Gems & Gemology

GIA

SPRING, 1967

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Diamond-Proportion Grading and the New ProportionScope

by

Richard T. Liddicoat, Jr.

One of the key factors determining the value of a diamond is the quality of cutting. This depends on the proportions of the fashioned stone and the quality of its finish.

The grading of cutting is based on two premises: (1) that the amount of weight yield from the rough has an important bearing on price, and (2) that the relative beauty of the product also affects price. These factors are emphasized when one realizes that some expert cutters average a 40% to 43% yield in weight of polished goods from average rough, whereas others consistently retain over 50% on the average. In other words, the latter's yield is 25% greater on the average. This additional weight is retained at the expense of beauty in relation to the brilliancy and fire potential produced by ideal proportions and finish.

GIA standards are based on the weight that could have been retained, if average rough had been cut to ideal figures – with slight modifications related to profound effects on beauty that yield minor gains in weight retention. For example, if one deepens the pavilion greatly, not too much weight is retained, but the stone takes on a black-centered appearance that is especially ugly. This is weighted more heavily in the GIA system.

What information must we have in order to classify a diamond's cutting quality? We need information that will tell us how much weight should have been retained from average rough to cut this stone. In the present system, this means we need to know table diameter in relation to the width of the girdle (all of our percentage figures are measured against the girdle diameter, taken as 100%). We need to know crown height, total depth (table to culet), girdle thickness, and pavilion depth, all as a percentage of girdle diameter. In addition, we need to note whether there are major symmetry faults, which also are a result of an effort to save weight.

There is one thing certain in diamond-cutting grading: any discrepancy in the make of a stone was taken for a purpose. If a stone is out of round, the

Figure 1

rough was out of round. If the culet is well off center and the table tilted, it means that more weight was retained from the rough than would have been if it had been reduced enough to give ideal proportions and symmetry.

How do we go about obtaining these figures? The *ProportionScope* uses a silhouette of the diamond cast on a screen calibrated with the necessary scales to measure the silhouette.

The ideal figure in relation to girdle diameter for the table diameter is 53%, but 52% to 57% is within ideal range. 16.2% is the ideal figure for crown height, but 15.1% to 16.5% is the acceptable range. 43.1% is the ideal figure, but 42.9% to 43.3% are acceptable for pavilion depth. The ideal figure for girdle thickness depends on the size of the stone. Girdle thickness, measured where the points of the bezel and main facets reach the girdle may be adequate, if it equals 1% on a 3-carat or larger stone; but at that figure, the girdle would be knife-edged on a 10-point stone. Thus, an ideal girdle for different sizes differs. The following approximation is reasonable.

Up to .40 carat	=	up to 3.0%
.41 to .80 carat	=	2.0 to 2.5%
.81 to 1.50 carats	=	1.5 to 2.0%
1.51 to 3.00 carats	=	1.25 to 1.75%
3.1 carats up	=	1 to 1.5%

The GIA *ProportionScope (Figure 1)*, a new and powerful tool for the diamond man, was introduced at the 1967 Conclave of the American Gem Society. Employing the basic principle utilized about 1949 or 1950 by Joseph A. Phillips in building a proportion instrument for GIA, the new instrument was designed by Gale Johnson and Kenneth Moore, GIA's instrument-manufactur-

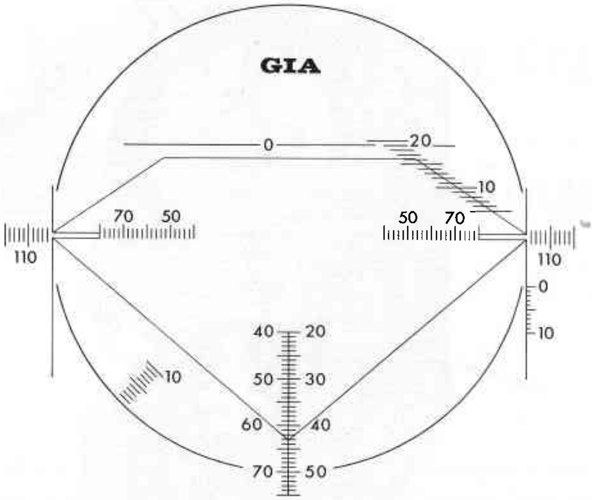


Figure 2

ing and instrument-sales managers, respectively. John Holtzclaw, CG, of Alva, Oklahoma who designed and built a proportion-grading instrument shown at the Conclave in Chicago in 1965, was responsible for creating the interest that led the Society to request that such an instrument be built. Several of Holtzclaw's ideas were used in the final design. Both the moveable screen and holes in one jaw of the stoneholder to expose the culet were Holtzclaw's ideas.

The basic idea of a *ProportionScope* is to cast a shadow on a screen marked with a diagram showing a cross section of an ideal brilliant for comparison purposes. The screen is printed with scales divided into units that are percentages of the girdle diameter. The girdle diameter is taken as 100%, and all of the scales are divided into units of girdle diameter. Thus, any readings are made in percentages *(Figure 2)*.

When the image is magnified until the girdle diameter of the silhouette just fits that of the diagram on the screen, any departures from the ideal are obvious and their extent is easily measured. For ease in reading off the comparisons, the silhouette is magnified from about 7 to 12 times, depending on the size of the diamond being measured. There are two screens, one analyzes brilliants from about .18 to 1.30 carats, and the other from about 1.21 to over 8 carats.

To analyze its proportions, the diamond is placed in the C-shaped stoneholder, which has four circle magnets on the bottom side. To do this, the stone is held in tweezers or in the fingers of one hand and placed between the jaws of the holder with the culet toward the threaded side. This is the side that has holes in it, so that the culet is exposed. The other jaw is under spring tension, and the knurled knob is withdrawn between thumb and forefinger, while the stone is inserted with the other hand. Now the holder is placed with the magnets down on the steel ring around the light orifice at the center of the stage of the instrument.

