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IN THIS ISSUE

COMMON GEMS OF SAN DIEGO COUNTY, CALIFORNIA

by
Paul Willard Johnson

With Photographs by the Author

San Diego County is richly endowed with gem minerals. In the 4,258 square miles of the County more than 140 different minerals have reportedly been found. Here, the title "gem basket of the United States" is justly deserved, for no other U.S. county has the profusion, variety and quality of gems so represented within its boundaries. From the ocean on the west through the mountains in the middle to the desert on the east, San Diego County is unique in physiography.

The common gem minerals described herein occur in pockets, or vugs, in pegmatite dikes. No placer deposits of gemstones have ever been found in San Diego County. The mines are located in a central mountain belt trending from northwest to southeast across the county *(Figure 1)*. It is peculiar that the pegmatite districts closely coinside with the northwest-to-southeast-trending fault zones. Most of the gem districts occupy areas of dense chaparral (low vegetation), composed mainly of greasewood.

There are eight main pegmatite districts: Aguanga Mountain, Banner, Chihuahua Valley, Jacumba, Mesa Grande, Pala, Ramona and Rincon. These districts are indicated on the map in *Figure 1.* The two principal mining districts are Pala and Mesa Grande.

Lepidolite seems to be a valuable indicator mineral; without it, there is very little chance of finding colored gemstones. Lepidolite in the Pala district has been dated by John Earl using the rubidium-strontium method and found to be 106, plus or minus six million years old.

Matrix specimens in the past were usually discarded and ended up on the dump. They are currently very much in vogue, and specimens of this type from San Diego County grace mineral collections throughout the world.

The most complete permanent collection of San Diego County gems and minerals, mainly a study collection, can be viewed at the San Diego Museum of Natural History in Balboa Park. A small collection of specimens from the County can also be seen at the San Diego County Department of Agriculture at 5555 Overland Avenue. During the summer, the San Diego County Fair held at Del Mar usually has an excellent collection of San Diego County minerals and gems.

Historical Sketch

Local Indians had been collecting surface tourmaline from the Pala and Mesa Grande districts before white men arrived. In many Indian graves have been found green and pink tourmalines. The first discovery by white men of gems in San Diego County was in 1890, when Charles Russell Orcutt found pink tourmaline at what later became the Stewart Mine at Pala *(Figures 2 & 3)*. This stimulated a local search for other gem deposits.

In 1892, eighteen tons of lepidolite from the Stewart Mine was shipped to New York for specimens of pink-tourmaline sunbursts on lepidolite. The famous Himalaya Mine, in the Mesa Grande district, was first opened in 1898. The Himalaya was first worked by C. R. Orcutt, and later by Gail Lewis and Fred J. Rynerson. The Mesa Grande district was most actively mined from 1902 to 1912.

Kunzite was first found at the Katerina Mine on Hiriart Mountain, Pala district, in May, 1902, by M. M. Sickler and his son Frederick M. Sickler. The mineral sicklerite was named for the son. In May, 1903, the famous Pala Chief Mine was opened on Chief Mountain in the Pala district.

The Rincon district was first prospected by John Mack in 1903 and was worked primarily from 1903 to 1910. The Ramona district was first discovered in 1903.

The fall of the Chinese dynasty in 1912, headed by the Dowager Empress Tzu Hsi, caused the market for pink tourmaline to dwindle to insignificance. Thus, the Himalaya Mine was forced to close down. When the news arrived, the miners left in such a hurry they didn't even bother to remove their tools. Years later when the mine was reopened they found all the miner's equipment, just as it had been left, and open pockets of tourmaline!

Frank A. Salmons was an early developer in the Pala district. The mineral salonsite was named in his honor.

Morganite, the pink cesium variety of beryl, was first found in the Pala district.

In 1947, George Ashley, known as a fine faceter of kunzite, bought all the mines on Hiriart Mountain in the Pala district. Presently, Norman E. Dawson of San Marcos controls the Fargo, White Queen and Vanderburg Mines on Hiriart Mountain.

Since 1914, gem mining in San Diego County has been on a small scale. Most of the mining at present is being done only by individuals or small groups.

Production

From 1900 to 1914 about ninety percent of the gem output of San Diego County was recorded. Over 90 percent has come from five mines: Himalaya and San Diego in the Mesa Grande district and the Pala Chief, Tourmaline Queen and Katerina in the Pala district. Over $320,000 worth of gem minerals has been taken from the Pala district alone in the last fifty years. From 1898 to 1952, the Mesa Grande district produced over 244,850 pounds of tourmaline worth approximately $779,700. The estimated market value of cut stones of the Mesa Grande district tourmaline from 1901 to 1912 is 2.7 million dollars. The Himalaya has produced more tourmaline (about 100 tons) than all the other mines in San Diego County combined. The total value of gem minerals (in the rough state) in the County has been at least 2.3 million dollars.

Pegmatites

The pegmatite dikes originate in the north in Riverside County (where they were first found by Henry Hamilton in 1872 on Thomas Mountain), pass through San Diego County and terminate on the Gulf of California about 350 miles south of the United States border in Baja California, Mexico. The dikes are underlain mainly by plutonic igneous rocks of the Southern California batholith. This batholith is composed mostly of gabbro, tonalite, diorite, granodiorite and granite.

The common gem minerals discussed in this article are all pocket minerals and are found exclusively in the "pocket pegmatite" part of the dike, which usually varies in thickness from a few inches to about four feet. Pegmatite is a plutonic rock that is irregular in texture and usually very coarse grained. It is composed mainly of quartz and feldspar of the perthite variety, with minor amounts of mica and gem minerals.

Four zones of a complex pegmatite dike are frequently recognized: (1) border, or outermost zones, (2) wall zones, (3) intermediate zones, and (4) cores, or innermost zones. Graphic granite is usually present in the border and wall zones. It is composed of a cuneiformlike pattern of quartz and feldspar. The intermediate zones, or line rock, are frequently a garnet-rich aplite. Zones of massive (bull) quartz can usually be found between the gem-bearing pegmatites and the surrounding country rock. Pocket pegmatite is customarily found in the cores of the dikes, and is composed mainly of quartz, albite and orthoclase, with minor amounts of microcline, muscovite, lepidolite and black tourmaline. It is within the pocket pegmatite that the vugs and pockets of gemstones are found. A single pocket of tourmaline in the Mesa Grande district weighed 1,500 pounds. The pockets are usually filled with a red clay composed mainly of the mineral montmorillonite. Most of the gems are encrusted with this clay and must be cleaned to show their beauty. Sometimes in the mining operations pockets are encountered, in which the gem minerals are so friable they will crumble to pieces when touched.

Pegmatite dikes vary in thickness from less than an inch to 100 feet, and in length to about one-half mile. The productive Himalaya dike averages only four feet in thickness.

Beryl

Crystal description: Hexagonal system, hexagonal division; dihexagonal-dipyramidal class. In San Diego County it crystallizes in beautiful hexagonal

Varieties occurring in San Diego County:

Aquamarine	— Bluish green, blue, light green, yellow-green
Cat's-eye	— None
Golden Beryl	— Yellow
Goshenite	— Colorless
Morganite	— Pink, pale rose to peach

prisms, some of which are vertically striated. Also equant to tabular. Faces of the second-order pyramid are commonly well developed.

Occurrence: In San Diego County, beryl has been found in the following districts: Aguanga Mountain, Jacumba, Mesa Grande, Pala, Ramona and Rincon.

