

April 2007 Mineral of the Month: Phenakite

This month's mineral is a rare beryllium-silicate gemstone collected in Myanmar (formerly Burma) at a recently discovered deposit in the fabled Mogok Stone Tract, considered by many as the richest and most historic gemstone region on Earth.

PHYSICAL PROPERTIES

Chemistry: Be_2SiO_4 Beryllium Silicate

Class: Silicates

Subclass: Nesosilicates (Independent Tetrahedral Silicates)

Group: Phenakite

Crystal System: Trigonal (Hexagonal)

Crystal Habits: Usually in well-developed, flattened rhombohedrons, tabular-to-short prismatic crystals; less commonly as long prisms; lengthwise striations. Crystals usually less than one-half inch in size; penetration twins common. Also granular and as spherulites and columnar aggregates.

Color: Usually colorless; also white and pale shades of yellow, yellowish-brown, and pink.

Luster: Vitreous

Transparency: Transparent to semi-transparent

Streak: Colorless

Cleavage: Poor in one direction

Fracture: Conchoidal to uneven, brittle

Hardness: 7.5-8.0

Specific Gravity: 3.0

Luminescence: None

Refractive Index: 1.654-1.670

Distinctive Features and Tests: Best field marks are rhombohedral crystals, lengthwise striations, and hardness substantially exceeding that of quartz. Well-developed crystals occur only in pegmatites.

Dana Classification Number: 51.1.1.1

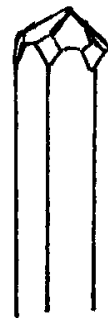


Figure 1 Phenakite.

NAME

The name of this month's mineral has two accepted spellings. The preferred spelling, "phenakite," currently used in all mineralogical literature, is pronounced FEH-na-kite; the alternative and somewhat outdated spelling is "phenacite," which is pronounced FEH-na-site. The name is derived from the Greek *phenakos*, or "deceiver," a reference to the previous confusion with quartz and tourmaline.

Before its mineralogy and chemistry were understood, phenakite was known as "white tourmaline" and "white schorl." In European mineralogical literature, phenakite is known as "phenacita," "phenacit," and "phenakit." "Germanium phenakite" is a pinkish, germanium-containing variety.

COMPOSITION

Our 133rd featured mineral is our second containing the element beryllium, after the red beryl from Utah we featured in March 1999. Yes, we featured red beryl! Of course, they were small specimens, but the Deluxe pieces were in matrix. The mine there has been closed for years, and what is still available is extremely expensive. This is our second featured mineral from Myanmar, after the red spinel in white marble matrix we sent in September 2000. Myanmar certainly has the potential to produce other minerals for us to feature, as you will read, along with information on the fascinating element beryllium.

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Phenakite, chemical formula Be_2SiO_4 , contains the elements beryllium (Be), silicon (Si), and oxygen (O). Its molecular weight is made up of 16.37 percent beryllium, 25.51 percent silicon, and 58.12 percent oxygen. The phenakite molecule has a positively charged cation and a negatively charged radical (a group of ions that acts as an entity in chemical reactions). The cation consists of two ions of beryllium (2Be^{2+}) with a collective +4 charge. The anion, the silicate radical ($(\text{SiO}_4)^{4-}$), has a collective -4 charge. The balance of these cationic and anionic charges provides the phenakite molecule with electrical stability.

Phenakite is a member of the silicates, the largest and most abundant class of minerals. Silicates are combinations of silicon and oxygen with one or more metals. The basic silicate structural unit is the silica tetrahedron ($(\text{SiO}_4)^{4-}$), which consists of a silicon ion surrounded by four equally spaced oxygen ions positioned at the four corners of a tetrahedron (a four-faced polyhedron). In silicate minerals, silica anions and metal cations join together like polymers (repeating chains) to form seven types of structures: independent tetrahedral silicates (nesosilicates); double tetrahedral silicates (sorosilicates); framework silicates (tectosilicates); single- and double-chain silicates (inosilicates); ring silicates (cyclosilicates); and sheet silicates (phyllosilicates).

