HISTORIC MINERAL FEATURE

Mineral History of Graves Mountain

by
Jose Santamaria

Introduction

It has happened to every mineral collector one time or another—losing a site. Bad memories, overgrown landscape, missing landmarks or disappearing roads—they can all lead to disappointment and embarrassment. Not this time. It was 1948 and the Georgia Mineral Society had scheduled a field trip to Graves Mountain, then as now it is Georgia's most famous and classic collecting site. The group had met at the Varsity, Atlanta's venerable burger and hot dog restaurant that still stands a few blocks from Georgia Tech. A caravan set out eastwardly on two lane highways, then left the pavement to ride on macadam and dirt roads. It was hard to miss the mountain—the only feature that rose above the countryside. But in case there was any doubt, there it was, a highway plaque, put up by the state of Georgia in honor of the locality's mineralogy.

For nearly 150 years, Graves Mountain has provided collectors and museums alike outstanding cabinet specimens. The world's finest rutile crystals are found here. No other place in the world will yield specimens of the size, luster and crystal perfection. Magnificent lazulite crystals up to three inches occur in powder-blue to deep ultramarine blue bi-pyramids and twins. White, golden, red and brown pyrophyllite is readily found in radial and sometimes botryoidal masses. Iron oxides known collectively as *turgite* but actually hematite and goethite occur in botryoidal, iridescent and stalactic formations on quartz and kyanite. Among the more unusual specimens are large (and crude) quartz crystals up to a foot tall covered with the various forms of hematite. Kyanite and pyrite have played a role in the mountain's history, while recent investigations into micro-minerals have led to new discoveries. A comprehensive mineralogy is provided by Robert Cook (1985). Julian Gray has updated the list based on research of Henry Barwood, John Whatley and Don Reems.

Geology—Fact and Fiction

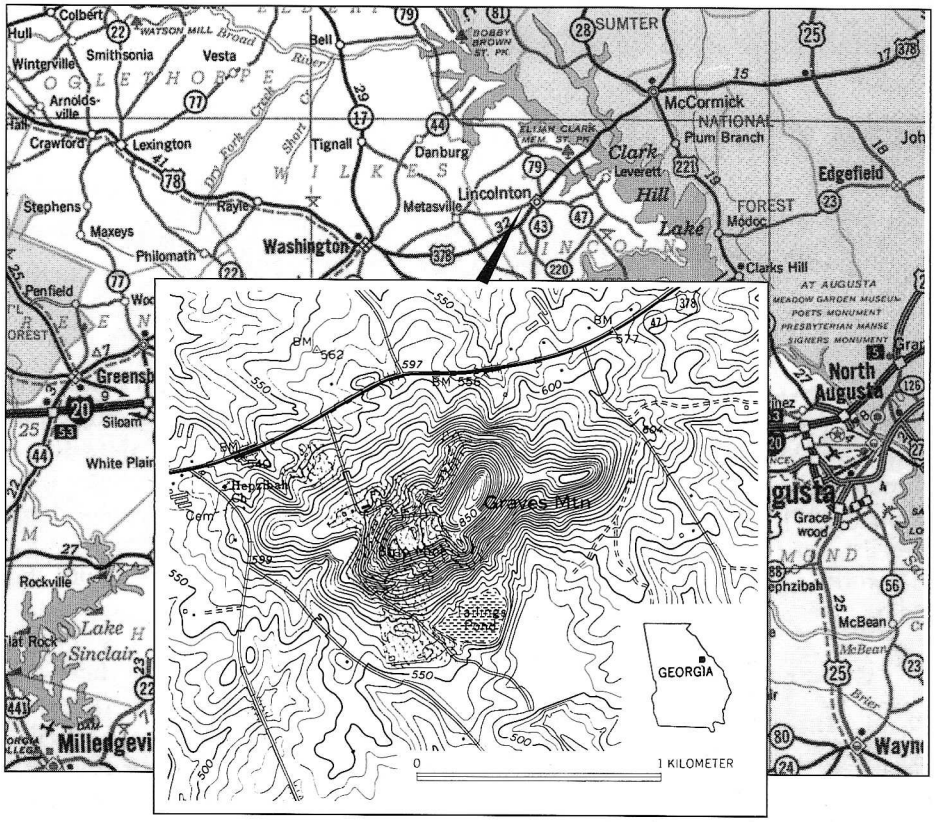
"Graves Mountain represents the fossilized remains of a late Precambrian hydrothermal system." *Douglas Crowe*

Graves Mountain is located on the western edge of Lincoln County five miles west of Lincolnton and fifteen miles east of Washington. The mountain is a long, ridge-like hill nearly a mile and a half long but less than half a mile wide, stretching from the northeast to the southwest. It once had two prominent summits, East and West Mountains, and a third smaller mountain. The highest peak rose 400 feet above the gently rolling hills of the surrounding area (Johnson). Between the two taller peaks was a connecting ridge referred to as the saddle. Mining has reduced these two peaks to pits 200 feet below their former heights. Ironically, the area around this saddle now provides one of the highest vantage points on the site.

"He (Kunz) was looking for fine mineral specimens and reported rutile crystals as big as five inches and weighing up to four pounds."

The mountain is composed of two predominant rocks: a kyanite-quartzite and quartz-sericite schist with mineralized veins of quartz that intrude throughout the rock. It is one of a number of similar outcrops that occur within the Carolina Slate Belt, a region which extends from Georgia northeast into Virginia. The region resulted from the metamorphism of a volcanic island arc system off the North American coast during the Cambrian Period. One of the centers of volcanic activity may have been the area around Lincolnton (Crowe). Layers of hardened volcanic ash deposited on the ocean floor were invaded and leached by hydrothermal fluids venting up in certain spots. One of these spots was to become Graves Mountain. The ash was altered to a high aluminum rock that contained metals such as iron, titanium and gold along with phosphate minerals. Subsequent continental collisions metamorphosed and fractured these units, resulting in either kyanite-quartzite or sericite schist. More hydrothermal solutions introduced quartz veins and remobilized the minerals, producing larger crystals of rutile, lazulite and quartz in these zones (Hartley). The kyanite-quartzite provided the most resistance to weathering and gave the mountain its height and rocky prominence. This rock at times has a friable, sugary texture and was originally confused for sandstone. The surrounding region is highly mineralized and has been mined for gold, lead and copper.

This complex scenario has led many a geologist to simply say that Graves Mountain was once a volcano, which is inaccurate. However, this notion may have been adopted by many locals simply because it was a tall, single mountain. John Temple Graves, the mountain's namesake, reportedly saw *"peculiar molten rocks on the mountain and thought they were volcanic."*



A map of northeast Georgia shows the location of Graves Mountain. Inset, from the Anoia 7.5 minute quadrauple (1972) provides topographic details.