Interesting facts: Beryl from San Diego County is associated with quartz, albite, lepidolite, potash feldspar, muscovite and tourmaline. Gem beryl occurs to about six inches in maximum dimensions, with an average of 2.5 inches or less. Nongem beryls in the county get quite large. The author found one that weighs over 85 pounds. Some of the beryls are tapered, probably due to the effects of corrosion.

Morganite was named by Dr. George F. Kunz in honor of the banker John Pierpont Morgan. Morganite is rarer than emerald, although not as popular. It seems to be more common than aquamarine. Morganite and aquamarine usually occur as greatly compressed hexagonal prisms. Some of the prisms have side growths with flat terminations at different levels along the c-axis. Usually, the crystals have flat basal terminations, which sometimes have pyramidal faces developed. Some of the flat basal terminations have a negative cavity due to corrosion paralleling the c-axis. The Mack Mine *(Figure 5)* in the Rincon district has produced some flawless light-green prisms of beryl. One from Pala had an aquamarine center with a morganite edge. The beryls of San Diego County are usually faceted in the emerald-cut style, and these are usually cut deep to bring out the color.

The material sometimes has inclusions of muscovite, lepidolite, quartz and tourmaline. It commonly has two-phase inclusions with a gas bubble. Two moveable bubble inclusions were found out of 26 specimens examined. One moveable bubble, after being heated with the microscope light, disappeared. There are also veillike liquid inclusions.

Spessartite

Crystal description: Isometric system; hexoctahedral class. Commonly in crystals, usually dodecahedrons up to ¾ inch in diameter. The larger crystals are usually simple dodecahedrons. Some are slightly etched and others, usually the smaller ones, are commonly trapezohedral with minor dodecahedral faces. The smaller the crystals, the more perfect they seem to become.

Occurrence: In San Diego County spessartite is found primarily in the Ramona district, with very minor amounts at Pala and Mesa Grande. In the Ramona district, it is found mainly at the Little Three Mine, and sometimes at the A.B.C. and Hercules Mines.

Interesting facts: Spodumene in San Diego County is associated with quartz, lepidolite, albite and muscovite. All transparent spodumenes are etched fragments of once-larger crystals. These crystal fragments are deeply striated in a direction parallel to their elongation. The original luster of the faces has been removed and the surface is sometimes altered to appear dull and/or earthy. Many specimens occur as crystal fragments within altered spodumene. Most of the gem-quality fragments have been less than 15 inches long. They also have triangular etch pits *(Figure 10)*. The deepest colors are seen when the stones are viewed parallel to the long axis of the crystal; the table of cut stones should also be oriented in this manner. Spodumene is usually cut deep so that maximum color is obtained.

The light-green San Diego County material owes its color to iron and therefore the variety name hiddenite (which is colored by chromium) is not applicable. The light tone of this color adds weight against using the name hiddenite.

Kunzite, the rare lilac spodumene, is found principally in three places in the world: Brazil, Madagascar and San Diego County. It was named for the late Dr. George Frederick Kunz (1856-1932), gemologist and former Vice President of Tiffany & Company in New York City. The color of kunzite is caused by manganese. Light-blue spodumene was rediscovered by George Ashley, of Pala, in 1952.

The name spodumene means "ashes" in Greek, in allusion of the fact that this mineral becomes ashy before the blowpipe.

San Diego County kunzite sometimes contains inclusions of what look like pocket clay. There are also two-phase inclusions in spodumene with a gas bubble; and long, thin, rod-shaped (needlelike) inclusions. There are also funnel-shaped inclusions.

Topaz

Crystal description: Orthorhombic system; rhombic-dipyramidal class. In San Diego County, topaz crystals are commonly of short prismatic habit. Very rarely twinned crystals have been found. Crystals of three different terminations occur: one with a broad, flat 001, or c, face developed; one that is an inverted V-shape with the 021, or y, face well developed; and a dome shape with the 111, or o, face and the 112, or p, face developed (see *Figure 921, Dana's Textbook of Mineralogy,* fourth edition, page 613). Usually, the crystals have only one termination, with the base fractured on the perfect basal cleavage. However, where growth conditions were favorable, a few are doubly terminated. Topaz crystals are sometimes slightly striated parallel to the length of the prism.

Varieties occurring in San Diego County: The ordinary variety is usually colorless or white; less commonly it is a light blue, greenish blue or light yellow.

Occurrence: Topaz occurs in San Diego County at the Little Three and A.B.C. Mines in the Ramona area, and from the Emeralite Number Two Mine on Aguanga Mountain. It has also been found at the Himalaya Mine at Mesa Grande and in very minor amounts in the Pala district.

Interesting facts: Topaz from San Diego County is associated with quartz, albite, lepidolite and green tourmaline. The crystals are very similar to those found in the Ural Mountains of Russia. Blue topaz has been found in sizes up to 2⅞ x 3¼ inches at the Emeralite Number Two Mine in Aguanga Mountain, 13 miles northwest of Warner's Hot Springs. This mine was owned and operated by the late John W. Ware of San Diego. Some crystals have frosted surfaces due to etching. It has inclusions of albite. It also has two-phase inclusions with a gas bubble and three-phase inclusions, some of which have two nonmiscible liquids, gas bubble and crystal of an unknown mineral. In addition, liquid veillike inclusions.

Tourmaline

Crystal description: Hexagonal system, rhombohedral division; ditrigonal pyramidal class. San Diego County crystals are usually prismatic in habit, with divergent radiating groups; also acicular. Tourmaline sometimes shows parallel side growths and columnar composites. Crystals usually display three curved sides in cross section. They occur in sizes from microscopic specimens to more than a foot long. The most common termination is the flat basal type. Tourmaline with a flat basal termination is called a negative termination; a slightly curved end is called a positive termination. Doubly terminated crystals usually have a flat termination at both ends, or a flat end and a trigonal pyramid or modification of it. Rarely both ends will be terminated by the trigonal pyramid, and occasionally the trigonal pyramid is itself slightly truncated by three faces. Rarely, tourmaline crystals are found that are curved or bent. The crystals are usually vertically striated.

Occurrence: Tourmalines from San Diego County are found in all the pegmatite districts: Aguanga Mountain, Banner, Chihuahua Valley, Jacumba, Mesa Grande, Pala, Ramona and Rincon.

Interesting facts: Tourmaline from San Diego County is associated with quartz, albite, lepidolite, beryl, perthite (feldspar), muscovite and cookeite. The color is sometimes arranged in transverse layers along the length of the prism, producing bicolored or tricolored stones. The color may also change from the center outward, showing very definite color zones. Sometimes, there is a black core with a yellow edge or a yellow core with a pink edge. The pink core with a green edge indicated the famous watermelon tourmaline. Rubellite with an indicolite edge is sometimes called a blue-skinned rubellite.

Colored tourmalines show the best color through the side of the prism or when viewed through its length. Faceted tourmaline is therefore usually cut with the table parallel to the length of the prism or perpendicular to it, to take advantage of the color. The emerald cut

Varieties occurring in San Diego County:

Achroite	— Colorless
Bicolored	— Red, green, blue, black, yellow, pink, white
Bicolored cat's-eye	— Pink and white
Cat's-eye	— Green, pink, white
Green tourmaline	— Green
Indicolite	— Blue
Rubellite	— Pink or red
Schorl	— Black
Tricolored	— Green, white, pink; blue, yellow, red
Violet tourmaline	— Violet
Watermelon	— Red or pink and green (color zoned)
Yellow tourmaline	— Yellow

and round brilliant cut are usually used.

