations can substitute for each other without disturbing the crystal lattice—the reason that barite always contains at least traces of strontium and lead. All three barite-group members have generally similar properties, with the exception of their densities, which vary considerably with the atomic weights of their metal cations. Celestine, in which the atomic weight of strontium is 87.62, is the least dense of the three barite-group minerals with a specific gravity of 3.9-4.0. Barium's higher atomic weight of 137.33 gives barite an intermediate density with a specific gravity of 4.3-4.6. Lead's very high atomic weight of 207.2 makes anglesite the densest of all with a specific gravity of 6.3-6.4. Cationic substitution between barium and strontium is so common that barite and celestine form a complete, graded solid-solution series. Intermediate phases of the barite-celestine solid-solution series are known as barite-celestine or barytocelestine. Barite less frequently forms a graded solid-solution series with anglesite, with the intermediate phase known as plumbobarite.

As an allochromatic (other-colored) mineral, barite's colors are caused by small amounts of nonessential elements or defects in the crystal lattice. Pure barite is colorless, but impurities such as iron and calcium can distort the crystal lattice to alter the manner in which it absorbs and reflects light. Mineralogists believe that barite's wide range of pale colors, notably the blues, is also the result of "color centers," imperfections in the crystal lattice that are often caused by natural geophysical radiation, which energizes electrons and displaces them from their normal positions. These energized electrons come to rest in vacant lattice positions called "traps." Trapped electrons absorb only certain wavelengths of visible light while reflecting others. This theory is supported by barite's affinity for the radioactive element radium. Even the radiation emitted by minuscule traces of radium can displace electrons and create color centers. Some barite varieties are phosphorescent, that is, they continue to emit visible light even after an incident light source has been removed. Phosphorescence is caused when electrons are energized by visible light and slowly release their excess energy in the form of visible light, usually in the blue or blue-green wavelengths.

Barite is the most abundant barium-bearing mineral. It occurs with anhydrite [calcium sulfate, CaSO<sub>4</sub>], fluorapatite [calcium fluorophosphate, Ca<sub>5</sub>(PO<sub>4</sub>)<sub>3</sub>F], and calcite [calcium carbonate, CaCO<sub>3</sub>] in carbonatites (carbonate-containing igneous and metamorphic rocks); with calcite, quartz [silicon dioxide, SiO<sub>2</sub>], and fluorite [calcium fluoride, CaF<sub>2</sub>] in mesothermal and epithermal vein deposits; and with gypsum [hydrated calcium sulfate, CaSO<sub>4</sub>·2H<sub>2</sub>O], dolomite [calcium magnesium carbonate, CaMg(CO<sub>3</sub>)<sub>2</sub>], and cerussite [lead carbonate, PbCO<sub>3</sub>] in massive hydrothermal replacement deposits. It also occurs as intergranular and crystalline precipitates and seam fillings in limestone, volcanic ash deposits, and other sedimentary rocks. Unlike most sulfates, barite is not soluble in water and is very resistant to alteration.

### *COLLECTING LOCALITIES*

Because barite is a common, widely distributed mineral with thousands of documented collecting localities worldwide, we can list only some of the many sources that have provided collectible specimens. Our barite specimens were collected at one of the classic localities for blue barite—a site near Stoneham in Weld County, Colorado. Other Colorado specimens come from the Book Cliffs area northeast of Grand Junction in Mesa County; the Black Cloud Mine at Leadville in the Leadville Mining District in Lake County; the Rico Argentine Mine in the Rico district of Dolores County; the Wagon Wheel Gap Mine at Wagon Wheel Gap in Mineral County; and the Sunnyside and adjacent mines in the Silverton district of San Juan County.

## ***January 2008 Mineral of the Month: Barite***

Quality Arizona specimens have come from the Blue Ball Mine in the Globe-Miami Mining District of Gila County; the Grandview Mine at Horseshoe Point in Grand Canyon National Park in Coconino County; the Mammoth Mine in the Mammoth district of Pinal County; and the Weldon Mine in the Osborn district of Pima County. California specimens occur in the numerous mines of the Cargo Muchacho district in Imperial County, the Lalkar Quarry at Santa Cruz in Santa Cruz County, and the aforementioned Palos Verdes locality. In Nevada, the nation's largest source of mined barite, specimens are found at the Seventy-Six Barite Mine in the Charleston district, the Judy Barite Mine in the Cave Creek district, and the Big Bird and Barite claims in the Merrimac district, all in Elko County.