Phenakite is a nesosilicate, or independent tetrahedral silicate. In nesosilicates, metal cations are packed tightly between silica tetrahedra that have no direct bonding to other tetrahedra. In the rigid nesosilicate crystal lattices, each silica tetrahedron is bonded covalently and ionically to the metal ions. Because of close atomic packing and strong covalent bonding, nesosilicates are hard, relatively dense, and form short, blocky, somewhat square crystals with little cleavage. Due to these properties, more gemstones (topaz, zircon, peridot, all garnets) come from the nesosilicates subclass than any other silicates subclass.

The phenakite lattice is a repeating, three-dimensional structure with nearly equal bonding in all directions. Because strong covalent bonding predominates, phenakite has poor one-directional cleavage. Its hardness of Mohs 7.5-8.0 is considerably greater than that of quartz [silicon dioxide, SiO_2 , Mohs 7.0] and approaches that of topaz [basic aluminum fluorosilicate, $\text{Al}_2\text{SiO}_4(\text{F},\text{OH})_2$, Mohs 8.0]. Phenakite's hardness is somewhat directional, being hardest along the two planes with predominant covalent bonding. Although phenakite's constituent elements all have light atomic weights, close atomic packing gives the mineral considerable density as shown by its surprisingly high specific gravity of 3.0.

Because surrounding oxygen ions completely shield the two beryllium ions, phenakite exhibits no metallic properties. Beryllium, one of the alkaline-earth elements, is a gray, brittle metal that ranks 51st in crustal abundance, about the same as tin. Beryllium has a very low atomic weight of 9.012, only three-quarters that of carbon, and is the lightest of all stable metals. Beryllium has electrical applications and is a component of lightweight, exotic alloys. With its unusual ability to transmit X rays and absorb neutrons, beryllium has many applications in radiology and nuclear-power generation.

As an allochromatic mineral, pure phenakite is colorless. But trace amounts of nonessential elements such as iron and aluminum alter the light-absorption characteristics of the lattice to create a range of pale colors. A white color in phenakite is due to traces of nonessential elements that disrupt the crystal-lattice symmetry in a manner that increases the reflectance of white light.

Phenakite crystallizes in the trigonal system, which has four axes of symmetry. Three are of equal length and separated by angles of other than 120 degrees; the fourth axis is shorter and perpendicular to the others. The trigonal system is sometimes considered part of the hexagonal system, which also has four axes, three of equal length on a common plane and separated by angles of 120 degrees. Although trigonal minerals sometimes form prisms and dipyrramids typical of the hexagonal system, their general symmetry is rhombohedral.

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Phenakite's rhombohedral structure and relatively high density make it a good refractor of light. This ability to bend light is measured by the index of refraction (R.I.), which is the ratio between the speed of light in air and in a crystal. Higher numerical values indicate greater degrees of refraction. High indices of refraction in mineral crystals correspond directly to brightness and brilliance in gems. Phenakite's index of refraction of 1.654-1.670 is higher even than that of such gemstones as beryl (emerald) and topaz.

Phenakite forms in three distinct mineralogical environments: hypothermal veins (hydrothermal mineralization emplaced at high temperature) in association with topaz [basic aluminum fluorosilicate, $\text{Al}_2\text{SiO}_4(\text{F},\text{OH})_2$] and cassiterite [tin oxide, SnO_2]; granite pegmatites with quartz [silicon dioxide, SiO_2], microcline [potassium aluminum silicate, KAlSi_3O_8], and albite [sodium aluminum silicate, $\text{NaAlSi}_3\text{O}_8$]; and regional metamorphic rocks with emerald, the green gem variety of beryl [beryllium aluminum silicate, $\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18}$], and chrysoberyl [beryllium aluminum oxide, BeAl_2O_4].

The Dana mineral-classification number 51.1.1.1 identifies phenakite as a nesosilicate with insular (isolated) silica groups (51). The subclassification (1) next specifies that its silica groups have "four-oxygen coordination" [$(\text{SiO}_4)^{4-}$]. Finally, phenakite is a member of the phenakite group (1), as the first (1) of three members. This group also includes willemite [Zn_2SiO_4], the well-known fluorescent mineral found at the famous Franklin and Sterling Hill mines in New Jersey, and eucryptite [LiAlSiO_4].