Rubellite, either red or pink, was a popular gem in China, where it was carved into beautiful figurines. The fall of the Chinese Dynasty in 1912, however, caused this market to dwindle to insignificance, and the resulting drop in price contributed to the virtual discontinuance of profitable mining in the Mesa Grande district.

Tourmaline crystals take a static charge and upon being blown out of a pocket by a dynamite charge, usually pick up and collect a great amount of dust and dirt, sometimes to the extent of being completely covered.

In the early days of gem mining in the county, occasionally microscopic tourmaline crystals would penetrate the miner's fingers and they would become infected.

Tourmaline is commonly encrusted with the white mineral cookeite. Tourmaline can be cleaned, especially of cookeite, by the use of hydrofluoric acid. This acid is very dangerous, however, and should only be used with extreme caution since it will even etch glass!

Tourmaline is sometimes found with an altered crust revealing a hard nodular core that has a conchoidal fracture and is often flawless. Only about three percent of the material recovered is of gem quality. Etching on tourmaline is sometimes quite pronounced, even to the extent of eating holes in the crystals. Some of the pink crystals from the Himalaya Mine have a thin black skin, as if they had been sprayed with black paint, but it is probably composed of black tourmaline. Negative cavities sometimes begin on the termination and are oriented parallel to the sides of the prism. A bicolored pink-and-white cat's-eye, with the eye in the white end, has very rarely been found. Rarely, tourmaline is found encrusted with muscovite casts. These casts with a core of tourmaline have been found at the Himalaya Mine. Some of the green crystals from the Himalaya Mine have a black cap, which is terminated by a trigonal pyramid.

The Emeralite Number Two Mine on Aguanga Mountain produced a light-blue tourmaline that has been called "emeralite." One unusual color-zoned tourmaline from the Tourmaline King Mine had a pink core surrounded by four distinct green bands. Radiating sunbursts of pink tourmaline (called tourmaline suns) in a fine-grained lepidolite are found at the Stewart Mine. The famous Himalaya Mine has probably produced more material (about 100 tons) than any other mine in the world. The only color not normally found in San Diego County is brown.

The mineral sometimes has inclusions of quartz, albite and the micas. It also has two-phase inclusions with a gas bubble, usually very irregular in shape. Very fine, long, rod-shaped inclusions and small elongated cavities that are triangular in cross section are oriented parallel to the length of the prism. When these inclusions are numerous enough, they are the cause of the chatoyancy, or cat's-eye, phenomenon.

Tourmaline, that myriad-colored gem that mimics the spectral hues of the rainbow, is the most colorful of the San Diego County gems.

Acknowledgements

I would particularly like to express

my appreciation to Mr. Robert W. Rowland, Curator of Mineralogy at the San Diego Museum of Natural History, for his continual guidance, insistance on accuracy and encouragement in the field of mineralogy. I am indebted to the late Vete George Black, G.G., F.G.A., for permission to examine the collection of San Diego County gems collected by the late Wilburn Wyatt of San Diego, California. Mr. and the late Mrs. Louis B. Spaulding courteously provided data on their Little Three Mine. For critically reviewing the manuscript I am grateful to Dr. Florence Williams and Prof. Nathalia Crane Black, G.G., both from San Diego State College, San Diego, California. The map in *Figure 1* was drawn by William M. Burgin.

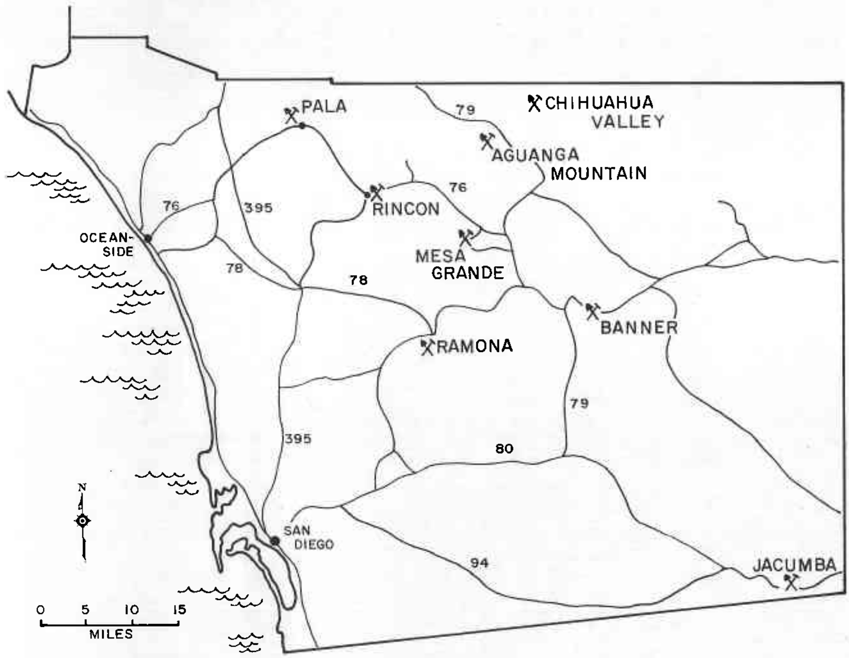


Figure 1. **Map of San Diego County, California, showing the location of the main pegmatite gem-mining districts.**

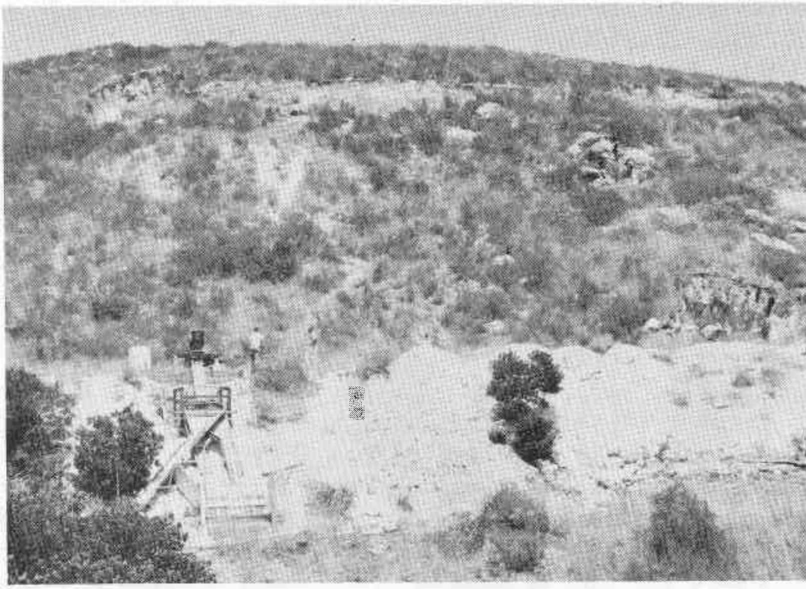


Figure 2. Main entrance on the south side of the Stewart Mine, Pala district. It was here that gemstones were first discovered in San Diego County. Because of the lilac color of the lepidolite (lithia mica) found here, it was at first thought to be cinnabar, an ore of mercury. The large white area in the center right is the mine dump.