Barite specimens are found in numerous mines near Cave-in-Rock in the Illinois-Kentucky Fluorite District of Hardin County, Illinois; the McKnight, Henderson, and Gap Mountain mines in the Fancy Hill Mining District of Montgomery County, Arkansas; and numerous mines in Morgan, Washington, Texas, and St. Louis counties in Missouri. Notable Tennessee sources include the mines of the Sweetwater Barite District of Roane County, and those of the Falls Branch-Greeneville Barite District of Sullivan County.

Notable Mexican barite specimens are found in the Naica Mine at Naica near Saucillo, Chihuahua. The best Canadian specimens come from the Bailey Mine at Madoc in Madoc Township in Hastings County, Ontario; Mont Saint-Hilaire in Rouville County, Québec; and the Rock Candy Mine at Grand Forks in the Greenwood Mining District of British Columbia.

Chinese specimen sources include the Wenyuhe barite deposit in Zhushan County, Shiyan Prefecture, Hubei Province; the Danegou and Lushi mines in the Xiaoqinling Ore Belt in Sanmenxia Prefecture, Henan Province; the Gangxi Barite Deposit in Xinhaung County in Huaihua Prefecture, Hunan Province; the Tuchengzi Barite Mine in the Jinzhou district of Dalian Prefecture, Liaoning Province; and the Huangboshuwan Barite Deposit in Zyang County in Ankang Prefecture, Shaanxi Province. Russia also provides barite specimens, notably from Dalnegorsk at Primoskiy Kray in the Far Eastern Region.

In South America, Peruvian barite sources include the Casapalca Mine at Casapalca in Huarochiri Province, Lima Department; and the Herminia Mine in the Julcaní district of Angaraes Province, Huancavalica Department. Another South American source is the Jacupiranga Mine at Cajati near São Paulo, Brazil. Australian specimens come from the Kintore Mine at Broken Hill in Yancowinna County, New South Wales; and from Big Spring at Fitzroy Crossing, Ashburton Down, in Western Australia.

Fine South African specimens come from the Elandsrand Mine at West Rand in the Wittersrand Gold Field of Mpumalanga Province. Namibia is best known for specimens from the Rosh Pina Mine in the Lüderlitz District in the Karas Region, and the famed Tsumeb Mine at Tsumeb in the Otjikoto Region.

In Europe, fine specimens are collected at the Garpenberg Nora Mine, Garpenberg, Hedemora, Sweden; the Serpiano Barite Mine at Serpiano near Lugano Lake in Ticino, Switzerland; Bromley Hill at Nenthead in the Alston-Moor district of the North Pennines in Cumbria, England; the Les Farges Mine at Ussel near Corrèze in Limousin, France; the Clara Mine at Oberwolfach in the Black Forest Region of Baden-Württemberg, Germany; the Milos Mine on Milos Island in the Kykládes district of the Aegean Islands in Greece; and the Muscadroxius-Tres Montes Mine at Silius in Sardinia, Italy.

### *JEWELRY & DECORATIVE USES*

Although barite is too soft and brittle for use in most forms of jewelry, it is faceted into dazzling collectors' gems in a large variety of cuts, usually in a weight range of 6 to 12 carats. Rare, flawless barite gems, in desirable colors about eight carats in weight, can cost as much as \$700 each.

## ***January 2008 Mineral of the Month: Barite***

Barite has always been sought by collectors, both as individual crystals and composite specimens, for its range of colors, various crystal forms, often large crystal size, and affordability.

### *HISTORY & LORE*

Although known since antiquity, barite did not receive much attention until 1603, when an Italian cobbler named Vincenzo Casciarolo (vita uncertain), who was also a moonlighting alchemist, discovered a white, translucent, unusually heavy stone at Monte Paderno near the city of Bologna in northern Italy. In a series of experiments, Casciarolo ground the stone to a powder, mixed it with charcoal and heated it. Later at night, the alchemist was awed when the powdered stone emitted an eerie bluish glow in the darkness. His first thought was that he had discovered the long-sought-after “philosopher’s stone” that could transmute common metals such as lead into gold. Casciarolo named his discovery *lapis solaris*, literally “sun stone,” and showed it to the leading scholars of the day, among them the eminent Italian astronomer and physicist Galileo Galilei (1564-1642). One of Galileo’s contemporaries, Giulio Cesare La Galla (1576-1624), wrote that the *lapis solaris* must have trapped the sunlight and firelight to which it had been exposed and was somehow able to release it slowly in darkness—the first recorded observation of the phenomenon of mineral phosphorescence.