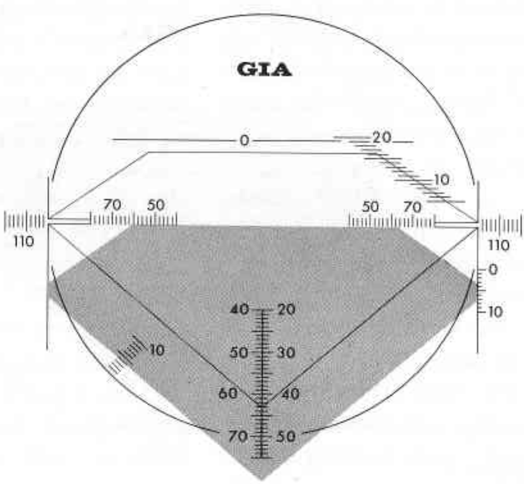
The stone probably is not in focus at this point; its silhouette is probably either too large or too small for the diagram. If the stone does not fit into the diagram, turn the magnification knob at the right until it does. Now bring the image into focus with the central knob. By using both knobs, the edges of the girdle are brought into sharp focus when they both just touch the vertical lines at the 100% position on the diagram. Now the stone is turned until pavilion and bezel main facets in the silhouette appear as straight lines.

As soon as the girdle width has been set at a 100% figure, the stone is turned through a complete revolution to notice whether there are any major symmetry faults, such as a table tilted in regard to the plane of the girdle, culet off center, or a considerable variation in girdle thickness (only the eight points on the girdle at which bezel and pavilion main facets are opposite are considered when measuring girdle thickness).

If the stone is too high or too low on the screen, the table appears to be curved, instead of a straight line. To make it appear flat involves moving the stoneholder up and down on the screen by moving it forward or back over the light source. A minimum number of moves needs to be made to make the necessary measurements with the 4-inch screen, if the screen is first placed so that its steel rim is against the top of the instrument. The stone is then brought into position for the table measurement. The corners of the table are placed at the lower edge of the hash marks along the girdle line. If the table is not exactly octagonal, the table percentage will vary as the stone is rotated *(Figure 3)*.

In contrast with all other divisions on the diagram, each division of the table scale represents 2%, because we are measuring toward each vertical boundary from the center. An exactly symmetrically cut, round brilliant will

Figure 3



show table readings that are equal, when the two corners that are visible are read against the scale. Often, however, the readings on the two sides differ, because the stone is not exactly symmetrically cut.

Unless the crown is exceptionally thick or exceptionally thin, the girdle thickness may be measured in this same position by referring to the 0-to-10% scale on the right-hand vertical line, just outside the circle and below the girdle of the diagram on the screen. Unless the girdle thickness appeared to be very even when the stone was rotated, it should be measured at the thinnest and thickest points visible when the bezel facets appear as straight lines on the crown silhouette.

The next step is to lower the screen until the lower edge of the girdle at the vertical lines on the screen exactly corresponds to the same points on the silhouette. Note: On a round brilliant, the girdle surface is often tilted toward the culet. When measuring pavilion depth in this situation the top of the girdle is at the vertical lines and the bottom of the girdle of the silhouette lines up with the bottom of the girdle line on the diagram, even though the corners of the silhouette fail to quite reach those of the diagram. Pavilion depth is read on the scale running through the culet, using the numbers on the right side of the scale *(Figure 4)*.

Next, the screen is moved down once more, to have the upper edge of the girdle on the screen correspond to the same points on the silhouette. Crown height is then read off the scale running up the right side of the crown. If the table is tilted, the crown height may be measured at other points by turning the stone 45 degrees at a time to the next pair of bezel and pavilion mains. The culet can only be seen along 2 axes at 90 degrees to one another. The 45-degree positions can be checked by holding the girdle while turning the

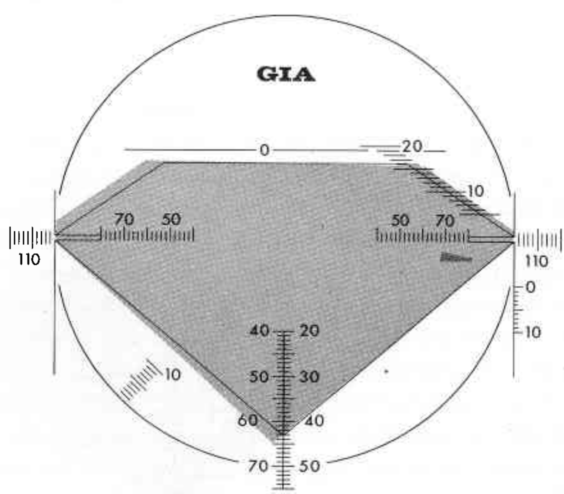


Figure 4

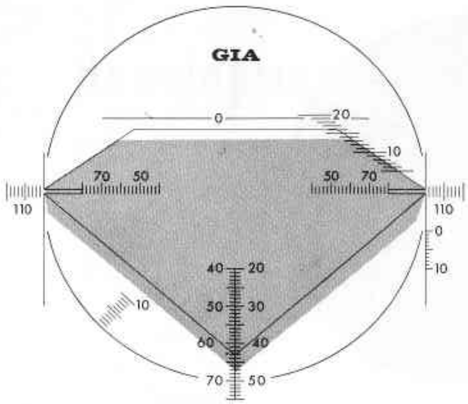


Figure 5

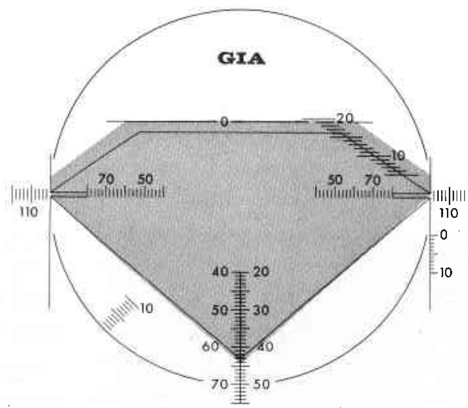


Figure 6

threaded side of the stoneholder about ⅛ turn, or 45 degrees. Crown-height variation can be recorded by showing the least and greatest crown-height measurements made when the stone has been turned full circle. Measurements are essential at more than one place only when the diamond showed variation in one or more of its dimensions when rotated earlier *(Figure 5)*.

The last step in the cross-section analysis is to move the screen down once more; this time it is lowered until the zero line corresponds to the top of the table of the silhouette. The total depth is measured on the scale passing through the culet of the screen, just as the pavilion depth was measured earlier. The figures for total depth appear to the left of the scale rather than to the right. The reading is taken at the point where the culet of the silhouette crosses the scale *(Figure 6)*.

If, in turning the silhouette on the screen, it is apparent that the culet is off center, it is not too difficult to determine how far off center it is. This is a matter of eye judgment, since there are only horizontal hash marks at this point. However, the unit lines are 3% of the girdle diameter long. Those at the 5 and 10 positions are 5% long.