COLLECTING LOCALITIES

A number of worldwide localities exist for phenakite, but few produce in quantity. Our phenakite specimens were collected at the Pelelni pegmatite mine near Khetchel village in the Molo quarter of Momeik Township in the Shan state of Myanmar. Other phenakite sources in Asia include the type locality at the Malyshevskoye emerald and chrysoberyl mines on the Tokovaya River at Ekaterinburg, Sverdlovskaya Oblast' in the Urals Region of Russia; and the Koktokay pegmatite field at Fuyun in Altay Prefecture of the Xinjiang Autonomous Region of China.

In Africa, phenakite occurs in pegmatites at Klein Spitzkopje in the Swakomund District of Namibia's Erongo Region; the Anjanabonoina pegmatites at Mount Ikaka in the Vakinankaratra Region of the Antananarivo Province of Madagascar; and at Magara on Lake Manyara in the Arusha Region of Tanzania. In South America, Brazilian phenakite is found in the Morro Aguda, Pedra Azul, Pica Pau, and Rio Piracicaba pegmatite mines near Santa Maria do Itabira in Minas Gerais, and at the Socotó emerald deposit at Serra das Almas in Bahia.

In Europe, phenakite occurs at the Pianasca and Beura-Cardezza quarries in the Ossala Valley, Piedmont, Italy; the Fichtel and Kirchenlamitz pegmatite quarries at Weissenstadt, Franconia, Bavaria, Germany; the Leckbachgraben emerald deposit at Nasenkopf Mountain in the Gastein Valley of Salzburg, Austria; at Drammen, Buskerud, Norway; at Franquiera, Pontevedra, Galicia, Spain; the Fianel Mine at Domleschg in the Ferrera Valley near Grischn, Switzerland; the Cheesewring, South Phoenix, and Wheel Phoenix pegmatite mines at Linkinhorne in the Liskeard District at Cornwall, England; and at quarries at Rothau at Bas-Rhin in Alsace, France.

In the United States, most phenakite comes from Colorado, notably from the granite pegmatites at Mt. Antero, Mt. White, and the Monarch district in Chaffee County. Other Colorado sources are pegmatites at Crystal Peak in Teller County, where last month's amazing amazonite crystals were unearthed; Harris Park in Park County; and Cameron Cone, Crystal Park, Specimen Rock, and Stove Mountain in El Paso County. Virginia specimens come from the Cash and Irish Creek mines at Irish Creek in Rockbridge County; and the Morefield pegmatite mine at Winterham and the Rutherford Nos. 1, 2, and 3 mines at

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Amelia in Amelia County. In New Hampshire, phenakite occurs at North Sugarloaf Mountain at Bethlehem in Grafton County; at Stratford in Coos County; and in Carroll County at the Weeks Mine at Wakefield, the Iron Mountain mines at Bartlett, and the South Baldface Mountain phenakite locality at Chatham. In Nevada, phenakite occurs at the Zapot Pegmatite in the Fitting District of Mineral County, the Virgin Mountain pegmatites in the Bunkerville District of Clark County, and the Mt. Wheeler Mine in the Lincoln District of White Pine County. Notable sources in Maine include the Bennett and Orchard Pit quarries at Buckfield, the Lord Hill Mine at Stoneham, the Harvard and Noyes Mountain quarries in Oxford County, and the Square Pit at Topsham in Sagadahoc County. In Wisconsin, phenakite is found at the Beryl Mine in Shawano County, and the Rib Mountain pegmatites at Rib Mountain in Marathon County.

In Canada, phenakite is found in Ontario at the Deadhorse Creek pegmatite complex near Marathon in the Thunder Bay District and the Beryl Pit at Lyndoch Township in Renfrew County; in the Northwest Territories at Blanchford Lake in the Mackenzie District; and in British Columbia at Mt. Foster in the Atlin Mining District.