(AC 8/25/70). This was without a doubt a reference to the strange hematite and goethite formations. The Augusta Chronicle in 1902 describes a minor panic when local residents noticed a brush fire on top of the mountain one evening. This occurred just a few months after the devastating eruption of Mt. Pelee in Martinique that claimed 29,000 lives. Some of the inhabitants living near Graves Mountain, seeing its summit glowing, assumed it was erupting. (AC 7/14/02). Another newspaper account stated that Graves Mountain was *"supposed to be of volcanic origin but some have thought that it was of meteoric origin"* (AC 2/28/38). In a published newspaper account, geologist A. S. Furcron, who would later become chief at the Georgia Geologic Survey, had to give a detailed explanation why this could not be so (AC 10/3/54).

Local History

Early references call it Lloyds Mountain, and the term "Little Mountain" was used occasionally (Willingham). Graves Mountain, however, was named after John Temple Graves, who purchased the mountain and surrounding property from the government in the early 1800s. Graves has been described in different publications as either a friend of the local Indian population or an Indian fighter. (AC 4/25/16 and 7/18/22). He was probably both. Stories have passed down from generation to generation among the local population that the mountain was a sacred place to Native Americans. (Willingham). Whether this is true or not, its sides were reportedly once littered with arrowheads, ax heads and other artifacts (AC 7/31/94).

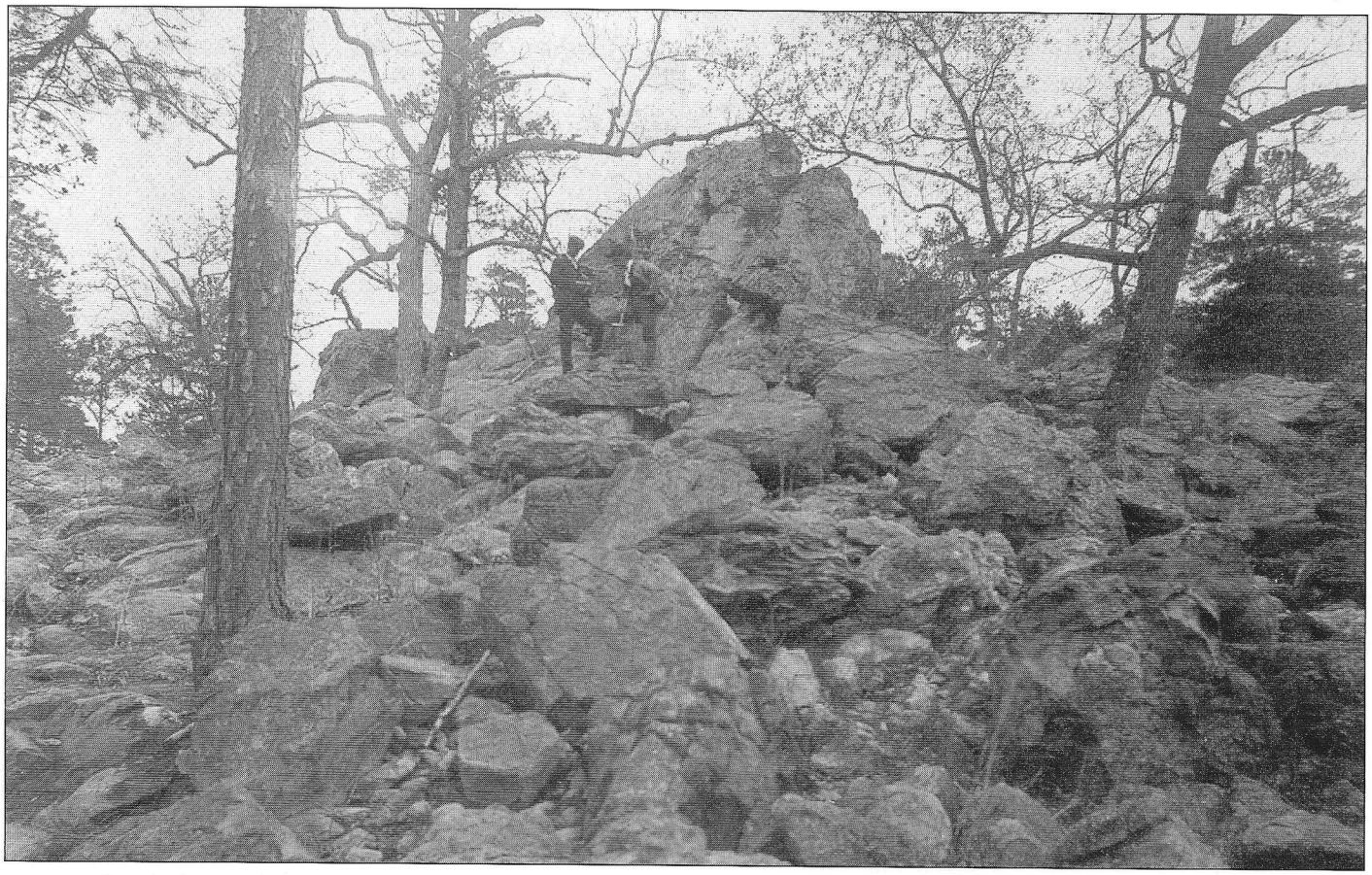
The mountain was a local landmark and could be seen for miles rising above pastures and cornfields. It rose gently from the north and east sides, but the south and west sides were very steep. Near the summit, the slopes became very precipitous and craggy with sharp drop-offs, a scenery described as *"bold, rugged and of the most fantastic and weird forms and shapes imaginable"* (Zodac). This extraordinary landscape inspired names such as "Lover's Leap" and "Wolf's Den" (Willingham). Numerous springs near its base made it an inviting place for local outings and picnics throughout the 19th century. A diary entry on August 29, 1864 by Wilkes County resident Belknap Smith mentions that he *"went to a mountain party at Little Mountain. Lots of ladies there. Had a fine time."* (Willingham). By the early 1900s, an annual picnic was scheduled around the fourth weekend in April, complete with vendors selling homemade ice cream and lemonade. Local politicians campaigned there during election years. (AC 8/25/71). Even into the 1950s when its economic potential was about to be realized, Graves Mountain remained a place for outings and the occasional collecting trip for mineral clubs and boy scouts.

Mineral History

"The occurrence of an interesting association of rather uncommon minerals."
Thomas and Wilbur Watson, 1912

Graves Mountain first appears in the mineralogical literature in 1859 through the efforts of Professor Charles Upham Shepard, who introduced the world to the rutile, lazulite and pyrophyllite from the site. Professor Shepard was a mineralogist, geologist and chemist. He studied under Benjamin Silliman at Yale and later became professor of chemistry and natural history both at Amherst College in Massachusetts and Charleston Medical College in Charleston, South Carolina. His mineralogical accomplishments include the discovery and naming of danburite in Danbury, Connecticut.