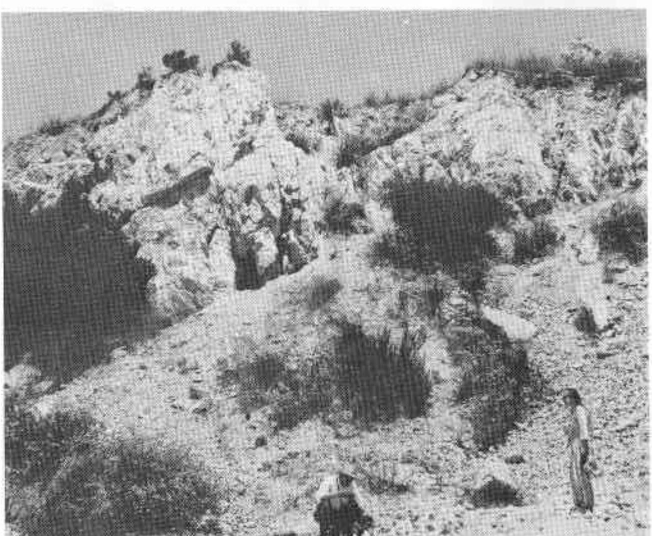


Figure 3. Open cut on north side of the Stewart Mine, Pala district. It is here that the compact lepidolite is shot through with pink tourmaline.

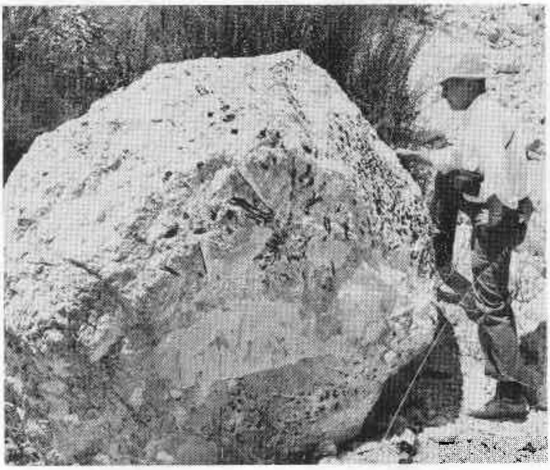


Figure 4. Closeup of a large block of pegmatite at the north side open cut of the Stewart Mine, Pala district. The black spots are black tourmaline.

Figure 5. Pegmatite dike at the Mack Mine, Rincon district. The white area in the center is the dike, which is dipping 43 degrees southwest. This mine is noted for prisms of light-green beryl.

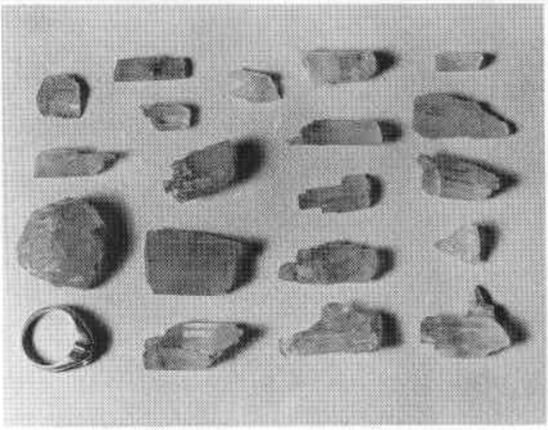


Figure 6. Rough crystals of beryl, mainly from the Emeralite Number Two Mine on Aguanga Mountain. The specimen just above the ring (shown for scale) is morganite. All specimens shown are from the author's cabinet.

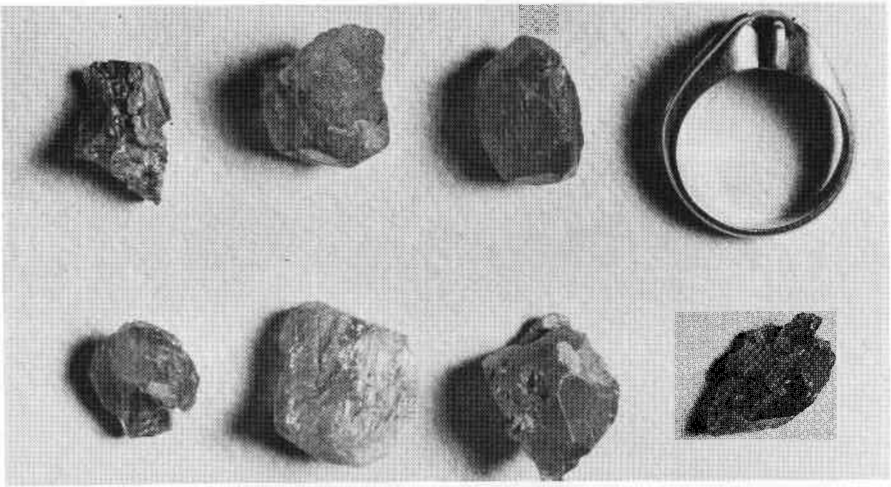


Figure 7. Rough spessartite crystals from the Little Three Mine, Ramona district.

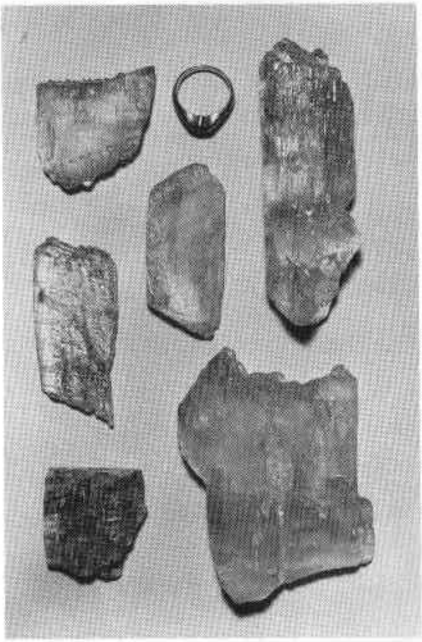


Figure 8. Medium-sized crystals of spodumene from the Pala district. The three specimens on the right are kunzite and the three on the left are triphane. The crystal in the lower left-hand corner is twinned.

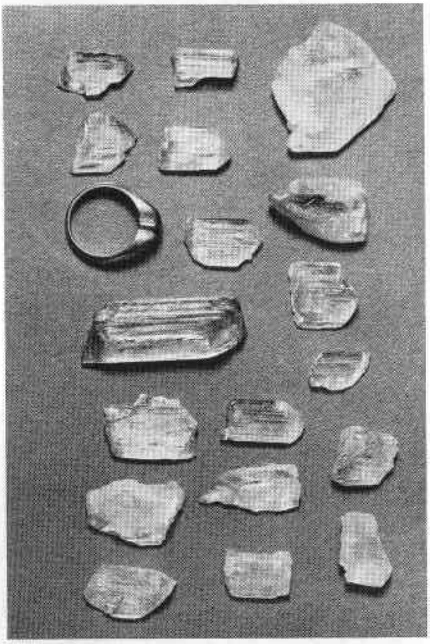


Figure 9. Small crystal fragments of spodumene from San Diego County, California. The specimen in the upper left exhibits the typical etched termination on a crystal fragment. Notice the striations.

