LAPIS LAZULI

Among the world's many gemstones, lapis lazuli, or "lapis" as it is familiarly known, has a distinction. Many scholars and archaeologists believe that it was the first gemstone ever mined in quantity. The oldest known lapis deposits, located in Afghanistan, have been systematically mined since about 4000 B.C.

Few gemstones display color as rich as the deep, royal blue of fine lapis. Adding to its visual appeal, lapis often exhibits glittering, golden flecks of pyrite. When cut and polished into cabochons and set in gold, lapis gemstones have a distinctive beauty all their own.

Understanding lapis lazuli, which is a rock, requires a basic understanding of lazurite, which is a mineral. Lazurite is the primary component of lapis lazuli and is also the cause of its blue color.

Lazurite, or basic sodium calcium aluminum sulfate chlorosilicate $(Na,Ca)_8Si_6Al_6O_{24}[(SO_4),S,Cl,(OH)]_2$, is a tectosilicate or framework silicate that is made up of 13.5 percent sodium, 7.8 percent calcium, 15.8 percent aluminum, 16.3 percent silicon, 6.0 percent sulfur, 38.1 percent oxygen, and small percentages of chlorine and hydrogen. The color of pure lazurite is a deep azure. It crystallizes in the isometric (cubic) system, usually as dodecahedral and occasionally as cubic crystals, but most often occurs in massive form. Lazurite is usually opaque, has a dull-to-greasy luster, poor cleavage in six directions, a pale-blue streak, a Mohs hardness of 5.0-5.5, and a specific gravity of 2.4-2.5.

Lazurite forms from high-grade, contact metamorphism of silica-poor marine limestone that contains available sulfur and chlorine. The host rock of lazurite is marble, the metamorphosed and recrystallized form of limestone. Lazurite crystals are rare; it usually occurs in massive form as a component of lapis lazuli and is frequently associated with such minerals as pyrite and calcite.

Lazurite should not be confused with lazulite, a basic magnesium aluminum phosphate. Although both minerals are blue, they have no chemical or structural similarities.

As a rock, lapis lazuli consists of an indeterminate mixture of minerals. Its primary component is lazurite, which accounts for 20 to 40 percent of its weight. The higher percentages occur in the most intensely colored, and thus the most valuable, grades of lapis. Other mineral components of lapis include calcite, sodalite, haüyne, diopside, pyrite, augite, enstatite, and nosean. Lapis has no crystal structure or cleavage. It has an uneven fracture, dull luster, fine grain, light-blue streak, and a specific gravity of 2.6-2.9. Because of its considerable hardness of Mohs 5.0-5.5, it takes a fine, lustrous polish. The most desirable lapis has an even, intense, "royal" blue color that is speckled with small, glittering bits of brass-yellow pyrite.

The name "lazurite" stems from the Arabic *lazaward*, variously meaning "sky," "heaven," or "azure" and alluding to the mineral's blue color. The term "lapis lazuli," meaning "blue stone," entered the English language in the 15th century and stems from the Latin word *lapis*, meaning "stone," and the Medieval Latin word *lazulum*, meaning "blue."

By 4000 B.C., Afghan lapis was being systematically mined and traded to the Sumerians and Assyrians. Later, it was traded to China and Egypt, and finally to Europe. Most Afghan lapis was fashioned into jewelry and decorative pieces; in Egypt, it was also ground to a fine powder for use as eye shadow. The Bible mentions lapis as one of the 12 stones in the fabled, jeweled breastplate of Aaron, the first high priest of the Hebrews. During Roman times, when lapis was known as *sapphirus*, the scholar Pliny the Elder aptly described it as "a blue stone

sprinkled with specks of gold" and "a fragment of the starry firmament." The Romans considered lapis a powerful aphrodisiac.

By the 7th century A.D., Afghan artists were using finely powdered lapis as the pigment for the blue paints that decorated temples and mosques. After passing near but being denied access to the Afghan lapis mines in 1271, the Venetian traveler Marco Polo wrote, "There is a mountain in that region where the finest azure (lapis lazuli) in the world is found. It appears in veins like silver streaks." European physicians of this period saw more than beauty in lapis, prescribing it in powdered form as an ingredient in various elixirs that supposedly helped to keep the limbs healthy, heal ulcers and boils, and free the soul from envy and fear.

When lapis pigment was introduced to Europe in the 1400s, it was known as "ultramarine"—literally "beyond the sea," a reference to its exquisite, deep-blue color. During the Renaissance, ultramarine was the most desirable blue pigment for use in the paints that were applied to frescoes and panel art, and in the inks used to illuminate manuscripts.

Ultramarine is essentially pure lazurite, and extracting it from powdered lapis lazuli at that time was extremely difficult. Alchemists devised many complex separation methods that relied on various oils, waxes, and chemical reagents that achieved only limited success. Ultramarine was in such great demand among Renaissance artists that its scarcity made it literally worth its weight in gold. Derived only from the finest Afghan lapis, ultramarine was known as "blue gold." Ultramarine remained exorbitantly priced until the early 1800s, when French chemists succeeded in synthesizing it.

Until the mid-1800s, Afghanistan's Kokcha Valley was the world's only significant source of lapis lazuli. Mineralogists assumed that lapis was a mineral until 1890, when Norwegian geologists Waldemar Christopher Brøgger and Helge Bäckström demonstrated that it was actually a rock composed of a number of minerals. Brøgger and Bäckström also proved that the blue color of lapis was caused specifically by a previously unknown mineral which they named "lasurite," a name that was soon changed to "lazurite."