While visiting Allatoona, Georgia, an acquaintance handed Shepard a blue crystal acquired from Dr. M. F. Stephenson of Lincoln County, Georgia. Shepard recognized the specimen as lazulite. Being unable to personally visit the site (Shepard originally thought it was in Lincoln County, North Carolina), he made arrangements for Dr. Stephenson to visit the place, obtain more samples and provide a site description. Through this arrangement, Shepard obtained more



Two undated photos about 1900 vintage depicting the ruggedness near the summit of Graves Mountain. Note Kyanite-quartzite boulder in the foreground of lower photo. Kyanite aggregates stand out in bold relief from the pitted surface.

specimens and was able to identify pyrophyllite, rutile and kyanite. Shepard reported that gold had been prospected at several small pits in the quartzite (which he referred to as itacolumite, a flexible sandstone). He also noted that the quartzite resembled the diamond-bearing matrix in Brazil and suggested the mountain should be examined for diamonds. Dr. Stephenson took this a step further, writing in an 1878 booklet on Georgia gemstones that *"here diamonds may be looked for of superior quality, with a certainty of success."* Alas, although the occasional diamond was encountered in a number of placer gold mines in Georgia, this was never the case for Graves Mountain.

With Stephenson's help, Shepard distributed samples to colleagues and mineral dealers in the United States and Europe, and they in turn provided mineral specimens to collectors and museums. The most significant mineral was rutile. Shepard must undoubtedly have noted the superior qualities of specimens from this site. Graves Mountain rutile was described in a number of crystallographic studies published in Germany between 1860 and 1897. Two German mineralogists, M. W. Haidinger (in 1860) and Gustav Rose (in 1862), credited Shepard as the source of their Graves Mountain rutile crystals. Mineral dealers Kranz and Ward were soon distributing specimens, and an informal survey by the author reveals just how quickly specimens from Graves Mountain reached museums around the globe. The Australian Museum in Sydney, for example, has a lazulite purchased from Krantz in 1878 and a rutile purchased from Wards in 1887. The California State Mining and Mineral Museum has rutile and pyrophyllite specimens acquired between 1881 and 1884 and a lazulite and quartz donated in 1888. In Russia, the Fersman Mineralogical Museum in Moscow has a rutile specimen first collected by Prince Petr Kochubey in 1877.

Toward the end of the 19th century, Shepard's successes drew the attention of George Frederick Kunz, gemologist, mineralogist and all around promoter of Tiffany and Company. Kunz prospected the country for localities of fine mineral specimens at a time when it was fashionable for millionaires to have exquisite mineral collections (they in turn would donate or sell them to museums). Tiffany catered to their tastes. Since the best rutile crystals seemed to come from the top of the mountain around the saddle area, Kunz and partner Ernest Schernikow purchased the upper portion of the mountain in 1896.

George F. Kunz, gemologist, mineralogist and part owner of Graves Mountain from 1896 to 1932. MATRIX Archives.

Kunz's association with Tiffany's fueled local speculation that the company itself owned the mountain, a belief that persists to this day. One account reported that Tiffany's was tricked into buying the mountain, expecting to mine gems but finding only those that were seeded. (AC 6/20/71). Kunz did not find gems, nor was he looking for them. He was looking for fine mineral specimens and reported rutile crystals as big as five inches and weighing up to four pounds (Watson). *"Twenty years ago,"* he wrote in 1923, *"we did some work and were amply repaid"* (AC 4/8/23). There was even a display of rutile specimens in the St. Louis Exposition of 1904 (AC 4/25/16). Logistics prevented Kunz from returning to Graves Mountain after his initial efforts. He wrote: *"If deeper and more extensive work were done, many remarkable specimens would be found. But my associate and I are so far from the locality, and our interests do not permit of time to undertake the work. Someone will be found to do this, we hope"* (AC 4/8/23).

Kunz pointed out that even then the easy collecting was over. Most of the crystals extracted by his enterprise were found by digging, primarily in the area around the saddle between the two peaks. Geologist Thomas Watson visited the site numerous times between 1900 and 1911. In 1912, he and Wilbur Watson published the first mineralogical description of the site since Shepard, describing it as *"the occurrence of an interesting association of rather uncommon minerals."* Watson visited the pits near the saddle and reported the openings caved in and obscured. Rutile, he reported, was hard to find in anything but near microscopic samples. Of lazulite, Watson suggested it may be of gem value or useful as an ornamental stone

In 1935, the Georgia Mineral Society, then a newly formed mineral club, had its first of many field trips to Graves Mountain. Members described the difficulty of finding quality specimens on the surface. Those that dug into the rock around the pits fared better. Float crystals were reported in the fields at the north base of the mountain. One collector reported that locals recognized the value of the mineral and would pick up specimens after a hard rain. In fact, he reported acquiring better specimens by buying them from a little boy on the road.

Gilbert Withers, a member of the club and future president, lamented that *"Graves Mountain minerals have been practically unobtainable for some time."* In 1938 he saw an opportunity when 110 acres of Graves Mountain were purchased by James Boykin from the heirs of Kunz and Schernikow, who had died a few years earlier. Boykin was apparently interested in the mountain's timber, not its minerals (AC 2/28/38). Withers soon announced that he had made arrangements with the owner and that he had

two men working the site for specimens. An ad in *ROCKS AND MINERALS* announced hundreds of specimens of rutile, lazulite and pyrophyllite for sale. Withers asked $10.00 to $25.00 for museum-quality rutile, less for others. ("Gil" Withers would soon quit a career in real estate and open the first rock shop in Atlanta, supplying the collector with gems, minerals and, undoubtedly, Graves Mountain specimens).

The same 1939 issue of *ROCKS AND MINERALS* provides a first hand account of a visit by Peter Zodac, editor and publisher of the magazine, who visited the site a year before. He and his party stopped and collected in the lower pits near the picnic grounds and spring, the upper pits near the saddle, and the trail in between. Zodac reported abundant pyrophyllite and kyanite, but only small rutile and lazulite crystals. After the trip, Zodac said prophetically *"if one could do a little digging and blasting he would undoubtedly uncover some very fine rutiles, pyrophyllites and lazulites."*

Graves Mountain Minerals

ATTENTION COLLECTORS AND MUSEUMS!

It is a pleasure to announce that due to arrangements having been made with the owners of Graves Mountain, in Lincoln Co., Ga., I now have two men working the area for mineral specimens. Once again, therefore, will this world-famous locality be made to yield its very fine rutiles, lazulites and pyrophyllites to enrich collections all over the world. It has been many years since this locality was last worked and as Graves Mountain minerals have been practically unobtainable for some time, I have, therefore, arranged to supply specimens to the thousands of new collectors who have sprung up within recent years.

Hundreds of very fine specimens have already been secured and are now offered for sale. Here is your opportunity to acquire a suite of choice Graves Mountain specimens at very reasonable prices.