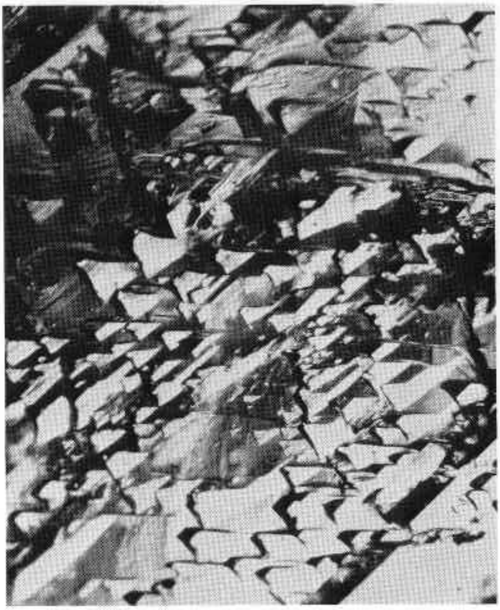


Figure 10. Microphotograph of triangular etch pits on the surface of kunzite from the Pala district.

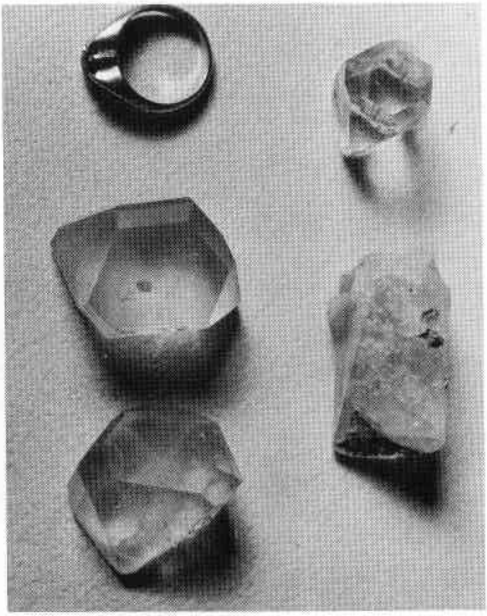
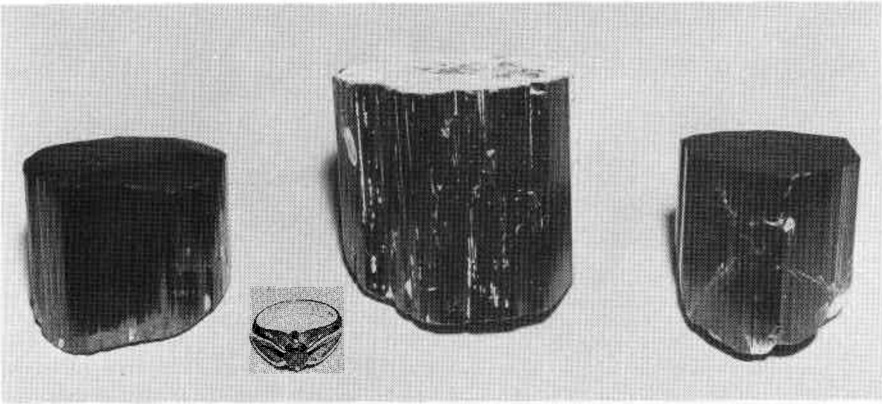


Figure 11. Medium-sized crystals of topaz from the Little Three Mine, Ramona district. The crystal in the upper right is doubly terminated.

Figure 12. Small crystals of topaz from the Little Three Mine, Ramona district.

Figure 13. Large crystals of green tourmaline from the Little Three Mine, Ramona district. The crystal on the left has the positive termination and the other two, the negative. The center crystal is encrusted with white cooketite.



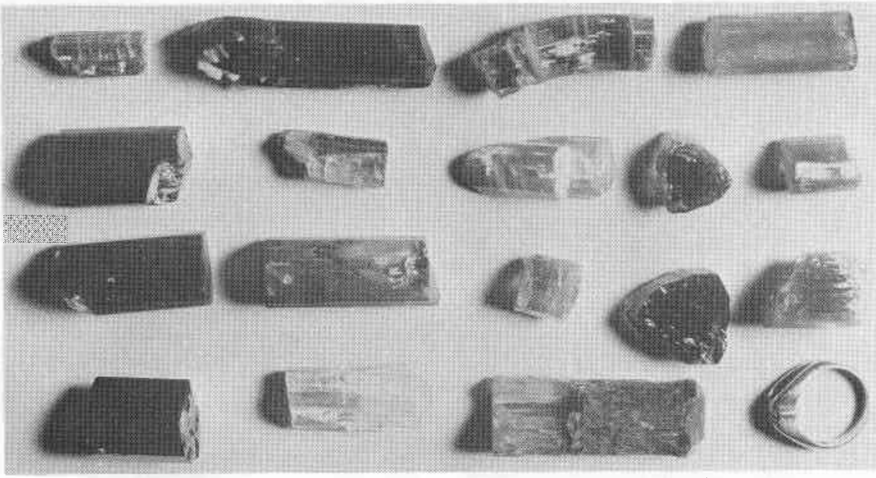


Figure 14. Medium-sized crystals of tourmaline, mainly from the Himalaya Mine, Mesa Grande district. Notice the curved crystal in the top row and the crystal in the bottom row (next to the ring) that has been almost completely etched.

Developments and Highlights at the Gem Trade Lab in New York

by

Robert Crowningshield

Imitation Turquois

We are indebted to GIA student Milton M. Arbetter of San Antonio for the chance to study more specimens of the unusual turquois imitation mentioned in the last column. It was noted that the refractive indices varied somewhat from 1.57 to 1.60 and the same was true for the seven specimens submitted. *Figure 1* illustrates the three main types; one with dark matrix, one with brown matrix and natural-appearing cavities, and one with no matrix whatever. As one would expect, the specific gravity varied from approximately 2.49 to 2.59, with the material without matrix being higher. One unusual reaction not mentioned in the last column is shown in *Figure 2*. When a hot needle is brought near the stone an area will puff up and turn white with no odor. A lighter area develops when a drop of hydrochloric acid is left on for a few minutes. In addition, the acid turns yellow, as one expects with compressed imitations.

Figure 1

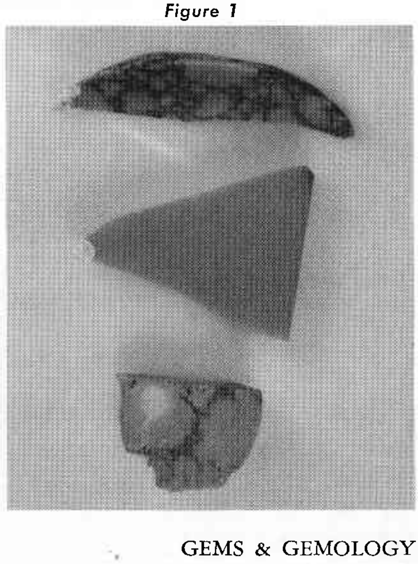


Figure 2

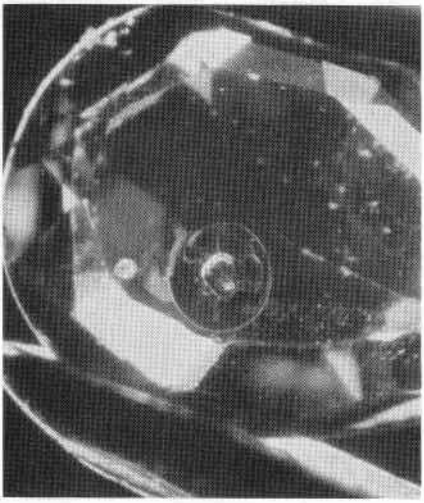


Figure 3

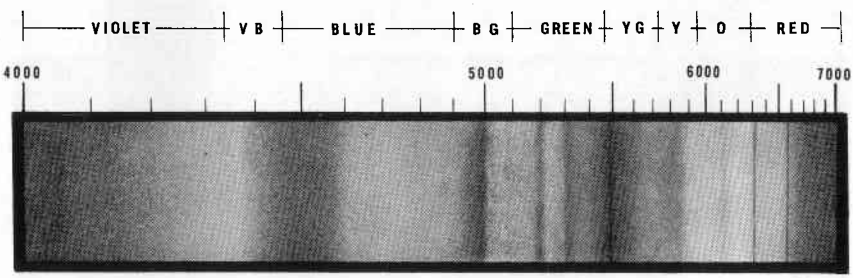
Inclusion in Alexandritelike Sapphire

Figure 3 shows an unusual inclusion in a small blue to purple alexandritelike Montana sapphire. It is an iridescent halo around an included crystal. Thanks to dealer George A. Bruce of Stone Mountain, Ga., for allowing us to study the stone.