JEWELRY & DECORATIVE USES

Phenakite has all the technical requisites to make fine faceted gems—superior hardness and the related ability to polish well, excellent transparency, and a high index of refraction. However, it lacks a distinctive color and is too rare to enjoy popularity in mainstream jewelry markets. The limited numbers of phenakite gems intended for jewelry use are in the two-to-five carat range and are mounted in silver. Phenakite is also faceted into collector gems, usually in emerald and oval cuts that weigh as much as 20 carats. Properly cut phenakite collector gems are stunning, with eye-catching clarity and a dazzling brilliance. Phenakite collector gems in the 12-carat range sell for about \$700. Two flawless, 34-carat and 43-carat phenakite gems are displayed at the British Museum in London. The largest known phenakite collector gem, a semi-transparent, octagon-cut stone of 568 carats, is displayed at the Natural History Museum of Los Angeles County in California.

Phenakite specimens, both composites and individual crystals, have gained great popularity with collectors in recent years, largely because of the mineral's increased availability from new sources in Myanmar and Madagascar.

HISTORY & LORE

Although known for centuries, phenakite was long confused with other minerals. British naturalist and illustrator James Sowerby (1757-1822) made the earliest known crystallographic drawing of phenakite in 1806. This drawing, which appears in the second volume of *British Mineralogy* in a plate titled "Argilla Electrica—White Tourmaline," depicts a large, white, prismatic crystal in a matrix of terminated quartz crystals. The distinct rhombohedral nature of the large crystal is revealed in two additional drawings. In his text, Sowerby states: *This substance which seems almost new to the whole mineralogical world, not being spoken of by any author, was sent to me in 1804. It was said to be found in a mine in St. Justs, Cornwall. I speak of it as new, really being a white Schorl or Tourmaline; for although tourmaline is said to occur in all the colors in mixtures of yellow, red and blue, yet it is not mentioned as ever having been found colorless or white until now; therefore, this is the rarest known.*

For a quarter-century, the white rhombohedral crystal in Sowerby's illustration was assumed to be a rare form of either tourmaline or quartz. But in 1830, Finnish-born mineralogist Nils Gustaf Nordenskjöld (1792-1866) was employed by the Russian Czar Nicholas I (1796-1855) to study minerals collected at the Malyshevskoye emerald and chrysoberyl deposit in the Urals. These minerals included colorless

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rhombohedral crystals very similar to those in Sowerby's illustration. But when qualitative analysis showed these specimens to be beryllium silicate, Nordenskjöld realized that he had found a new mineral, and that it was the same mineral in Sowerby's erroneously captioned illustration. Nordenskjöld gave the new mineral a fitting name—"phenakite," after the Greek word for "deceiver," alluding to its deceptive appearance. The Malyshevskoye deposit on the Tokovaya River at Ekaterinburg, Russia, became the type locality for phenakite. In the 1930s, American mineralogists William Lawrence Bragg (1890-1971) and William W. H. Zachariasen (1906-1979) used X-ray diffraction methods to finally determine the crystal structure of phenakite.

Metaphysical practitioners believe that phenakite's often exceptional transparency can clarify the thought process. Most importantly to metaphysicians, phenakite is seen as one of a very small group of extraordinary crystals called "angel stones," which are characterized by unusually high energy vibrations. As an "angel stone," they believe phenakite has the ability to enhance the healing and beneficial properties of all other crystals. For metaphysical use, phenakite crystals are never drilled or otherwise altered, but are wrapped in silver or copper wire and worn as pendants.

TECHNOLOGICAL USES

Phenakite has no technological uses and is too rare to serve as an ore of beryllium. Phenakite has been used as the model for its own synthesis in the study of crystal structure.

ABOUT OUR SPECIMENS

As noted, our phenakite specimens were collected at the Pelelni pegmatite mine near Khetchel village in the Molo quarter of Momeik Township in the Shan State of Myanmar (pronounced MYAWN-maw). The Union of Myanmar (formerly the Union of Burma) is located in Southeast Asia and borders Thailand to the southeast, China and Laos to the northeast, and Bangladesh and India to the northwest. The Andaman Sea is to the south and the Bay of Bengal is to the southwest. With an area of 261,969 square miles, Myanmar is almost the size of the state of Texas.