Rutile: Crystals, 3/8 to 1 1/4 inches, loose and in matrix of radiated pyrophyllite, platy hematite and brown cyanite. The brilliancy and beauty of the black Graves Mountain rutiles is not approached by those of any other locality. 2x2-3x4 inches, $1.00 to $5.00. Museum specimens $10.00 to $25.00.

Lazulite: Sky-blue, doubly terminated crystals in quartzite, 2x2-3x4 inches, $1.00 to $3.00. Museum specimens $10.00 to $25.00. A few specimens of twinned crystals in quartzite, 2x2-3x4 inches, $2.00 to $5.00.

Pyrophyllite: Radiated, yellow to brown in color, 2x2-3x3 inches, 75c to $2.00. Museum specimens $3.00 to $5.00.

Pink Corundum from Clay Co., N. C., small gemmy crystals and crystal fragments free of matrix, $1.00 per oz. In matrix of actinolite, 2x2 inches, $1.00.

Postage extra on all orders. Estimate 15c on every $1.00 order and any amount left over will be returned you in stamps, or better specimens will be sent.

GILBERT W. WITHERS

Southeastern Mineral Specimens

Advertisment from the May 1939 issue of ROCKS AND MINERALS.

Mining

"A little digging and blasting."

Peter Zodac

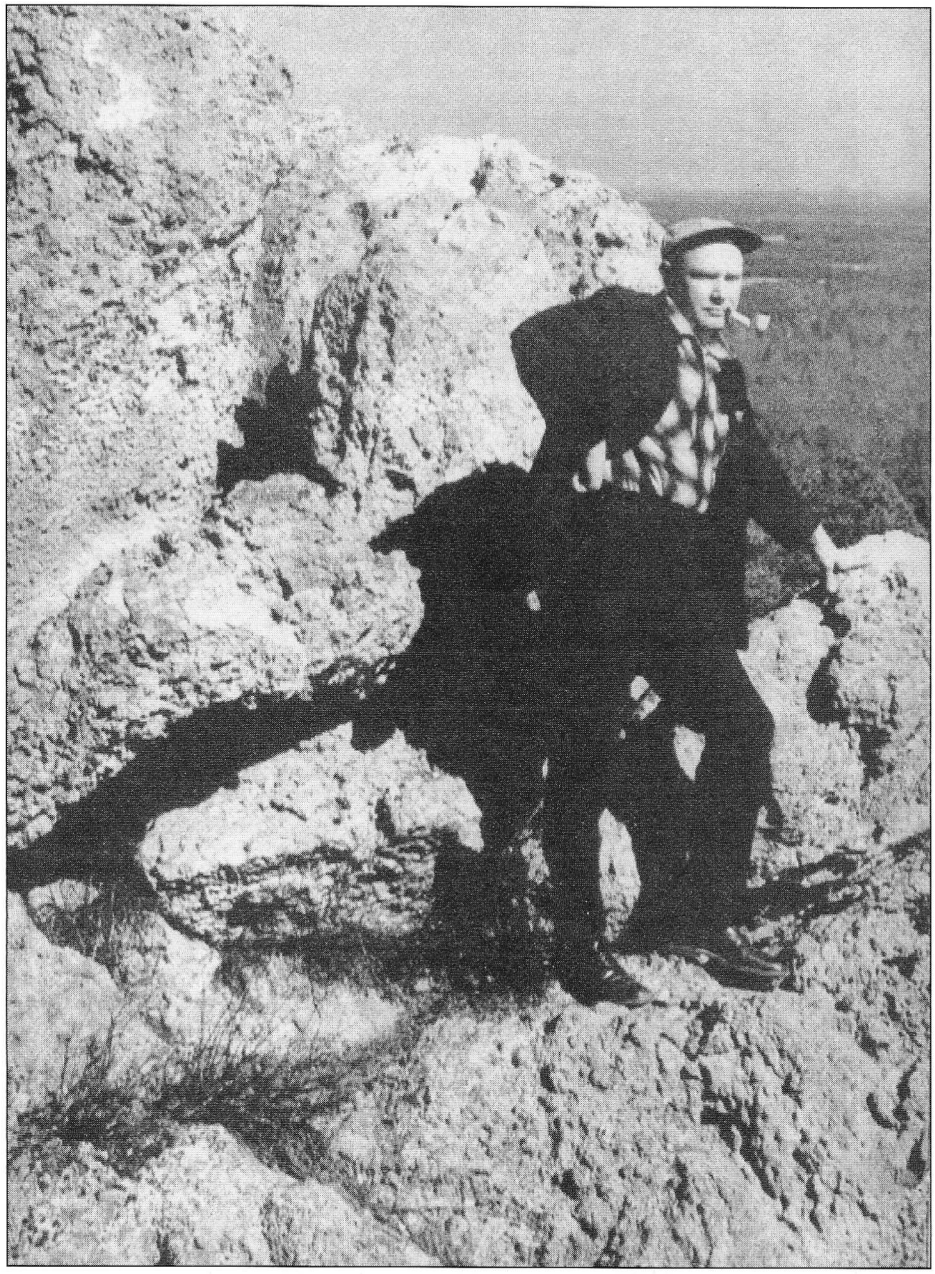
Despite the lure of fine rutile, lazulite and pyrophyllite specimens, the mineral that had the most significant impact on Graves Mountain was kyanite. This mineral had no economic value during the times of Shepard and Kunz. It was, in fact, known more as a curiosity—a mineral with a different hardness lengthwise than crosswise. In the early 20th century, however, kyanite was identified as a raw material to make high temperature ceramics, or refractories. During the First World War, a need arose for a better spark plug core because of their high failure rate in aircraft motors. Researchers noted a similarity between porcelain crystals (mullite) and sillimanite, an aluminum silicate that shares the same chemical formula (Al_2SiO_5) with andalusite and kyanite. Experimentation with synthetic sillimanite produced a spark plug body that was two to four times stronger and more heat resistant. Some saw another potential use—this new substance could be cast as brick for kiln linings (kilns were originally lined with cut sandstone, later with brick and mortar made from refined sand, but at high temperatures the quartz became unstable and brittle). Exploration began for natural sources in the United States and Canada for all three aluminum silicates. The problem was supply. Sillimanite was scarce in commercial deposits. Andalusite had only one known deposit suitable for large scale mining. Kyanite, however, was abundant and extremely heat resistant although it had a tendency to expand upon firing. This was to be eventually

resolved by incorporating clays into the mix. The clays would contract, essentially offsetting the expansion characteristics of kyanite. One plus was its use in refractory mortars, where it would expand and lock the brick into place.