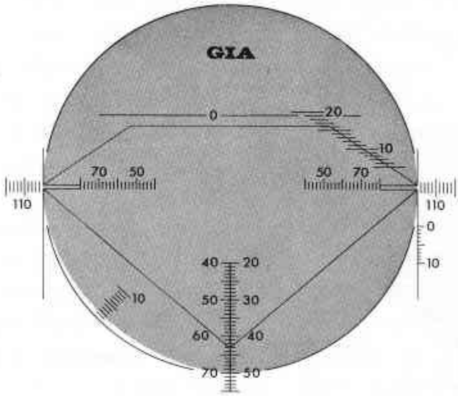


Figure 7

During the grading process, the diamond is also examined in a position that shows the whole circle of the girdle. In this process, it is not mounted in the holder used for cross-sectional analysis, but it is placed table down on a glass disc so the girdle outline can be compared to the circle on the screen. If a diamond is out of round, it is obvious during this stage of the analysis.

There are two purposes for examining the girdle outline: one is to determine the extent to which a diamond is out of round, and the other is to be able to estimate the reduction in diameter that will occur when a broken diamond is recut.

The degree of departure from roundness can be measured by turning the screen until the scale at the lower left in *Figure 2* is at the point where the silhouette fails by the greatest amount to reach the circle when it is touching some other points on the circle (see *Figure 7)*.

The first reaction to the new instrument made it apparent that a majority assumed that it would be a powerful sales aid for ideally cut merchandise, but worse than useless with other proportions. This parallels the initial reaction to the original *Diamondscope* – that it would stifle the sale of any but a flawless stone. Just as a customer happily buys an SI_2 or an I_1 having seen its inclusions for himself, so he will happily buy a spread stone – knowing that the pavilion angle is correct for maximum brilliancy and that he is getting more weight for his money.

With the wide dissemination of information on the grading of diamond cutting through the courses of GIA, plus the introduction of the AGS cutting grading system to its membership, and now, a tool for easy demonstration of cutting quality, the public will soon be asking about the neglected fourth "C."

The new *ProportionScope* is likely to change the diamond sales picture in this country and Canada. For the first time, jewelers can demonstrate the relationship between ideally proportioned and poorly made diamonds so that customers can see the differences clearly.

Developments and Highlights at the Gem Trade Lab in New York

by
Robert Crowningshield

Figure 1

Grossularite-Idocrase Carvings

A pair of lovely translucent, pink carved Kuan-Yin (the Chinese Goddess of Mercy), approximately seven inches in height, proved to be grossularite-idocrase. The idocrase component is comparatively slight, if one judges by the strength of the idocrase absorption line. One of the pair is illustrated in *Figure 1.* By coincidence, another pair of carved figures, this time of birds and similarly represented as jade, proved to be grossularite-idocrase with a very strong idocrase absorption line. In appearance, it was green and white and resembled the material we have seen from Pakistan. *Figure 2* represents one of these carved birds.

"Sugar-Cube" Inclusions

Figure 3 shows unusual "sugar-cube" inclusions in a pair of green-treated diamonds kindly loaned to us for study by

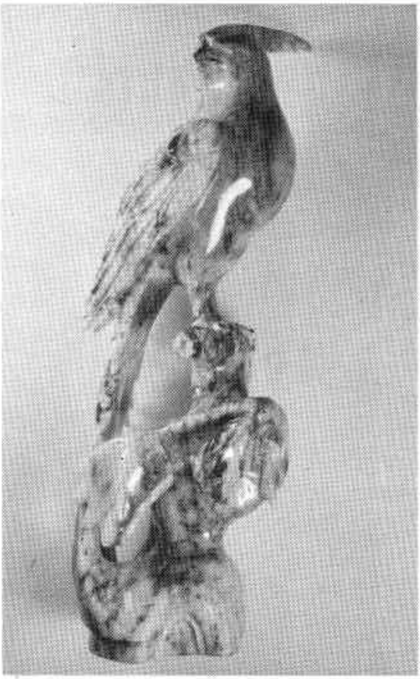


Figure 2

Mr. Irwin Moed of Theodore & Irwin Moed, Inc. These inclusions are evidently very much like the one illustrated in the last issue of *Gems & Gemology,* as seen in the Los Angeles Laboratory.

Identification Hazard

Frequently, one can identify a natural blue sapphire with the unaided eye, if he sees reflections from silk patches. The hazards of such sight identification were brought to our attention when we examined a 5-carat stone that had been sold as natural on the basis of the "natural" inclusions. *Figure 4* shows a patch of very white curved lines consisting of bubbles and color zoning that lay near the surface and reflected very much as the silk in natural stones. The stone, of course, was synthetic.

Unusual Absorption Lines

While observing the absorption spectrum of what appeared to be a Tanzania ruby, we were surprised to see unusual absorption lines that passed the field in oblique lines and slanted first to the