Momeik Township, located in north-central Myanmar, lies within the legendary Mogok Stone Tract, one of the world's richest gemstone-mining areas (see "The Mogok Stone Tract"). Khetchel and the Molo area of Momeik are about 40 miles northeast of the famed ruby-mining and ruby-trading town of Mogok. Mogok is 130 miles north-northeast of Mandalay, Myanmar's second largest city and the trading and transportation hub of the central part of the country. At an elevation of 700 feet in the eastern foothills of the Irrawaddy River valley, Momeik has a warm, tropical climate well-suited for growing coffee, tea, avocados, rice, physic nuts (*Jatropha curcas*, a tree nut that yields purple dye, leather-tanning extracts, and oil for candle, soap, and biodiesel purposes,) and another significant, though illegal, crop: poppies for heroin production.

The Pelelni Mine exploits a group of pegmatite veins in weathered granite hills above the village of Khetchel. Pegmatites are bodies of very coarse-grained granite that form when residual magma cools slowly. Rather than quickly "freezing" into fine-grained granite, this residual magma crystallizes on a fractional, or mineral-by-mineral, basis to form pods, lenses, pockets, and irregular dikes. Residual magma, the last of a magmatic intrusion to solidify, is often enriched with accessory or rare minerals. As residual magma slowly solidifies, gases sometimes create vugs, or miarolitic cavities, that provide space for the growth of unusually large, well-developed crystals. At the Pelelni Mine, granitic magma has intruded peridotite country rock. The slow cooling of the residual magma, enriched with beryllium, lithium, and rare-earth elements, forms horizontal pegmatitic veins and crystal-filled, miarolitic cavities. (*Continues on Page 8.*)

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THE MOGOK STONE TRACT

In the world of gemstones, especially rubies, “Mogok” is a legendary and magical name. The Mogok Stone Tract, a loosely defined, roughly 100-mile-long by 20-mile wide, north-south trending section of hills and valleys in north-central Myanmar, is one of the great gemstone-mining areas. The name “Mogok,” a colonial-era corruption of the Shan name *Mong Kut*, means “winding valley.” The town of Mogok, population 250,000, lies in the 20-mile-long Mogok Valley in the center of the Mogok Stone Tract. Gemstone mining at Mogok goes back thousands of years; the region is the origin of many of the world’s current gemstone traditions and customs.

The Mogok Stone Tract is best known for its phenomenal production of fine rubies, the red gem variety of corundum [Al₂O₃]. It is also a source of sapphires (non-red varieties of corundum); peridot, the lime-green gem variety of forsterite [Mg₂SiO₄]; golden chrysoberyl [BeAl₂O₄]; moonstone, the adularescent gem varieties of several feldspar minerals [aluminum silicates containing potassium, sodium, and calcium], spinel [MgAl₂O₄]; garnet [gem varieties of the garnet-group complex silicates], amethyst, the purple gem variety of quartz [SiO₂], and several varieties of the beryl gemstones [Be₃Al₂Si₆O₁₈].

The remarkable abundance and variety of gemstones in the Mogok Stone Tract are due to a very complex regional geology that involves metamorphism, magmatic intrusions, skarn formation (high-temperature contact metamorphism resulting from silicate-rich magma intruding calcium-rich sedimentary rock), accessory-element metasomatism (chemistry-altering metamorphism), and hydrothermal emplacement of superheated, mineral-rich solutions. The Mogok Stone Tract lies within the greater Mogok Mineral Belt, a long, narrow zone of heavily metamorphosed and intrusive rock that extends nearly the entire length of Myanmar, from the Indian-Chinese border in the north to Yangon (formerly Rangoon) in the south. Within the Mogok Mineral Belt, country rock consists of Precambrian sediments, mostly marine limestone that scientists believe was deposited 750-800 million years ago. Subsequent tectonic-plate collisions generated crustal stresses that folded these sediments during three major deformation-metamorphic events. The first occurred during the Jurassic Period 150 million years ago, and the second and third occurred 50 million and 20 million years ago, respectively, during the Tertiary Period.