Synthetic Absorption Spectra

In the last issue we showed the absorption spectra of synthetic scheelites. Again, thanks to Dr. Kurt Nassau of Bell Laboratories, we are able to show the absorption spectra of other synthetics. *Figure 4* is the spectrum of a deep-red synthetic fluorite, whereas *Figure 5* shows that of a near-emerald-green synthetic fluorite. *Figure 6* shows the absorption of an intense orange-brown synthetic greenockite. *Figure 7* shows the characteristics of a synthetic yellow Europium garnet and *Figure 8,* that of a light blue-green yttrium-aluminum garnet. *Figure 9* shows an unusual absorption in the deep blue of a light-yellow YAG.

Figure 4



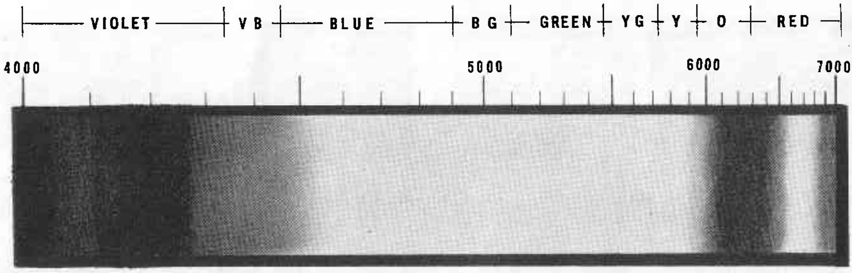


Figure 5

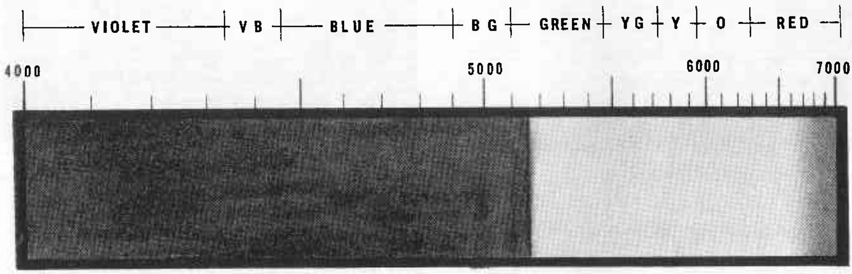


Figure 6

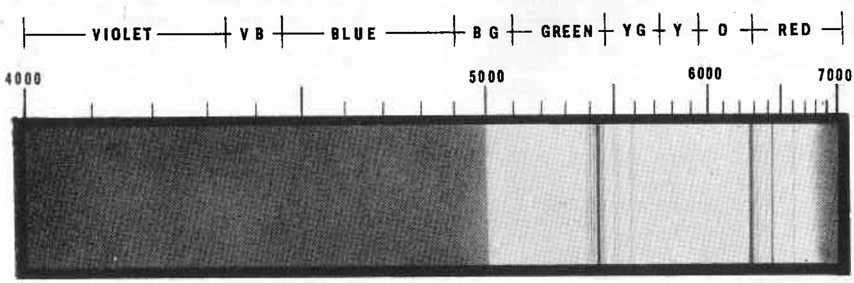


Figure 7

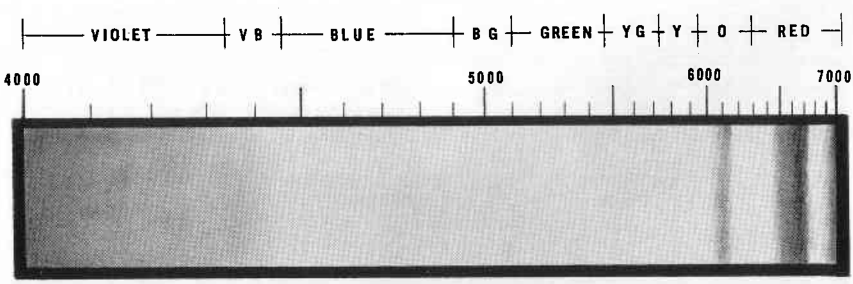


Figure 8

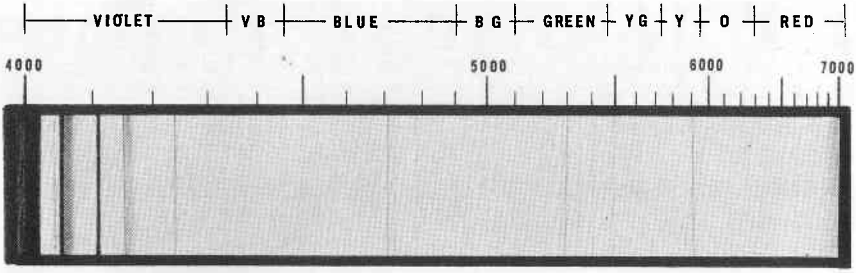


Figure 9

Transparent Green Grossularite

Figure 10 is a 2.02-carat, faceted, transparent green grossularite cut by Eastern Headquarters staff gemologist Jerry Call. An attempt, largely successful, was to cut with proper angles, to determine the depth of color that could be obtained along with this garnet's fairly high dispersion. The result is a quite bright, though perhaps too pale a stone for good commercial appeal. One property of this new variety of grossularite that was not mentioned in the last issue is the unique (for garnet) appearance of fluorescence under both short and long ultraviolet. Under short ultraviolet there is a pronounced yellow-orange glow, whereas under long ultraviolet the color is a duller red-orange, much like that of a yellow Ceylon

Figure 10

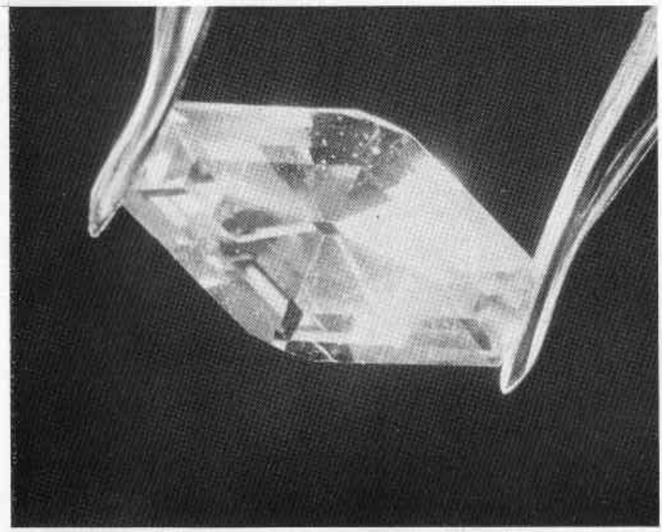


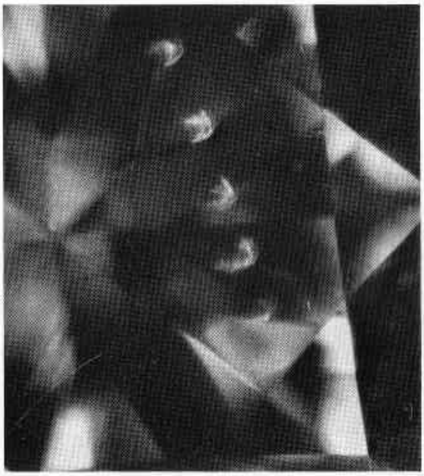
Figure 11

sapphire.