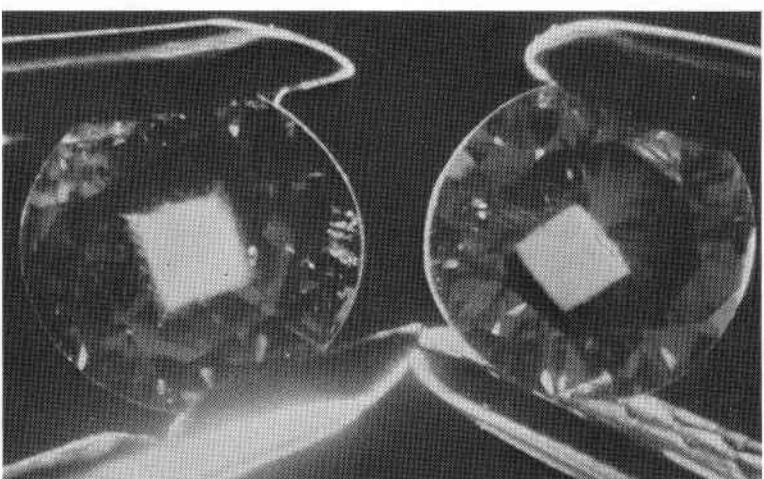


Figure 3

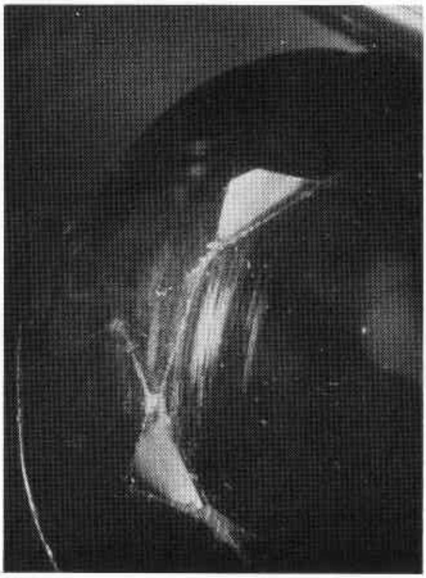


Figure 4

right then the left and in certain directions separated. Also, they became alternately light and dark when a Polaroid plate was rotated over the light source. This appearance was seen only with the stone on its table. We began to suspect the instrument itself but no other stone observed that day gave similar results. *Figures 5* and *6* illustrate the odd appearance. We feel that part of the explanation lies in the fact that the stone was repeatedly twinned *(Figure 7)* though how this particular stone's twinning caused the phenomenon we do not know.

Thin Color Zoning

We have occasionally written about natural blue sapphires in which the color lies in one thin plane, but until

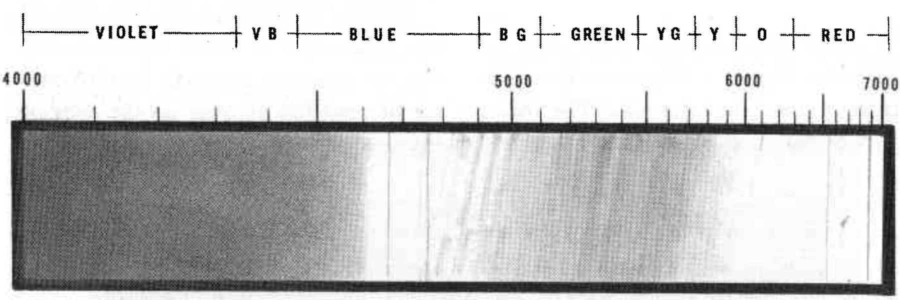


Figure 5

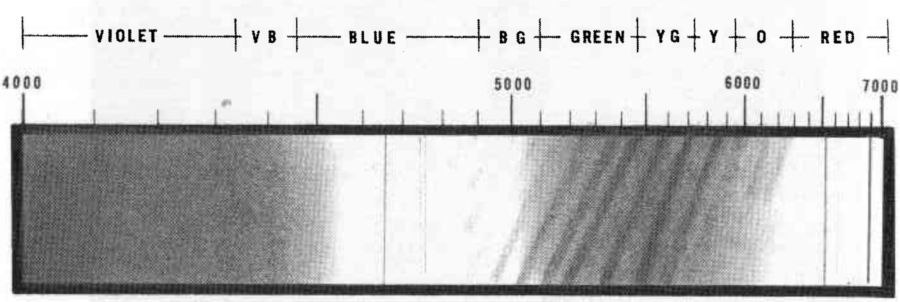


Figure 6

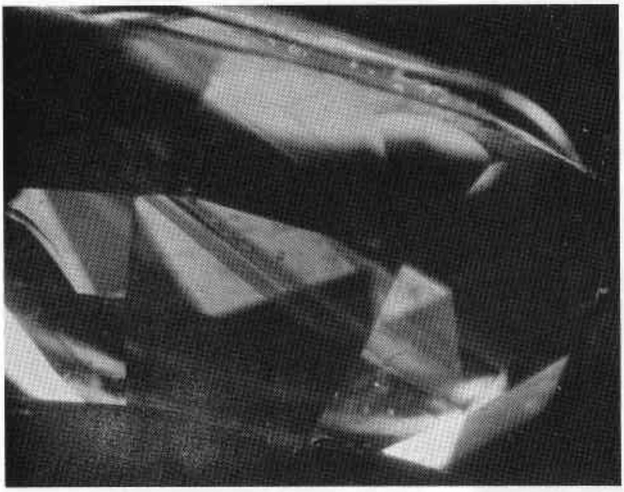


Figure 7

GIA Graduate Louis Kuhn kindly loaned a lot of such stones for our study we had never seen a selection of them. *Figure 8* shows the cabochons face up, in which position they were quite acceptable. *Figure 9* illustrates the same three stones from the side. The major part of the stones is absolutely colorless, with the blue color banding approximately 10% of the depth.

Unusual Opal

Figure 10 illustrates an exceptionally fine black opal in which the black matrix, or common material, formed mosaiclike patches of color on the apex of the cabochon, causing doubt as to the

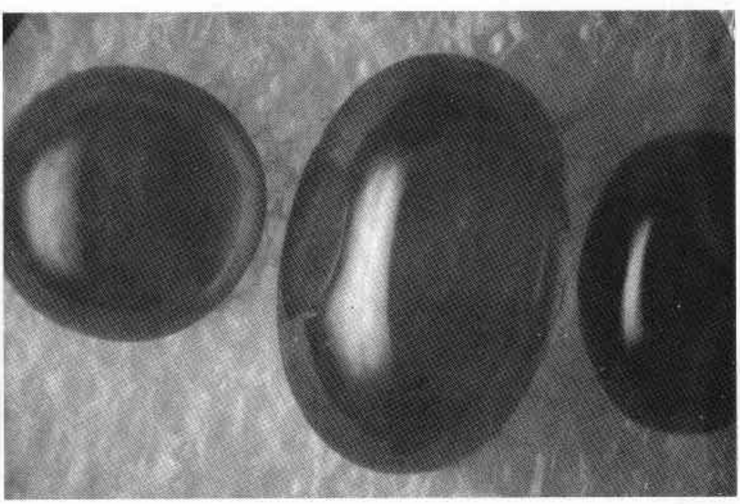


Figure 8

Figure 9

stone's natural color.

Flux-Grown Rubies

Figure 11 illustrates the wispy inclusions seen in some flux-grown synthetic rubies. This stone, of 3.07 carats, was cut with no seed crystal showing. Another solution-grown synthetic ruby of 8.70 carats, containing a seed crystal, is the largest of this type we have seen.

Natural Ruby? No!