Nationwide searches began for mineable kyanite deposits. In the southeast, numerous deposits were explored and prospected, and detailed reports were published about them. In his 1935 report on the economic potential of the kyanite at Graves Mountain, W. D. Johnston provided an updated geological description of the site and its mineralogy. In the end he concluded that the deposits would not be of economic value until more effective methods of concentrating the ore were developed. Nevertheless, Joel Watkins, a geologist from Virginia, purchased Graves Mountain in 1940. Watkins had fifteen years earlier operated a kyanite mine on Baker's Mountain, Virginia in a kyanite-quartzite deposit similar to Graves (Espenshade). This was the first large scale kyanite mine in the country. At Graves, Watkins drove an adit nearly 50 feet into the mountain to assess the quality of fresh ore, estimating a 30% kyanite content. Unfortunately, low demand and the nation's entry into World War II made mining unfeasible. The tunnel, however, provided fresh specimens, mainly "fools gold" in kyanite to collectors and was described as *"a fine place to cool off in the summertime or warm up in the winter"* during field trips (GMS May 1948).

A group of businessmen, also from Virginia, purchased the mountain from Watkins in 1947, but had no better success at starting operations. In the meantime, Virginia was becoming the center of kyanite mining in the southeast. In 1945, the Kyanite Mining Corporation purchased the Baker's Mountain property and brought it into full production (there had been several unsuccessful mining ventures since Watkins at the site). The company would later expand operations into nearby Willis Mountains in 1957. It is interesting to note that the Willis Mountain plant is currently the country's sole producer of kyanite, producing in 1999 an estimated 132,000 tons, or about 86% of the worldwide output.

In 1959, Paul Bennett, an exploration geologist working for Reynolds Aluminum, was investigating the potential of kyanite as an aluminum ore. At that time the country was importing 95% of its bauxite (ironically, the figure is now 99%). Bennett, who had written his dissertation on Virginia's kyanite deposits, explored deposits along the east coast from Nova Scotia to Alabama, Graves Mountain included. Realizing the economic potential of the southeastern kyanite deposits, he convinced his brother William to go into business with him. *"With the gumption of a young man,"* Bennett said, he left the corporate world and went into kyanite mining. Not, however, for aluminum metal but to supply the refractory industry. Graves Mountain was the best deposit available to him. Bennett leased the property from Watkins in 1960 and

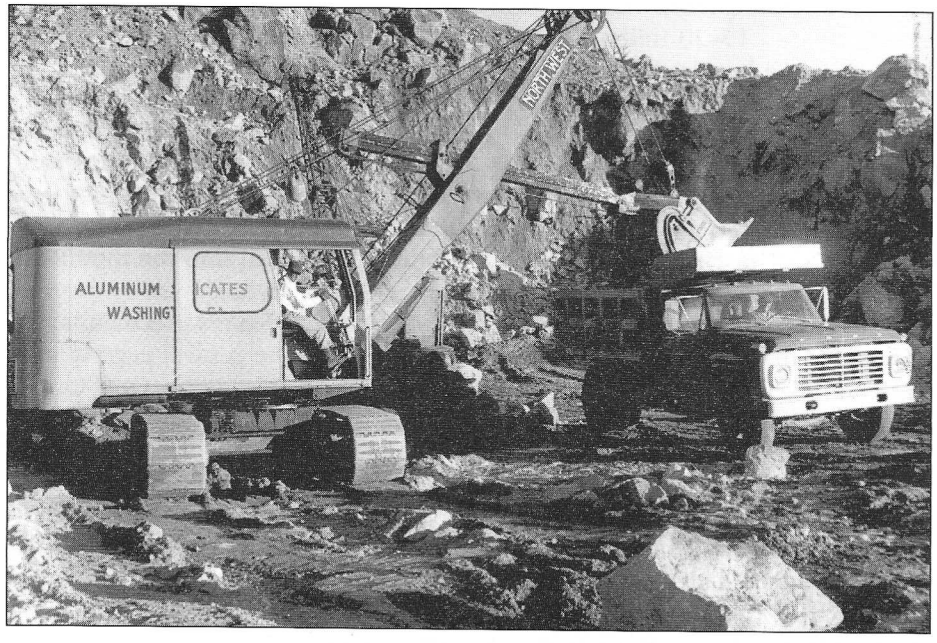


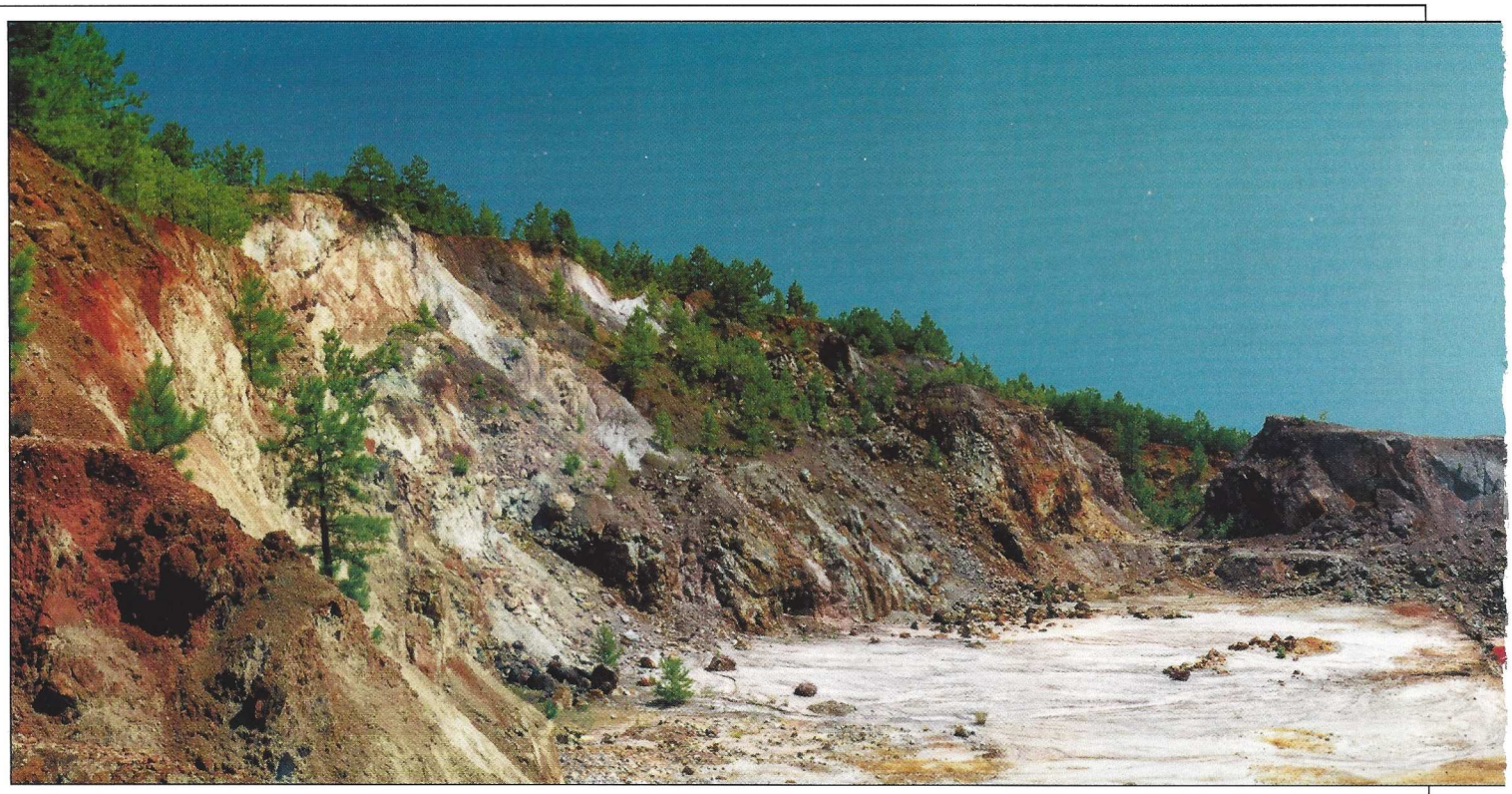
Paul Bennett stands among the craggy kyanite-quartzite boulders at a precipice on the southeastern edge of Graves Mountain. Photograph by Kenneth Rogers for the April 19, 1964 Atlanta Journal and Constitution Magazine, courtesy of Paul Bennet.