*Lapis solaris*, which became widely known as “Bologna stone,” attracted great attention throughout Europe where, for the next 200 years, it continued to intrigue both alchemists and scientists, despite the fact that its identity remained a mystery. Researchers were able to determine the composition of Bologna stone only after recognizing barium as an element in the early 1800s (see “About Barium”). “Bologna stone” was finally identified as the mineral form of barium sulfate in 1837 and assigned the name “barite.” The cause of its phosphorescence, however, was not satisfactorily explained until the emergence of quantum theory in the early 1900s. X-ray diffraction revealed the atomic structure of barite in 1922.

“Rose rock,” a rosette-shaped cluster of intergrown barite crystals with included iron-stained, reddish quartz grains, is found along the 80 miles between Pauls Valley in south-central Oklahoma and Guthrie, 30 miles north of Oklahoma City. The prime collecting area is in Cleveland County near the town of Noble, which, with its annual rose-rock festival and a rose-rock museum, fittingly calls itself the “Rose Rock Capital of the World.” Rose rock occurs in Oklahoma in the 250-million-year-old, Permian-age Garber Sandstone and formed when barium-rich seawater precipitated barite as the sediments were deposited. Harder and more durable than the surrounding sandstone, the rosettes weather into positive relief on outcrop surfaces, eventually separating from the sandstone and scattering into the sandy soil. Most rose rocks are one-half-inch to four inches in diameter and consist of 5 to 20 radiating, bladed barite crystals. The largest known rosette measures 17 inches across and 10 inches high, and weighs 125 pounds. Clusters of rosettes more than three feet tall can weigh as much as a half-ton. Governor Dewey F. Bartlett signed House Bill 1227 on April 8, 1968, officially designating barite rose rock as Oklahoma’s state rock.

According to modern metaphysical belief, barite helps heal the Earth, creates the initiative to pursue one’s dreams without restraint, facilitates independence, and enhances friendship, harmony, and love.

### *TECHNOLOGICAL USES*

Barite has important industrial and medical uses. It is the “weighting” agent in the drilling fluids, also called “drilling muds” and “spud muds,” that are vital to oil and natural-gas drilling. Drilling mud, which consists of finely ground barite mixed with water and clay, is pumped into drill holes during drilling operations. Drilling mud removes drill-bit cuttings, maintains drill-hole stability, cools and lubricates the drill bit and, because of its high density, prevents “blowouts” from oil or natural gas under high formation pressure.

## ***January 2008 Mineral of the Month: Barite***

Barite's radio-opacity (the ability to absorb X-rays and gamma rays) has proved useful in the medical and nuclear fields. Finely ground barite is the core ingredient in the familiar hospital "barium milkshake" used in X-ray diagnosis of the gastrointestinal tract. While X-rays pass through soft tissue, they are completely absorbed by the barite fluid and thus produce clearly defined images of the gastrointestinal tract. Although many barium compounds are toxic, barite is nontoxic because it is insoluble in water. Ground barite is an additive in radiation-shielding "heavy cements" to make concrete containers for storage of radioactive wastes. In a similar use, finely ground barite is also a component of the glass used for computer and television screens, where it absorbs potentially harmful radiation.

Barite is also added to glass mixtures to create high-refraction "leaded" glass or "leaded crystal." Finely ground, high-purity barite is added to paints, enamels, plastics, and paper as a filler and glossing agent. Heavy, glossy catalogue paper and playing cards all contain substantial amounts of barite.

### ***BARIUM***

*In 1774, Swedish chemist Carl Wilhelm Scheele (1742-1786) distinguished an unknown, heavy, oxide mineral in calcined lime [calcium oxide, CaO] and concluded that it contained an unidentified metallic element. French chemist Louis-Bernard Guyton de Morveau (1737-1816) named this oxide "barote," after the Greek barys, meaning "weight." His colleague Antoine-Laurent Lavoisier (1743-1794) then changed this name to "baryta," which quickly gained acceptance within the scientific community. Finally, in 1803, British chemist and physicist Sir Humphry Davy (1778-1829) electrolytically reduced the molten oxide to isolate a new metal, which he named "barium," after "baryta."*

*One of the alkaline-earth metals, barium is a soft, heavy, silvery metal. The alkaline-earth metals fall under group II A on the periodic table of elements and, along with barium, include beryllium (Be), magnesium (Mg), calcium (Ca), strontium (Sr), and radium (Ra). All alkaline-earth metals burn readily when heated in air. Although not as chemically active as such alkali metals as lithium, sodium, and potassium, they are reactive enough to never be found free in nature. Barium has a relatively high atomic weight of 137.33 (2.5 times that of iron) and a melting point of 1341 °F. (727 °C.) Because it oxidizes very easily in air and reacts violently with water, elemental barium must be stored under petroleum or other oxygen-free liquids to exclude contact with air and water.*