Figure 12 shows the danger of relying on the printed word! From the photo one would suspect that the angular bands (actually twinning structure) in the star ruby would prove it to be a natural stone. Wrong! *Figure 13* shows curved color bands, as seen with the stone over the iris opening of a *Gemolite* and light projected directly through it.

An Enigma

Figure 14 is a mystery. It shows a round, polished depression in the table

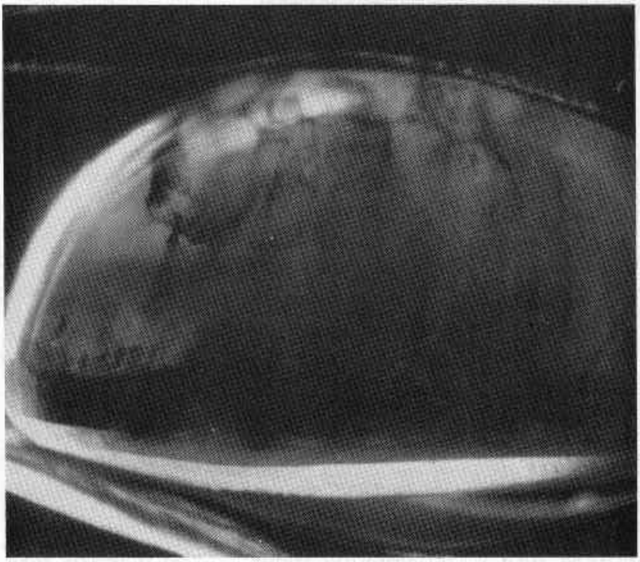


Figure 10

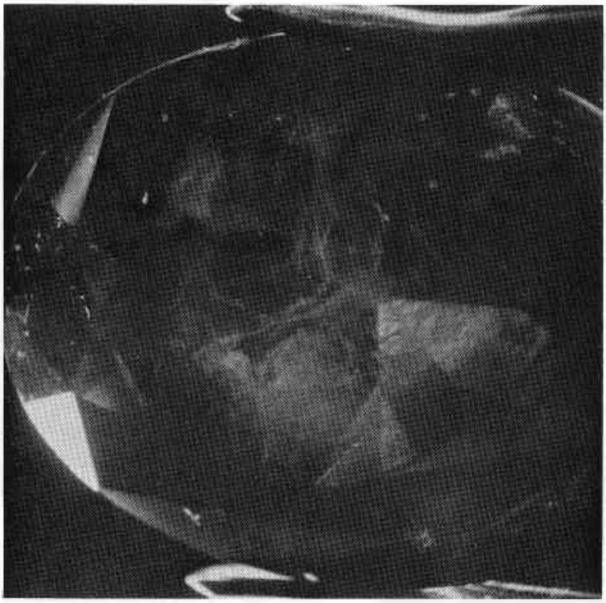


Figure 11

Figure 12

of a synthetic ruby. It is difficult to imagine how such a configuration could have been made, to say nothing of why.

We are indebted to GIA student Don Green of Mount Clemens, Michigan, for making the stone available for study.

Crackled Pattern in Sapphire

We have always thought that the crack pattern produced in a synthetic corundum when it is quench crackled after heating was mostly dependent on the stone probably being under strain. However, a similar pattern was observed in a fine natural blue sapphire of six carats that was mistreated during repair to its setting *(Figure 15)*.

Acknowledgements

We are indebted to New York stone dealer, **Harry Swartz,** for a fine rough labradorite specimen and two types of unusual agatelike opal. Two of each are shown in *Figure 16.* The black material is nearly opaque, but there is an agatelike structure just barely visible in

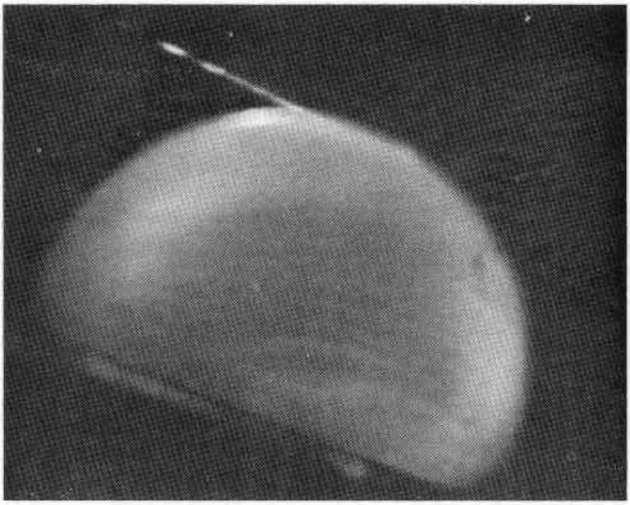


Figure 13

reflected light.

We thank the **Wm. V. Schmidt Co.** of New York City for the gift of small rhodolite garnets from Tanzania. These stones will be of great value for instruction purposes, to make this beautiful gemstone more widely known.

We received from, and wish to thank, **Mr. Jean Naftule** of Naftule Fils of Geneva, Switzerland, for a selection of corundum crystals from Tanzania. Also, we wish to thank him for letting us examine several very beautiful orange garnets from that country, which proved

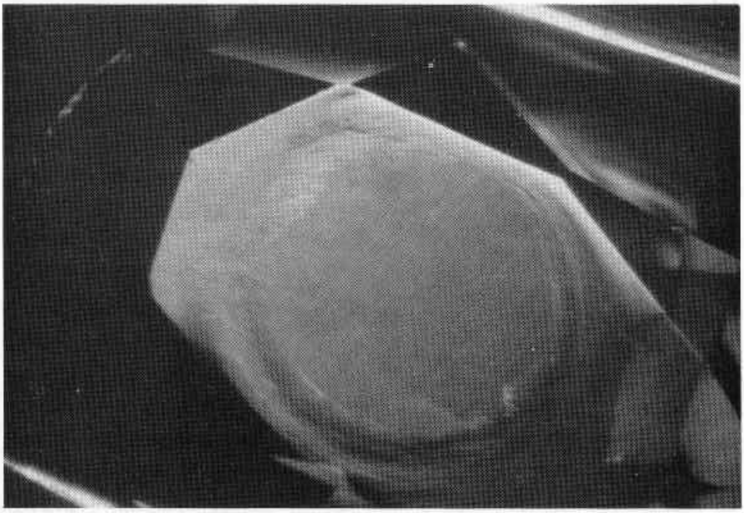


Figure 14

Figure 15

to be spessartite-almandite with possibly some grossularite present. The stones showed an unusual absorption spectrum, combining the main features of the almandite lines and the manganese lines of spessartite *(Figure 17)*. The other constants however, were low for both garnets, suggesting the pres-

Figure 16

ence of the grossularite molecule. The refractive index was from 1.755 to 1.759; the specific gravity was 3.86.