Above: Aerial view of the mine at Graves Mountain as it went into full production. Below: Aluminum Silicates Corporation begins mining on Graves Mountain. Photos courtesy of Paul Bennett.

his company, Aluminum Silicates Corporation, broke ground in 1961. With mill equipment purchased from an old uranium mine in Utah, the mine went into production in 1963.

The mine was a standard open pit operation, centering its activity on the kyanite-quartzite ore at the south side of the mountain (the old picnic grounds) and moving toward the west summit. The rock, about 30% kyanite (as Watkins had predicted), was blasted, loaded into trucks and hauled to crushers near the top of the mountain. It was then milled and fed through a series of flotation cells, resulting in a concentrate of about 97% kyanite. The product then was bagged and shipped to the company's cus-





The View: This unearthly scene of the main (or south) pit of Graves Mountain greets visitors that follow the road up the north slope that leads to the edge of the pit. The best rutile has come from the upper wall to the left which is the area of the former "saddle". Large lazulite crystals may be found beyond the far edge on the lower slopes. The floor and walls, however, and strewn with kyanite, quartzite with lazulite, pyrophyllite, hematite and more. A reddish pond fills a lower pit. This is water high in sulfuric acid that has been impounded for treatment by the reclamation team. 120 degree photograph by the author using eight 35mm prints digitally stitched by Meteor Labs in Atlanta, GA.

tomers. Graves Mountain became one of only three producers of kyanite in the world, the other two being in North Carolina and Virginia. By 1964, the plant was operating 24 hours a day, seven days a week. Bennett estimated he had 15–20 million tons of reserves and a hundred year life span for the mine at his current rate, forty at his anticipated peak rate.

Bennett sold the company in 1965 to C. E. Minerals but stayed on as manager and chief geologist until the mid 1970s. The new owners, C. E. Minerals (a division of Combustion Engineering and now part of Imerys), specialized in the mining and processing minerals used in refractories. The company purchased the property in 1968. Mining began to level down the summit and eventually expanded to the East Mountain.

At one point the Graves Mountain Mine produced half of the kyanite consumed in the United States. One noteworthy application was its use as a component for tiles used on the Space Shuttle (Wenner). Pyrite, which accounted for up to 10% of the rock, became a secondary product (classified as "glassmaker's grade") and was sold to glass manufacturers to produce the brown coloration in beer bottles (Wenner/Hartley). Rutile crystals $\frac{1}{4}$" or less were common during mining, but since it composed no more than 0.5% of the rock and was widely dispersed, but it was never considered of economic value—except to the miners. As mining proceeded into the mountain, areas of large crystals were uncovered. Collectors and dealers that maintained contact with the miners eagerly purchased their specimens. One former miner reports going into the property at night and filling the back of his pickup truck with crystals.

By 1984 the price of kyanite could not keep up with the cost of production and inflation, and mining came to a stop. Edwin Pasco, a mining engineer who replaced Bennett as the plant manager, formed his own company, Pasco Mining, and leased the site in order to mine it himself. Silica sand for sandblasting became another secondary product. Low prices and low demand for kyanite finally forced him to close the plant in late 1986 and the property returned to C. E. Minerals, its current owner.

Reclamation began in 1990 and still continues. The tailings were covered with soil and over-planted. Pyrite, however, has posed a bigger challenge. The sulfide occurs throughout the kyanite and quartzite. Mining exposed huge volumes of it, accelerating its decomposition and resulting in an increase in sulfuric acid runoff. To control this, the lowest pit was dammed and water is piped to a treatment plant on site. A series of ponds were built at the base where the water was treated with calcium hydroxide. In addition, wetlands were constructed where bacteria are employed to convert the sulfuric acid.

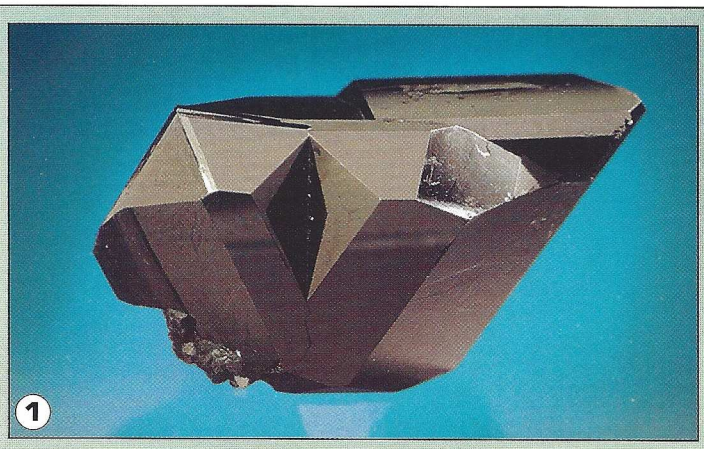
What will prove impossible to do is to fill in the pits. No figures exist on the amount of rock removed from the mountain. Where the two highest summits stood, pits several hundred feet lower now greet the viewer. To the locals that fondly remember outings to the picnic grounds, Lover's Leap and the Wolf's Den *"were ground up in the progress heap"* (AC 8/25/71). To the collector, however, it is a dream come true. The walls and pits of Graves Mountain have exposed a mineralogy that Peter Zodac could only dream of when he wished for *"a little digging and blasting."*