*While barium compounds have many important uses, elemental barium, a metal that is rarely ever seen, has only a few. The most important is as a "getter" in television and other vacuum tubes. Because of its high chemical reactivity, metallic barium quickly bonds with free oxygen and other reactive gases. Thus, a tiny quantity of alloyed barium placed within vacuum tubes eliminates residual free oxygen to greatly extend the service life of the tube. Small amounts of barium are alloyed with lead to improve the performance of acid storage batteries, with nickel for the manufacture of automotive ignition parts, and with iron to produce ductile ferric alloys. Elemental barium is also used a "carrier" when working with the radioactive element radium.*

Nearly eight million metric tons of barite are mined worldwide each year. China accounts for half of this production, followed by India, the United States, and Morocco. Barite is mined from sedimentary deposits by open-pit methods, then washed or jigged to remove gangue material. Washed barite is relatively inexpensive, now costing about \$36 per ton. The United States produces nearly 500,000 metric tons of barite annually from eight mines, four of which are in Nevada. Ninety percent of the world's barite production goes into drilling mud; the remainder is used to produce barium metal and various barium chemicals and medical compounds.

## ***January 2008 Mineral of the Month: Barite***

Barite is also important in paleo-oceanographic studies. Because diagenetic (secondary) barite within sedimentary formations is resistant to alteration, geophysicists use measurements of its lead-isotope and strontium-isotope ratios to reconstruct conditions of seawater chemistry and temperatures that existed when host formations were deposited.

### *ABOUT OUR SPECIMENS*

Our barite specimens were collected at a classic locality for blue barite—a site near Stoneham in Weld County in northeastern Colorado. Stoneham, located at the junction of Colorado routes 14 and 17, is 125 highway miles northeast of Denver and just 28 miles south of the Nebraska state line. The nearest town of any size is Sterling on Interstate-76, 25 miles to the east. Stoneham is an unincorporated crossroads settlement with a United States Post Office, a few small stores, and a population of just 50. At an elevation of about 4,500 feet, Stoneham is located on the gently rolling high plains near Pawnee National Grassland. The collecting site, a low-lying escarpment known as the Chalk Cliffs, is four miles north-northeast of Stoneham.

The geological origin of this site began 25 million years ago during the Oligocene Epoch, when intense volcanic activity hundreds of miles to the southwest produced dense clouds of ash. Much of this ash, which carried elevated levels of barium mineralization, settled in layers, becoming interbedded with other sediments to form the White River Group of Oligocene shales. Erosion later reduced the surface to roughly the level of Late Cretaceous sediments. However, the younger Chalk Cliffs remain as an isolated remnant of the once-overlying Oligocene shales.

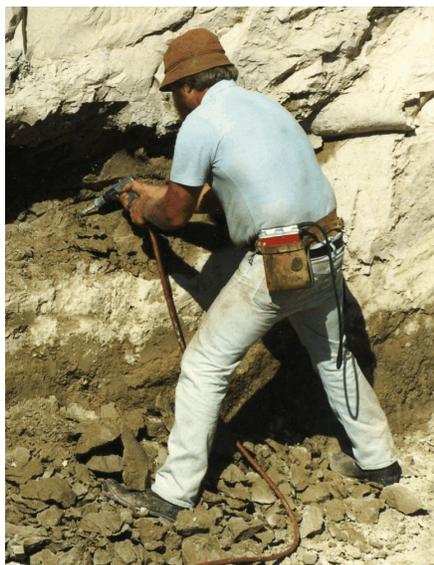
As erosion began to expose the Chalk Cliffs, groundwater percolated downward through the shale, dissolving calcium and barium mineralization, then redepositing both as the minerals calcite and barite within seams of the lower shale strata. Simultaneously, the shale began altering into montmorillonite clay (a general name for a complex group of basic, hydrated clays that form primarily from alteration of volcanic ash and contain calcium, sodium, magnesium, aluminum, and iron). Although most of the host shale weathered into clay, the barite crystals, because of their insolubility in water, were not altered. Today, the Chalk Cliffs are badlands of steep, rapidly eroding bluffs and deep gullies with exposed layers of soft shale and clay that contain seams filled with crystals of yellow calcite and blue barite.