From **Allan A. Goldman,** New York stone importer, we received a handsome orange-red synthetic sapphire, a new color for our collection.

We are very much indebted to **Mr. Pierre Gilson, Jr.,** for an .88-carat synthetic emerald manufactured by their firm. It represents a departure in both refractive index and specific gravity, as well as fluorescence. The R. I. falls within the average for natural emeralds, as does the specific gravity. The fluorescence is a dull, dark red, instead of the usual greenish orange, but the inclusions are typically those of flux-grown synthetic emerald.

We are thankful for a gift of rough cut opal from Australia received from Dover, Massachusetts, student **W. A. Rose.**

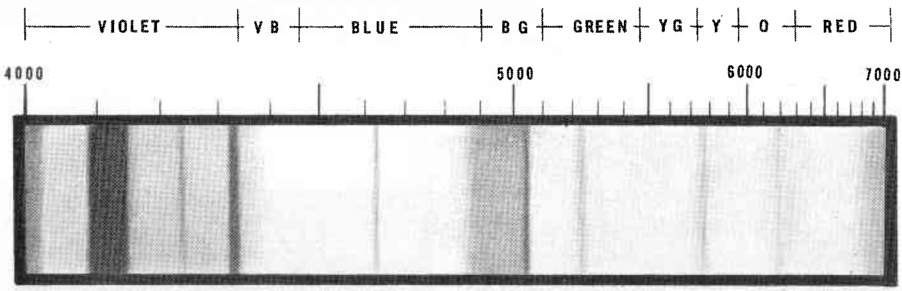


Figure 17

Developments and Highlights at the Gem Trade Lab in Los Angeles

by

Richard T. Liddicoat, Jr.

Black-Coral Characteristics

One of the characteristics of black coral is a half-moon-shaped arc of white in the cross section of the limbs of the material. Another characteristic not quite so frequently seen is a regular pattern of tiny protuberances in rather translucent layers along the length of the limbs *(Figure 1)*. Along the edges of the translucent areas the coral is built up in layers, and the protuberances are visible on a bulge on the side of the stalk.

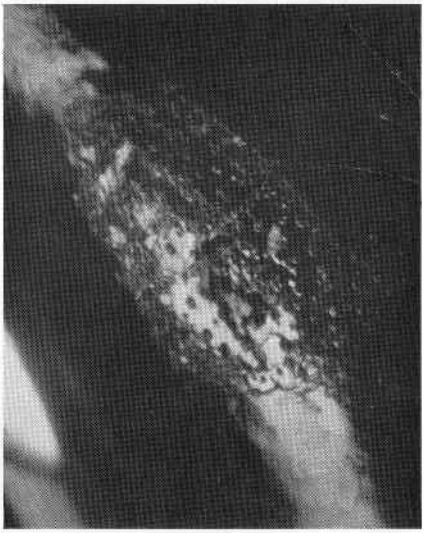


Figure 1

Unusual Diamond Inclusion

In a recent issue of *Gems & Gemology,* we discussed a rather odd inclusion in diamond: a very thin, almost two-dimensional, square, cottony area. Since then, we have had several comments. George Kaplan, of the Lazare Kaplan & Sons diamond firm, states that this type of inclusion is a characteristic of diamonds from Sierra Leone. One of our students, John B. Davis of Great Falls, Montana, sent photomicrographs of a diamond with such an inclusion

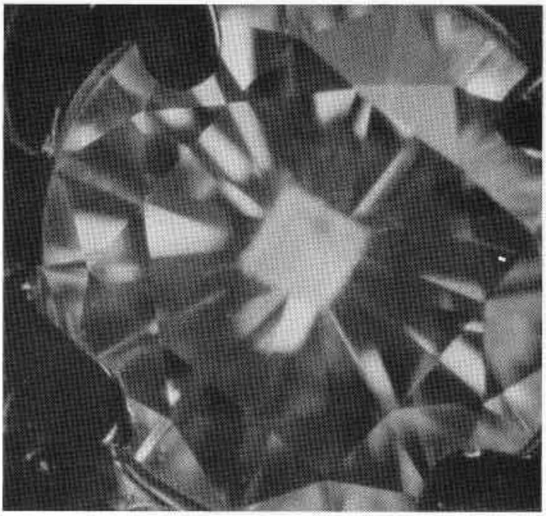


Figure 2

that was submitted for appraisal by one of his customers. It is illustrated very nicely in *Figures 2* and *3*. The photos were taken by Mr. Davis, using a *Photoscope*.

Synthetic-Garnet Striae

We had another opportunity to examine a synthetic yttrium-aluminum garnet (the so-called YAG). We were somewhat surprised to note some very definite curved striae *(Figure 4)*. The material was a rather attractive chrome green, with a very strong red color when subjected to intense illumination by a beam of white light.

Odd Emerald Inclusions

Sometimes rather strange things turn up in the always-fascinating *jardin* of an emerald. We examined a stone that had the usual variety of inclusions, but one was particularly interesting, because it so closely resembled a large gas bubble *(Figure 5)*; it is visible almost in the center of the photograph. Perhaps if it had appeared in the stone

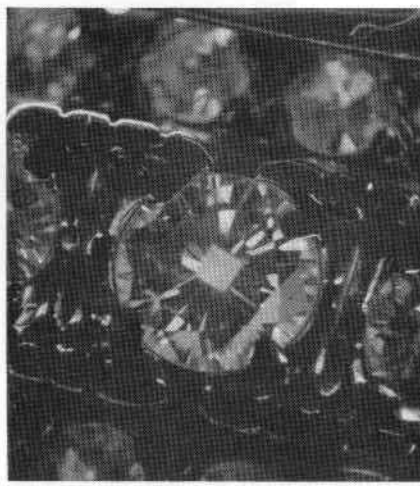


Figure 3

without any other inclusion, it would have seemed confusing.