Stone-Cleaning Hazards

The danger of steam cleaning precious stones is sometimes not appreciated by repairmen and manufacturers. Placing a cold stone directly into steam is responsible for much damage. Stones with inclusions and fractures, such as emeralds, may suffer irreparable damage or change of appearance. *Figure 11* shows a fine-colored cabochon emerald that was set in an earring and then steam cleaned. The steam drove out oil, which is commonly used to disguise fractures, in addition to extending some of the fractures.

Figure 12



Diamond Bruises

Figure 12 illustrates an unusual series of bruises on the table of a diamond. They resemble three-toed dinosaur tracks. No reason for them was determined.

Needlelike Inclusions in Diamond

A cloud of needlelike inclusions in a 7-carat marquise diamond is shown in *Figure 13.*

Figure 13

A "Flawless" Diamond

Figure 14 shows an unfortunate decision to make a fine diamond "flawless" by distorting the facets toward one point while removing hairline feathers near the girdle. Because the stone was a critical weight, the upper-girdle facets were not replaced.

Unusual Fluorescence in Synthetic Emerald

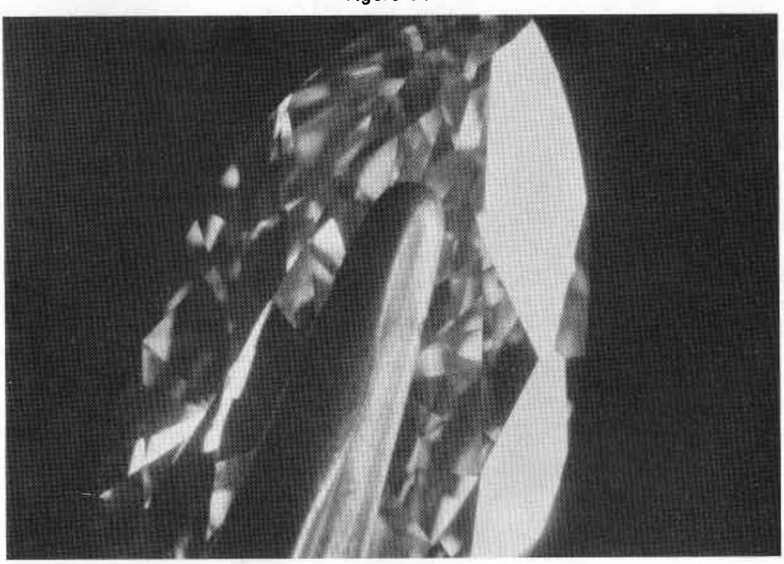
We recently encountered two small synthetic emeralds, probably of Gilson manufacture, that fluoresced a stronger red under short ultraviolet than they did under long ultraviolet.

Acknowledgments

We are indebted to student **Joseph Garriti,** lapidary of New York City, for a boule and two cut stones of the rare synthetic alexandritelike spinel. The boules were sold as "tourmaline-colored spinel," and were perhaps too dark in color to be commercially useful. Only a few stones were cut, and the alexandritelike property was not noticed when the boules were received years ago.

We wish to thank our Leveridge-

Figure 14



gauge repair specialist **Edward Dooskin** for a copy of *Minerals,* by Warne, which he obtained in London recently.

London is also the source of an important gift to the Institute in the form of rough Russian diamond crystals, a gift of **Mr. Robert Webster** of the Laboratory of the London Chamber of Commerce. When Mr. Webster was visiting us in October, we mentioned that we had not had the chance to examine known Russian rough and he very kindly offered to provide some for study.

We thank jeweler **Wesley Bergan,** who gave us through the good offices of student **Steve Rocklin,** a faceted phenakite, that we removed from a lady's gold ring—a most unusual place to find a colorless stone of this type.

We wish to thank **Mr. James Drilling** of New York City for several blue zircons that, within his experience as a volume dealer in zircons, were unusual in that they had inclusions visible to the unaided eye. It would seem that the Thai cutters automatically eliminate stones with obvious inclusions; hence, their rarity.

We very much appreciate a gift of numerous stones valuable for student study that we received from graduate **Jack Newstadt,** Norwalk, Connecticut.

From student **Murray Darvick,** New York City, we received a very useful gift of numerous tumbled peridots.

Examples of treated and untreated turquois were received from student **Jacob Aminoff,** New York City gem dealer.

Developments and Highlights at the Gem Trade Lab in Los Angeles

by

Richard T. Liddicoat

Linobate

For sometime we have had in our possession both rough and cut samples of lithium metaniobate to study. This material is offered under the trademark name Linobate, by Crystal Technology, Inc., of Mountain View, California. It is a very interesting material with some gem potential, for it has high refractive indices, high dispersion, and occurs in an attractive colorless form. It has some drawbacks as a diamond substitute, in that it is relatively soft and very strongly birefringent. Its chemical composition is $LiNbO_3$. It crystallizes in the rhombohedral division of the hexagonal system. The specific gravity is approximately 4.65, and the refractive indices approximately 2.21 - 2.30 in sodium light. The dispersion is very strong; within the visible spectrum, for example, the ordinary index varies from approximately 2.41, approaching the lower end of the visible violet portion of the spectrum, at 4200 Å. The dispersion is somewhat over double that of diamond. The birefringence is about .090, thus appreciably greater than that of high zircon, at .059.

This new manmade material makes an attractive gemstone in its own right. Of course, the very high birefringence gives it a somewhat fuzzy appearance, even with the table cut perpendicular to the optic axis. The dispersion is enough lower than that of synthetic rutile or of strontium titanate to give Linobate a more natural appearance.

Yellow Spots on Diamonds

Recently, while grading numbers of diamond brilliants, we encountered something that no one recalls having seen in the past: distinct, round, yellow spots on naturals on the girdles of the stones. The spots appeared to be confined to the surface, but we were unable