Each deformation event was accompanied by regional metamorphism followed by repetitive intrusions of granitic and peridotitic magmas that caused intensive contact metamorphism. Associated hydrothermal fluids then introduced many accessory and unusual minerals into the mineralogical chemistry. The metamorphism of limestone to marble created a near-ideal environment for ruby formation, while the slow cooling of enriched, residual portions of intruded magmas formed miarolitic (gas-cavity) pegmatites with space for remarkable crystal development. Some 10 million years ago, the entire Mogok Mineral Belt was uplifted, accelerating the erosion that eventually exposed many deposits of metamorphic and pegmatitic gemstones and crystals. In what is now the Mogok Stone Tract, the weathering of surface rock freed huge quantities of gemstone crystals that concentrated gravitationally in rich, shallow placer deposits.

Archaeological evidence indicates that the gemstone placers at Mogok were systematically mined long before the time of Christ. When European explorers reached Southeast Asia in the 1500s, they eagerly traded for superb rubies that had certainly come from Mogok. As trade increased between Southeast Asia and the West, gemstones from Mogok found their way into many European crown-jewel collections. Mogok rubies have always been considered the world’s finest.

Myanmar was a satellite state of China in the early 1800s, when the French gained control of the region,

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which became known as “Burma.” In 1886, the British annexed Burma as part of its Raj (its rule of the greater Indian subcontinent). British investors quickly formed the Burma Ruby Mines Company, Ltd., and brought modern, large-scale placer-mining equipment to the ruby-mining region now known as the “Mogok Stone Tract.” For 20 years, the Burma Ruby Mines Company profited handsomely from large-scale placer mining, while greatly increasing the worldwide availability and popularity of fine rubies. But the company’s fortunes sank when world gem markets were disrupted, first by the appearance of synthetic rubies in 1908 and again by World War I. The Burma Ruby Mines Company never fully recovered, and finally ended its operations after a disastrous flood at Mogok in 1925.

Miners then began operating independently, opening hundreds of small diggings. Gemstone production increased somewhat after 1937, when Burma became a self-governing British protectorate, but halted again during World War II when the Japanese army occupied the region. Gemstone production picked up again in 1948, when Britain granted the Union of Burma full independence. By 1957, more than 1,200 small gemstone mines were operating near Mogok.

In 1962, a military coup overthrew the democratic government of Burma, initiating a long period of national isolation and economic stagnation that decimated gemstone production. In 1988, the military government finally crushed its opposition, instituted strict military rule, banned foreign visitors, and renamed the country Myanmar. The government also nationalized the gemstone industry, placed all mines under military control, and banned private ownership and trade in gemstones. The relatively few gemstones that did fall into government hands were sold at auction in Yangon (Rangoon) by the state-run Myanma [sic] Gems Enterprise. But the corrupt military administration of Myanmar’s gemstone industry led only to rampant illegal mining and the emergence of a booming black market.

Realizing the failure of its nationalized gemstone-mining system, the military government soon began to liberalize both mining policies and travel restrictions. Westerners, including gemstone buyers, again began visiting the Mogok Stone Tract, while partial privatization of mining operations slowly increased gemstone production. Until the early 1990s, Mogok miners had been concerned almost exclusively with placer production of rubies and smaller quantities of sapphire, spinel, chrysoberyl, and peridot, gemstones for which established markets already existed. Thanks to the return of foreigners, Mogok miners learned that during Myanmar’s 30 years of self-imposed isolation, the markets for, and the value of, quality mineral specimens had grown significantly. Awareness of the value of non-gemstone mineral specimens, together with increasing privatization of mining and the availability of capital to acquire hardrock-mining equipment, has since led to a significant change in the trend of gemstone mining in the Stone Tract. With the historic placers largely depleted, miners are now looking beyond the traditional ruby-mining areas. This trend is clearly reflected in the discovery and mining of the pegmatites at Molo in Momeik township—the source of our phenakite specimens.