Today, lapis lazuli serves as both a gemstone and a decorative stone. For jewelry use, lapis is fashioned into beads for necklaces, earrings, and bracelets, and cabochons for rings and pendants. As a decorative stone, it is made into everything from figurines and amulets to ornaments, trinket boxes, goblets, and mosaic inlays. Prices of rough lapis vary widely according to grade. Low grades with pale-blue, mottled colors are sold by the ounce. Higher grades are priced by the gram and sometimes cost more than $1 per gram (about $28 per ounce). The very best Afghan lapis has sometimes sold for more than $100 per gram. The cost of small carvings fashioned from such material can run into thousands of dollars.

Lower grades of lapis that are heavily streaked with white calcite are often color-enhanced with blue ferrocyanide solutions or organic dyes. Imitations, such as "Swiss lapis" and "German lapis," are white or gray chalcedony that has been dyed blue. A popular lapis imitation introduced in the 1950s consists of a mix of fragmented, synthetic blue spinel, blue cobalt oxide, and pyrite sintered together under heat and pressure. In the 1970s, French chemists introduced a lapis imitation made of synthetic ultramarine pigment mixed with hydrous zinc phosphates and bits of pyrite. "Reconstructed lapis" refers to small chips of natural lapis that are cemented together with epoxy resin.

Both lapis lazuli and lazurite are appealing to mineral collectors. Specimens of lapis lazuli are collected as gemstones that are not often seen in their natural state. Lazurite crystals are collected for their rarity. The most desirable lazurite specimens are deep-blue dodecahedrons that contrast beautifully against their white, marble matrix. Although lazurite crystals have been

known to reach two inches in size, most are much smaller. One-inch lazurite crystals can cost $1,000.

Lapis lazuli and lazurite have few collecting localities. Currently, there are only two commercial sources of lapis lazuli in the world. The premier source, which is also the type locality and classic locality for lazurite, is the Sar-e-Sang district in the upper Kokcha Valley, Badakhshān Province, Afghanistan. Lapis is also mined commercially in Chile at the Flor de Chile Mine near Ovalle in Lamari Province in the Coquimbo Region. Small quantities of lazurite and lapis lazuli also occur at sites in Tajikistan, Russia, Sweden, and Italy. The only commercial lapis source in the United States is the Blue Wrinkle Mine on Italian Mountain in Gunnison County, Colorado, last mined in the 1990s.

Modern metaphysical practitioners believe that lapis lazuli and lazurite have distinctly different energies. They consider lapis to be a stone of universal truth and friendship that brings harmony to relationships, helps one to openly state his or her opinions, and enhances both mental clarity and psychic ability. Lapis lazuli is an alternate birthstone for the month of December.

Lazurite, on the other hand, is thought strengthen the physique and spirit, and aid in spiritual evolution and in connecting with higher realms. It is also believed to be useful as a calming influence in daily life, an aid to organizing routines, and a builder of self-confidence. Most importantly, lazurite is thought to enhance love and fidelity, and thus strengthen the bonds of marriage.

Lapis lazuli, as it did centuries ago, has a technological use as the source of the blue pigment ultramarine. Today, lazurite is extracted from high grades of finely ground lapis with a number of physical separation processes, then refined to high purity to prepare ultramarine, which is a specialty blue pigment for artist's paints. It is also used in special industrial paints, certain plastics, and metal lacquers for cloisonné jewelry. Ultramarine also has a high-tech application: Because of its unique and readily identifiable crystal properties, it is the blue pigment in the special "security" inks used to print currency and certificates.

Any discussion of lapis will always focus on Afghanistan. Throughout Afghanistan's long, turbulent history, lapis lazuli from the Kokcha Valley in Badakhshān Province has always had an unusual economic importance. The Kokcha Valley lapis mines, the world's oldest gemstone mines, are located in northeastern Afghanistan at an elevation of 9,000 feet in a remote, rugged section of the Hindu Kush range. During the 1800s, these mines consisted of underground galleries 12 feet high and wide and about 200 feet long. Miners then still relied on the ancient rock-breaking technique of "softening" the rock with fires, then manually hammering it to pieces. Among the difficulties these miners faced were strenuous work at high elevations, bitterly cold winters, dangerous trails, sheer cliffs, and armed thieves.

Lapis has always been one of the few Afghan materials that could earn currency in international trade. Newly mined lapis was traditionally sent to the capital city of Kabul to be worked into decorative objects and jewelry until the 1979 Soviet invasion disrupted this trade. Despite the Soviet military presence, mujahideen nationalist guerrillas maintained control of rural areas, including the Kokcha Valley lapis mines, taxing production and using the proceeds to purchase weapons. Rather than sending the newly mined lapis to Soviet-controlled Kabul, the mujahideen now began smuggling it across the Pakistani border. Ironically, the Soviet invasion also helped to partly modernize Afghan lapis mining. Previously, lapis miners had little access to explosives. But now explosives became readily available, thanks to the steady supply obtained from disassembled Soviet land mines. The use of explosives has since increased Afghan lapis production to its highest levels in decades.

Today, the U.S.-backed central government controls Kabul and other cities, but not the Kokcha Valley lapis mines. These mines produce an estimated $5 million worth of lapis per year, most of which is still smuggled into Pakistan. The Afghan government hopes to nationalize the lapis mines and modernize operations. To do this, the government has begun negotiating with European and Asian companies, offering potentially lucrative, long-term mineral leases to companies that will agree to build mine-access roads and increase lapis production. These modern intrigues are all part of the most recent chapter in the 6,000-year-old history of lapis lazuli.