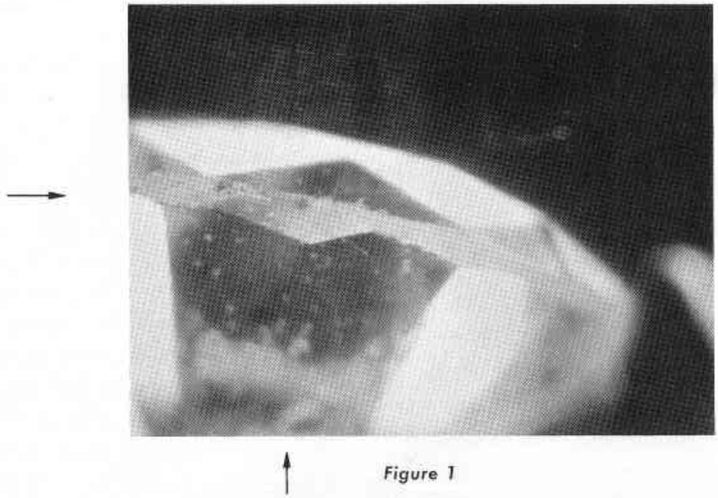


Figure 1

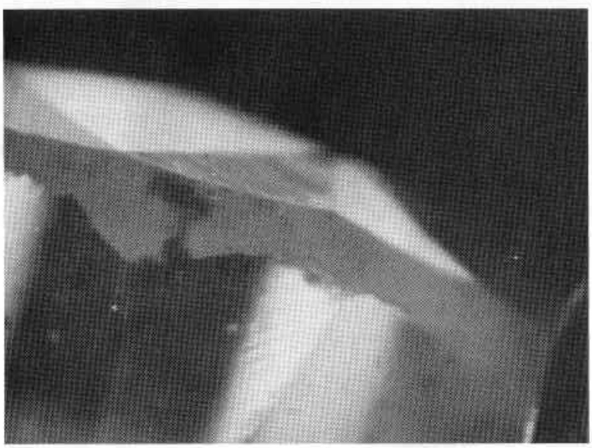


Figure 2

to scrape them off or to scratch through them. No attempt was made to dissolve them in acid. *Figures 1* and *2* show the spots. In *Figure* 1 the location is marked by an arrow.

Odd Opal Inclusions

A GIA student brought us a very interesting opal that had unusual inclusions. *Figure 3* shows the inclusions under rather low magnification. The branchlike vertical stalks contrast strongly with what appears to be a portion of a leaf in the lower center. In *Figure 4* the leaflike area is shown under higher magnification. Note the apparent veins that are to be seen in the thin material. Close examination did not suggest that these were actually organic, but they certainly appeared to be at first glance.

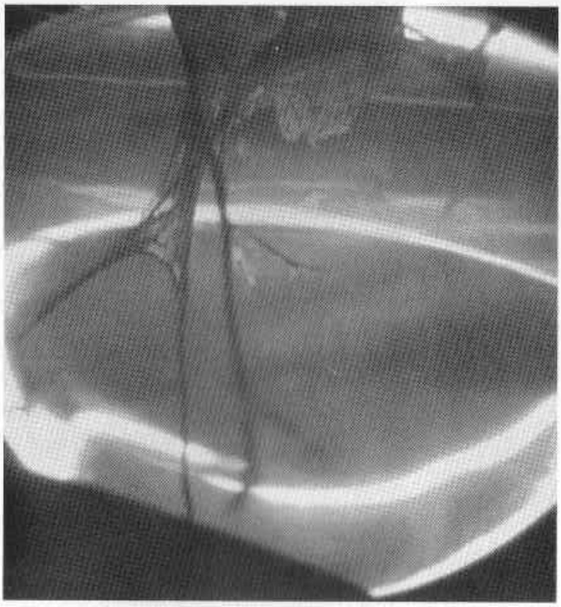


Figure 3

Figure 4

Strange Inclusions in Peridot

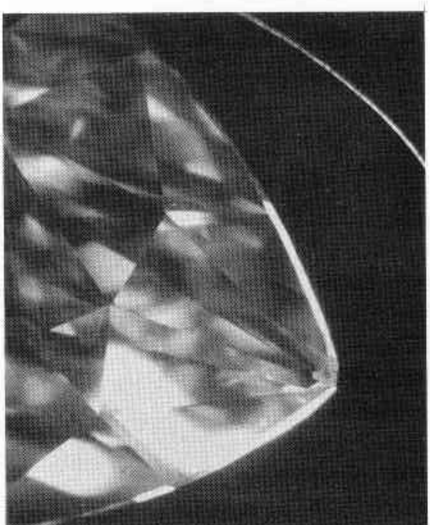
Some rather unusual hairlike inclusions in a peridot are shown in *Figure 5*.

Figure 5

Unusual Faceting Pattern

On the point of the marquise shown in *Figure 6,* the bezel facet is not the usual kite shape, but was divided into

Figure 6



two triangular facets with a ridge running from top to bottom of what ordinarily would be a flat kite-shaped facet. Note the small chip out of the point.

Star Doublet

Figure 7 shows reflections from tiny air spaces in the cement joining a colorless synthetic corundum cap to a star-sapphire base, creating an effective star doublet. The reflections from the silk in the base portion made possible a strong star, so the doublet would pass for natural when viewed from directly above.

Unique Turquois

We see many paraffin- or oil-treated turquoises, but recently, for the first time, we noted a distinct fingerprint

Figure 7

pattern in a turquois that had nothing to do with matrix *(Figure 8).* We would only conclude that there was a layered distribution of porosity in the stone before treatment, and that this created a difference in the concentration of paraffin or oil in the impregnated stone.

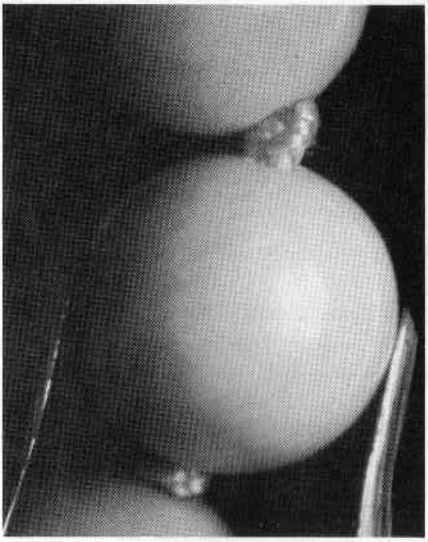


Figure 8

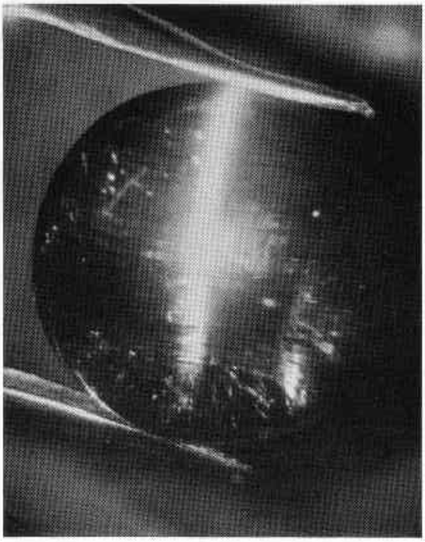


Figure 9

Cat's-Eye Zoisite

Martin L. Ehrmann, Los Angeles gem-and-mineral dealer, was examining a large parcel of blue-zoisite rough in preparation for sending it to his cutters when he noticed that one of the pieces appeared to contain numerous needle-like inclusions in a parallel orientation. As a result, he had the stone cut in a cabochon form and produced a rather attractive eye *(Figure 9)*. As can be seen, the eye is strong.

Acknowledgments

We wish to express our sincere appreciation for the following gifts:

To **George Harvey,** Denver, Colorado, for his gift of both rough material and fashioned gemstones.

To **Don Leake** of Long Beach, California, for his gift of mixed stones, which will be used to advantage with our students.

To **Ben Gordon,** Gordon's Jewelry Company, Houston, Texas, for the generous gift of assorted stones for our Gem Identification classes.

To **Charles J. Barr,** Lubbock, Texas, for one serpentine bead and one nephrite cabochon to be used in the Gem Identification sets.

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VOLUME XII

Spring, 1966—Winter, 1968

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EYE OPENING PRESTIGE INSTRUMENTS THAT SELL DIAMONDS & CONFIDENCE!

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