The most productive section of the 20-acre collecting area is along the western edge of the Chalk Cliffs. The crystal-filled seams and pockets within the layers of soft shale and clay range in size from mere inches to as large as 10 feet. On average, the barite crystals are one to two inches in length, although exceptional specimens can measure eight inches. The barite is closely associated with white and yellow, drusy calcite. Stoneham barite crystals are transparent, usually very well developed, terminated, and often doubly terminated. In the most attractive specimens, clean, blue barite crystals project upward from a drusy-calcite base. The bladed barite crystals, usually white or pale blue, tend to occur in clusters. The pale-blue of the thicker crystals has been compared to the delicate color of fine aquamarine, the blue gem variety of beryl [beryllium aluminum silicate,  $\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18}$ ], and is attributed to the deformation of the crystal lattice caused by radiation from trace amounts of radium.



**Figure 2.** Barite locality near Stoneham.

## January 2008 Mineral of the Month: Barite



**Figure 3.** Extracting barite crystals with power tools.

Which did you notice first—the crystal form or the blue color? Both are exceptional, and the very best Stoneham barites can have a color and translucence rivaling aquamarine. Everyone loves long, thin prismatic crystals like these, especially with such excellent faces and terminations! Under our ultraviolet lamp, we noticed no change in the barite in either short or longwave light, but the few bits of remaining matrix on some pieces gave off a nice bright neon green color. Now that we have been privileged to add barite in two completely different colors and crystal forms from two classic localities to our collections, we can already anticipate what form it may take next time we feature this fascinating mineral!

Barite crystals were first reported at the Chalk Cliffs in the late 1870s, the same time that a railroad was being built through Stoneham. The first collectors likely found large quantities of blue barite crystals scattered about the surface. Because the Chalk Cliffs have been a popular collecting area for more than a century, limited quantities of specimens have periodically appeared on specimen markets. By the 1950s, Stoneham had gained recognition as one of the top barite localities in the United States. But quantities of specimens only became available after commercial collectors began working the site with mechanical equipment in the 1990s. One of these commercial groups was The Collector's Edge of Golden, Colorado. Excavating to a depth of more than 10 feet, this group made superb recoveries that cemented Stoneham's reputation as a classic blue-barite site. This success encouraged The Collector's Edge to return in 2005, during which time our specimens were collected. This site includes both public and private land, with the best barite coming from the latter. Because the private land is now closed, prospects for future specimen mining are uncertain.



**Figure 4.** Success! Lovely barite crystals in host rock. All photos courtesy of Collector's Edge Minerals.

References: *Dana's New Mineralogy*, Eighth Edition; *Encyclopedia of Minerals*, Second Edition, Roberts, et al, Van Nostrand Reinhold Co.; *2004 Fleischer's Glossary of Mineral Species*, Joseph Mandarino and Malcolm Back, The Mineralogical Record Company; *Mineralogy*, John Sinkankas, Van Nostrand Reinhold Co.; *Manual of Mineralogy*, Cornelius Hurlbut and Cornelia Klein, Twenty-first Edition, John Wiley & Sons; *Colorado Rockhounding*, Steve Voynick, Mountain Press Publishing Co., 1994; "The Origin of Color in Minerals," Kurt Nassau, *American Mineralogist*, Volume 63, 1978; "Colorado Barite," M. R. Cook, *The Mineralogist*, Volume 20, 1952; "Blue Barite near Sterling, Colorado," R. E. Eklund, Jr., *Rocks & Minerals*, January-February 1965; "The Stoneham Barite Locality, Colorado," Norman L. Bennett, *The Mineralogical Record*, July-August 1986; "Barite: Not Just a Collectible," Steve Voynick, *Rock & Gem*, December 1997; "Barite," M. Michael Miller, *2005 Minerals Yearbook*, United States Geological Survey; "Colorado Barite," Barbara Munyan, *Rocks & Minerals*, July-August 1998; "Colorado Mineral Collecting Localities," Peter J. Modreski, *Rocks & Minerals*, September-October 2005; "Origin of Marine Barite Deposits," Adina Payton, Sarah Mearson, et al, *Geology*, August 2002; "High Plains Barite," Steve Voynick, *Rock & Gem*, March 1988; "A Tour of Colorado Gemstone Localities," Jack A. Murphy, *Rocks & Minerals*, July-August 2002; "Colorado Minerals: Amazonite, Rhodochrosite, and Barite Head the List," Bob Jones, *Rock & Gem*, June 2006.