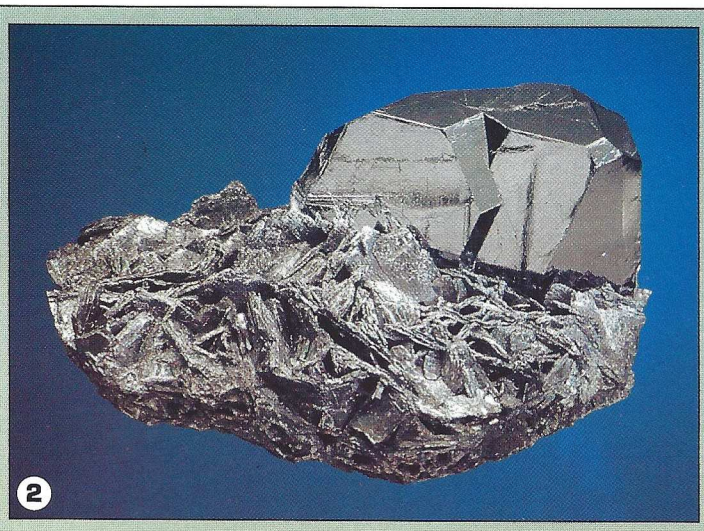
Collecting Resumes

During mining, the property was virtually off limits to collectors. In the late 1980s after all operations ceased, word spread among collectors that the caretaker, who lived behind the mountain, would let one in for a fee. If they could get to his wife first, however, she would only charge half of that. Unfortunately, a group of collectors learned from the local sheriff that the couple charging "admission" were not the actual caretakers and had no right to allow people onto the property. Memers of several mineral clubs, including the Georgia Mineral Society, located Junior Norman, the real caretaker and a former miner at the site. They first secured permission for small groups to collect. The groups got bigger and the word spread to clubs throughout the southeast. Graves Mountain was again open to collecting! Norman, incidentally, has organized an annual rock swap at the mountain that is reminiscent of the annual picnics during the early part of the 20th century. People come to collect and swap specimens, and food vendors provide snacks and refreshments. Hopefully, the event will be spared the politicians.

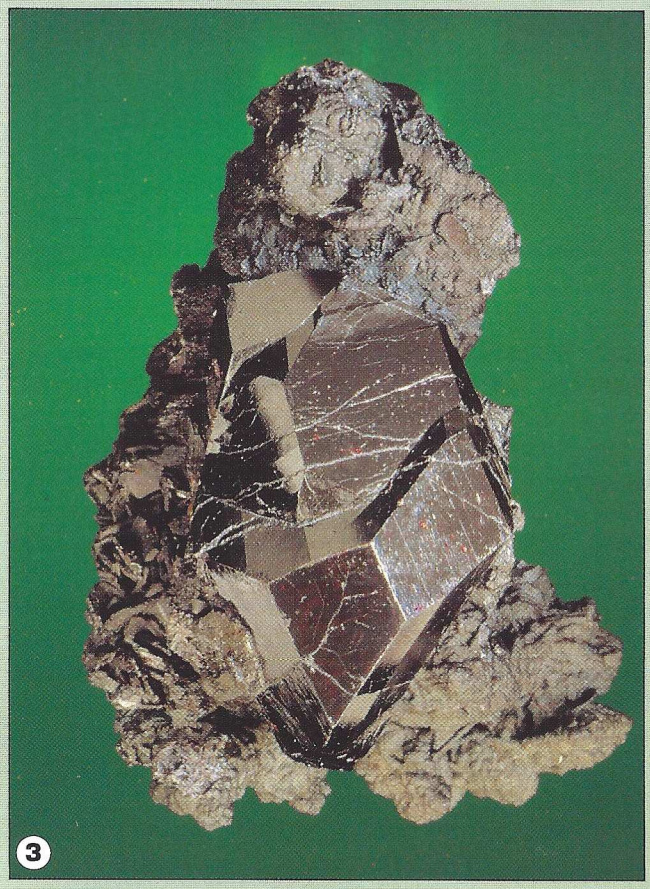
Presently, organized groups are able to access the site, and once more Graves Mountain is producing outstanding specimens. Rutile still proves elusive and requires digging into a hard rock matrix. Many hard-working collectors, most of whom belong to mineral clubs in Georgia, South Carolina and Tennessee, have uncovered some of the finest specimens yet produced. Outstanding lazulite has also been collected in the sugary quartzite near the base of the mountain. As Watson predicted, lazulite has also become an ornamental stone—dark blue lazulite in a gray quartzite matrix is now marketed as cabochons and polished spheres, going by a number of trade names including "denim lapis." Other minerals easily collected are specimens of white, golden, red and brown pyrophyllite and iridescent and stalactic hematite. Kyanite and pyrite are everywhere. Among the most fascinating specimens are the large milky quartz crystals coated with iridescent and sometimes botryoidal and stalactic hematite found in the wide quartz veins. Curiously, there is no record of these prior to mining.

A new chapter in the mineralogy of Graves Mountain is being written by micromounters such as Henry Barwood, who specialize in picking up what most collectors leave behind: vuggy, friable and "junky" pieces of quartzite. Angular cavities within the quartzite, when looked at through a microscope, have revealed phosphate minerals such as woodhouseite, variscite, strengite, cacoxenite, crandallite and phosphosiderite. Some of these phosphates occur as pseudomorphs after lazulite or pyrite. Other micro-minerals include quartz, pyrite, pyrophyllite, dickite, jarosite and sulfur.