Figure 6 shows a roiled effect in another emerald that we assumed to have been caused by layers of calcite. Although layers of this kind are seen occasionally, we have rarely encountered

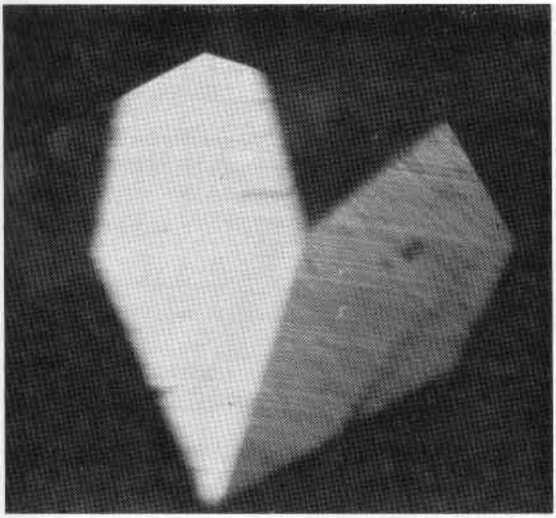


Figure 4

Figure 5

an emerald that gave such a completely roiled effect as this did under magnification in darkfield illumination.

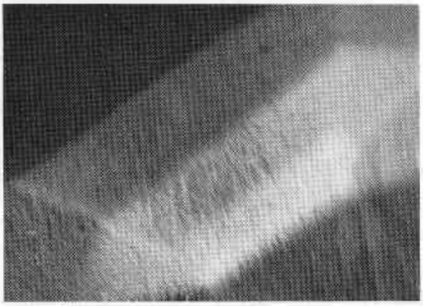


Figure 6

Unusual Glass Inclusions

Sent in for identification was a strand of green beads that resembled jade. Under magnification, many elongated inclusions were visible. However, there was a lighter streak through the center of the stones and the inclusions were arranged circumferentially. *Figure* 7 shows the inclusions in one of the

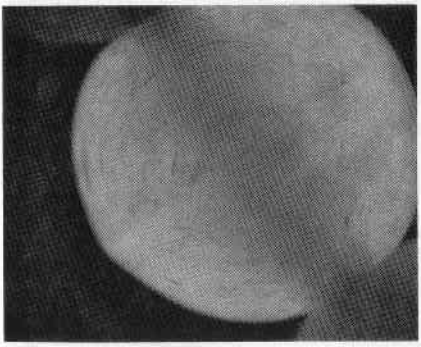


Figure 7

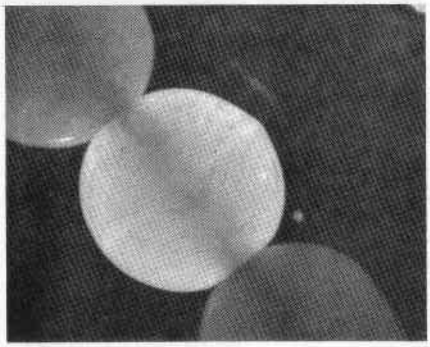


Figure 8

Figure 9

stones under magnification, showing they were elongated and appeared straight, even though the total pattern gave an impression of concentricity. *Figure 8* shows the same stone under lower magnification; the light streak through the center is more apparent. The necklace consisted of glass beads cast with the two sides pressed together at the center, along which plane the transparency was greater.

"Oolitic" Opal

Almost opaque opal is often subjected to the same kind of treatment given gray agate to blacken it to create "black onyx." The purpose is to make white opal appear to be black and to intensify the play of color near the surface. Such stones have been described several times in *Gems & Gemology* and elsewhere, giving details on how they may be distinguished from untreated opal. One of the characteristics of the treated stone is an odd fragmentation of the areas of play of color, which has come to be regarded as typical. The means of detecting this kind of treatment is the presence of many tiny black spots visible under high magnification.

Recently, we have encountered a number of opals that have this kind of patchiness in the areas of play of color, but in which no black spots are evident under magnification. We have learned that opal from a new deposit is being imported to which some have given the name "oolitic" opal, because of its appearance of being composed of a multitude of spherules, reminiscent of oolitic limestone. It is claimed this is natural opal that, unfortunately, has many of the appearance characteristics of the treated type. Such a stone is shown in *Figure 9.* It may be difficult to distinguish the areas of play of color shown in this photomicrograph, but the rather small spots of the material's oolitic nature are quite evident. It may be distinguished from the treated by the absence of the minute black spots that typify the treated material. Although these have not been darkened as are the treated opals, the pattern suggests that they may have been heated.

Glass Vs Opal

Occasionally, one encounters a stone that is particularly difficult to classify to the satisfaction of the owner. Perhaps the most difficult of analyses is one in which the person submitting the stone for identification wants to know whether a glass is a tektite; i.e., a glass of meteoric origin. If the material has the properties of a natural glass, how does one determine whether it is indeed a tektite, or perhaps a terrestrial form of natural glass? In the rough state, the wrinkled, pitted surface of the globular or flattened mass may suggest meteoric origin. Reported properties show an index range from 1.48 to 1.53 and an S.G. of 2.3 to 2.5.

Recently, the stone pictured in *Figure 10* was submitted to the Laboratory. As the photograph shows, the material was thinly layered, and there must have been minute differences in refractive index, because light interference