Among the quality mineral specimens now coming out of the Momeik area of the Mogok Stone Tract is tourmaline, specifically uvarovite $[\text{Ca}_3\text{Cr}_2(\text{SiO}_4)_3]$ and distinctive “mushroom” rubellite, the red variety of elbaite $[\text{Na}(\text{Al}_{1.5}\text{Li}_{1.5})\text{Al}_6(\text{BO}_3)_3(\text{Si}_6\text{O}_{18})(\text{OH})_4]$. Other minerals from nearby pegmatites include enstatite $[\text{Mg}_2\text{Si}_2\text{O}_6]$ and baddeleyite $[\text{ZrO}_2]$.

Recent exploration and discoveries have led many geologists to believe that the true extent of the Mogok Stone Tract has yet to be defined and far exceeds its historic limits of gemstone mining. Some geologists propose that significant deposits of mineral gemstones and crystals will actually be found over a 600-mile-long stretch of the Mogok Mineral Belt. If so, the best of the fabled Mogok Stone Tract is yet to come!

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(Continued from Page 5.) Although the pegmatites at Momeik Township were discovered in 1993, they were not immediately explored because they contained neither rubies nor other traditional gemstones. Furthermore, local miners were familiar only with placer techniques, not the hardrock-mining methods necessary to exploit the in situ granite pegmatites. Finally, in late 2003, miners began drilling into the weathered granite to make a major phenakite discovery that has since been developed into the Pelelni Mine. (Despite repeated Email requests, we were not able to obtain photographs of the mine or of Mogok from our sources. We'll post them on our web site if and when we receive them.)

The discovery was noted in the July 12, 2004, issue of the English-language *Myanmar Times & Business Review*: *A NEW source of rare minerals and gemstones has been found in Shan state, according to the Myanmar Geosciences Society, which delivered a paper on the topic at University of Yangon (Rangoon) on June 25. A large deposit of a rare, quartz-like gemstone, known as phenakite, was found earlier this year, an advisor from Yangon University's Department of Geology, Professor Hia Kyi, said last week . . . The discovery was made in Molo, which is situated 23 miles northeast of Momeik in Shan State, and is home to a slew of other rare gemstones, such as petalite (colorless pink or pinkish-brown), hambergite (colourless or white), morganite (pink beryl), and colorless pollucite . . .*

The Pelelni Mine, an open-pit operation on a steep slope of weathered granite, is best known for large numbers of transparent to semi-transparent, colorless to pale-yellow phenakite crystals. The Pelelni Mine and other nearby Molo pegmatites also yield fine specimens of petalite [lithium aluminum silicate, $\text{LiAlSi}_4\text{O}_{10}$], hambergite [basic beryllium borate, $\text{Be}_2\text{BO}_3(\text{OH})$], morganite, the pink gem variety of beryl [beryllium aluminum silicate, $\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18}$], and colorless pollucite [hydrous cesium sodium aluminum silicate, $(\text{Cs},\text{Na})(\text{AlSi}_2\text{O}_6) \cdot n\text{H}_2\text{O}$]. Note how the chemical compositions of all these minerals indicate that the residual magma that formed the pegmatites was enriched with beryllium, lithium, and the rare-earth element cesium.

Though very small, our phenakite crystals are exceptional for their clarity and the excellence of their form. Most other localities produce phenakite crystals that are either stubby, have rounded edges, or are otherwise poorly formed, while ours from Myanmar have near-ideal 6-sided symmetry when viewed from above or below, with beautifully symmetrical, relatively long prism faces, and excellent terminations. The clarity is also outstanding, some with fascinating veils and planes inside. You may be tired of us recommending the 10x loupe we have available, but they really do open up another level of appreciation when viewing small specimens such as these.

Crystals of this caliber are rare among most mineral species, and in larger sizes than ours have tremendous value. A portion of our collections should definitely be devoted to such small but exceptional specimens, enjoyed not just for their beauty and perfection but for their fascinating properties. And who knows what other Mogok Stone Tract minerals we may feature in the future!

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