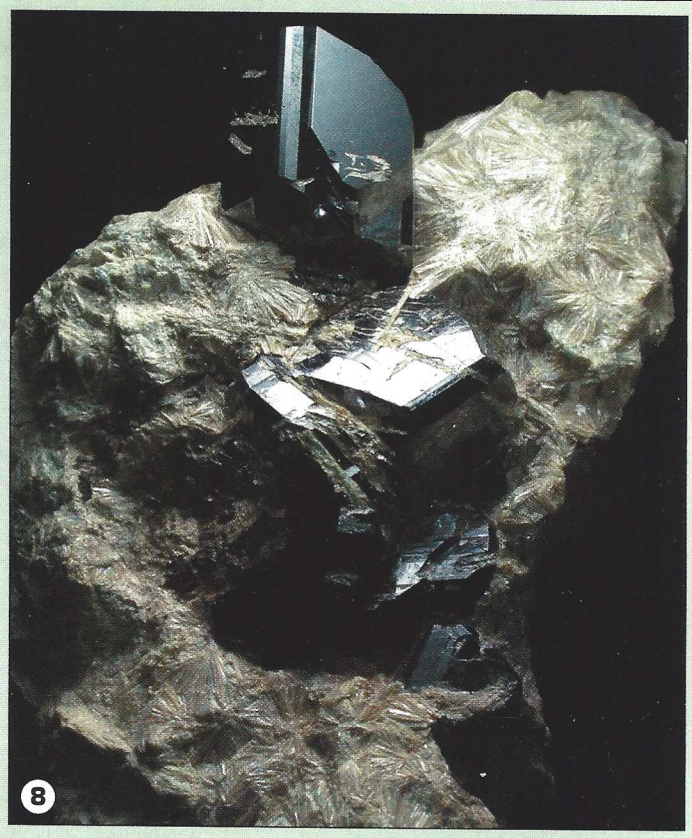




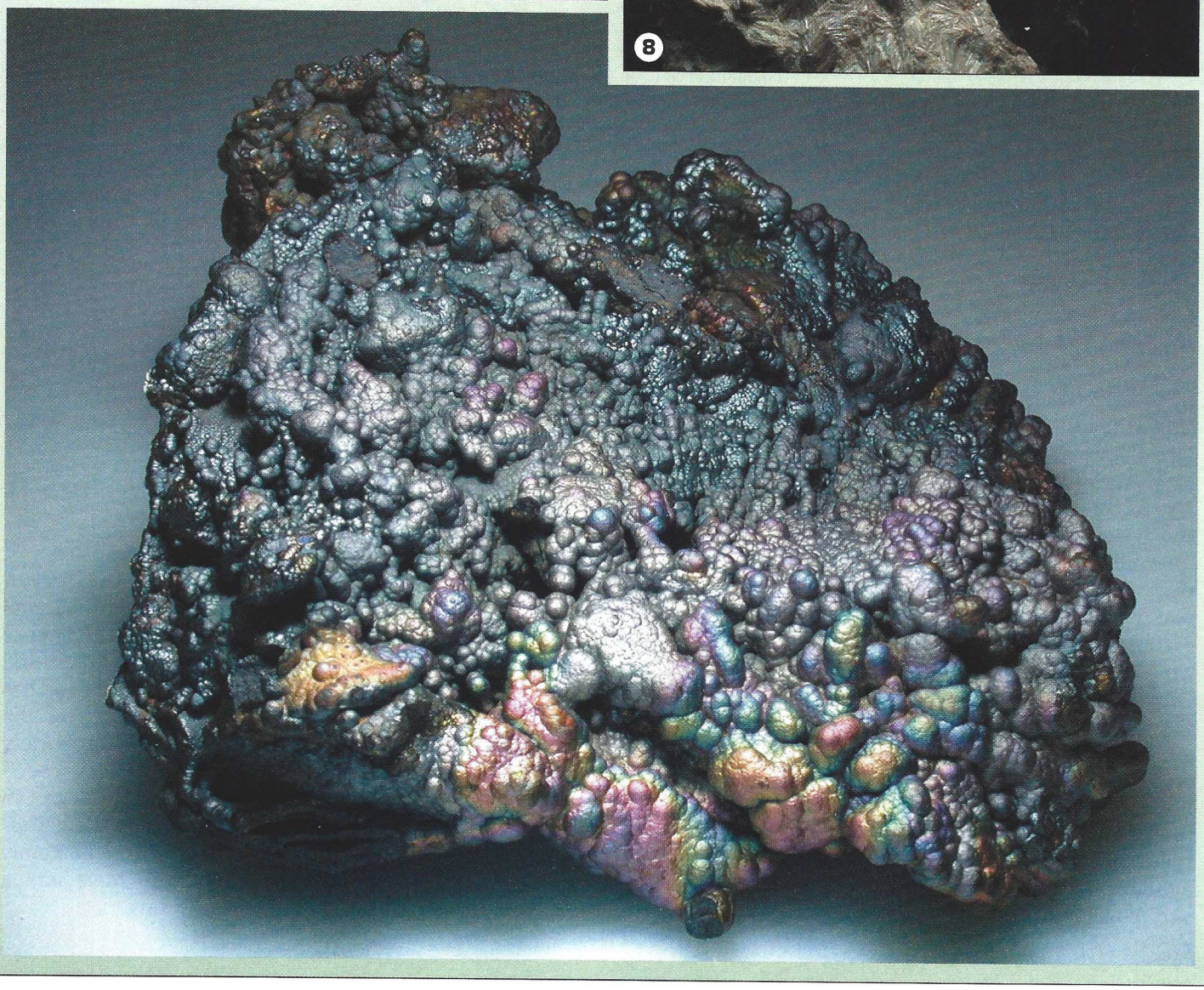
GRAVES MOUNTAIN MINERALS



1. Rutile, 3.2 cm. wide, Terry Ledford Collection. 2. Rutile on matrix, 9.7 cm. wide, Steve Smale Collection. 3. Rutile on matrix, 8.1 cm. high, Carolyn Manchester Collection. 4. Hematite, 7.3 cm. wide, Weinman Mineral Museum. 5. Rutile on matrix, xl. 1.8 cm. wide, Terry Ledford Collection. 6. Lazulite, 2.3 cm. wide, Kay Robertson Collection. Photos by Jeff Scovil.



7. Lazulite xl. measuring 3 cm. wide. 8. Rutile xls. in a pyrophyllite and kyanite matrix. 3. Iridescent hematite/goethite var. turgite. Specimen measures 22.5 cm. wide. Specimens from the Weinman Mineral Museum Collection, photos by Julian Gray.



A word must be mentioned here about gold. Shepard reported that Graves Mountain was prospected for the precious metal. During the mid to late 1800s, there were rumors of gold on the site and a number of shallow pits were dug. Although it is very unlikely that any gold was found, the rock units at Graves occur within a gold producing area. Gold mines such as the Magruder (just three miles to the northwest) which operated off and on from 1850–1939 and 1880–84, the Stony Ridge (1870s) and the Latimer (1915) may have inspired many prospectors to try their luck on the mountain. For example, in May of 1879, during a period when gold fever had hit the area, the Washington Gazette reported that *"Graves Mountain Would Soon Erupt"*, presumably in reference to an expected gold rush at the site.

Trace amounts of gold were detected during mining (Bennett) and some collectors have gold specimens from Graves Mountain (Paris). The gold occurred in two very abundant minerals—pyrite and goethite (a weathering product of pyrite). This may sound intriguing at first, but geologist Travis Paris said *"I've done gold assays of the pyrite concentrates. Taking into account mining, milling, and recovery costs you might just break even on the gold. The pyrite is worth more."*

Conclusion

Unlike many other sites around the world, Graves Mountain can be said to be in the midst of another Golden Age of collecting that began in 1859. During the nearly 150 years since, specimens have steadily made their way to collections throughout the world. When mining exposed fresh material to the collector, a new era began. A friendly relationship has developed between C.E. Minerals, represented by the property's caretaker, and the collecting community. Mineral clubs and other such organizations schedule frequent field trips to the site. In this manner, many new specimens are once again coming to light and are finding their way to private collections and museums once again. This is due to the hard work and generosity of collectors who, in the spirit of Shepard and Kunz, have been once again instrumental in distributing Graves Mountain minerals where they can be showcased. ⚒

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