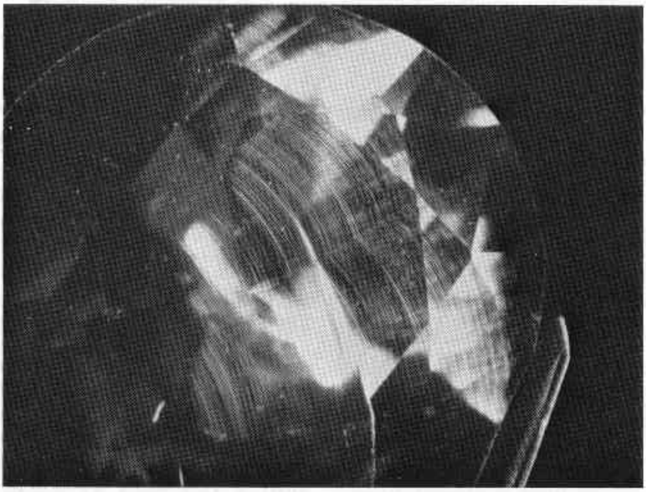


Figure 10

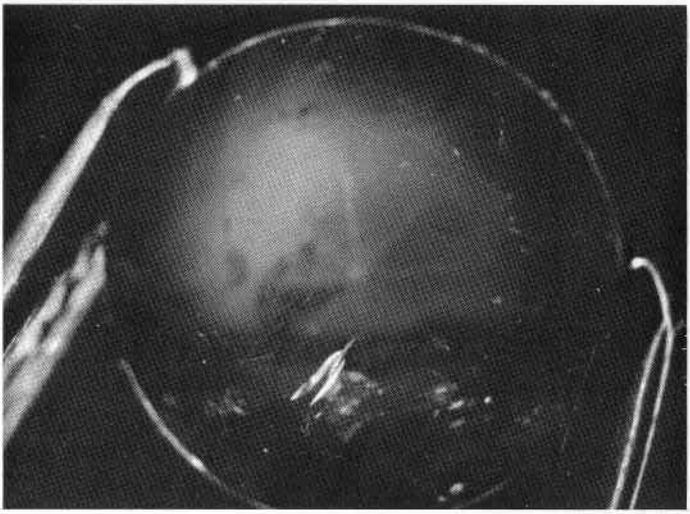


Figure 11

was apparent. The R.I. of 1.468 and S.G. of 2.255, plus the iris-agatelike structure, proved the material to be not a tektite, as the owner thought, but an opal — probably from the new Mexican source mentioned recently by Leiper and Sinkankas.

Unusual Gem Materials

During the last few months we have seen some very unusual materials; for example, three pieces of flux-grown synthetic gahnite spinel, some flux-grown magnetoplumbite and synthetic hematite, also flux grown. We have seen cut specimens of natural cerrusite and anhydrite (a 1.30-carat transparent specimen cut by a local cutter, C. D. Parsons). Mr. Parsons also showed us a synthetic greenockite. In addition, we have identified a natural legrandite, a bright-yellow transparent stone, the first specimen of this mineral we have ever encountered. It is a hydrated zinc arsenate.

Synthetic Fluorite?

Recently, we encountered a cleavage specimen — an almost perfect octahedron of what appeared to be fluorite. However, the material had a specific gravity of 4.89 and a refractive index of 1.47, fitting nothing in any source we could locate. Our reaction was to tell one of our staff members that he must have conjured up the stone — that it must be a "fragment" of his imagination. We asked sythetic-crystal growers to learn the properties of sythetic fluorite when strongly doped with heavier elements, and learned that synthetic fluorite doped with lanthanum had similar properties.

Strange Spinel Inclusions

During the course of routine testing, we encountered a natural spinel with rather strange inclusions *(Figure 11)*. It will be seen that the stone was much more cloudy than one usually expects to see in a spinel. This condition was caused by a multitude of very minute

Figure 12

inclusions. Occasionally, the inclusions were interrupted by others that resembled brush strokes; where these appeared, the stone was more transparent than elsewhere. There were also a number of typical octahedra.

Paraffin-Treated Turquois

There is nothing particularly unusual about paraffin-treated turquois. The small statuette pictured in *Figure 12*, however, had not only been soaked in blue paraffin or wax, but a good deal of it had been left on the surface to conceal the more greenish body material. However, it did not take long to wear off the surface in spots, so it left a rather unsightly combination of yellowish-green and turquois-blue colors. In addition, matrix had been simulated by painting a tarry substance on the turquois in a veined pattern. It can be seen best on the woman's sleeve, next to the child's head, and across the cloth the child is carrying.

. . . .

A stone dealer brought in a necklace of turquois he had sold a year or two earlier and that had been returned to him because some of the beads had started to discolor quite obviously. His usual treatment for discolored turquois was to put it into a rather weak hydrogen-peroxide solution. When this strand was left in the solution overnight, quite a number of the beads cracked through and some actually broke in half. After checking, we found that the beads had been completely infused with wax or paraffin; when we brought a hotpoint to a distance of two millimeters from the surface, the

Figure 13

wax started to run even at the center.

Partially Coated Emerald

A woman who had bought an emerald ring in Europe for a very low price was disturbed only a few days later when she noticed that part of the stone appeared very pale in color. Looking at the back of the stone, she thought it had been painted and actually chipped off some colored material. The stone is pictured in *Figure 13.* It may be seen that the thin plastic coating has chipped away to a large extent, leaving only the upper end still covered. It was a very clumsy effort, calculated to last not much longer than it would take to leave the store.

. . . .

Another coated pavilion was encountered on the emerald shown in *Figure 14.* The thick coating can be seen just under the back of the mounting, near the girdle. It had been coated all the way around under the mounting, so it would not be too obvious from the back. This imparted enough color to make the stone appear much more valuable than it was.

Irradiated Cultured Pearls

We were asked to check two silver-gray pearls said to be cultured freshwater pearls from Lake Biwa that had been irradiated in a nuclear reactor. The color is well represented in *Figure 15,* which shows the two pearls together with a white cultured pearl. The photograph was taken at about 3x.

Cyclotron-Treated Diamond

A marquise-cut diamond that had

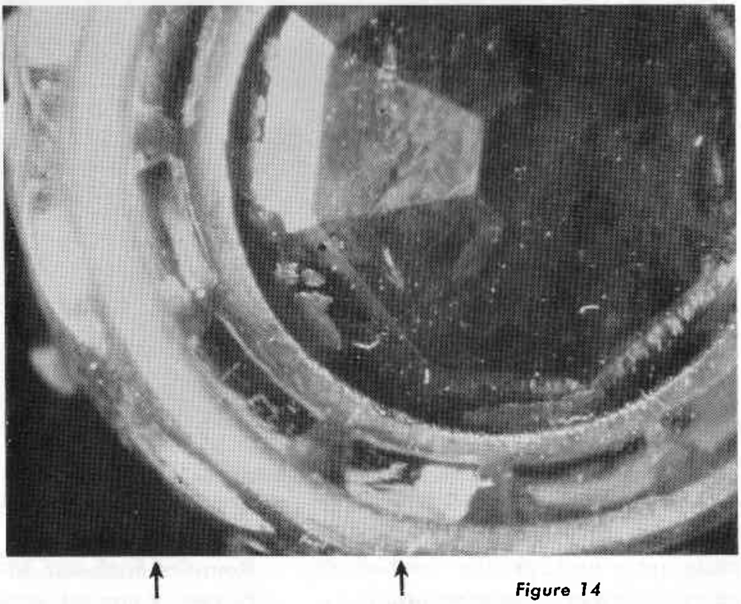


Figure 14

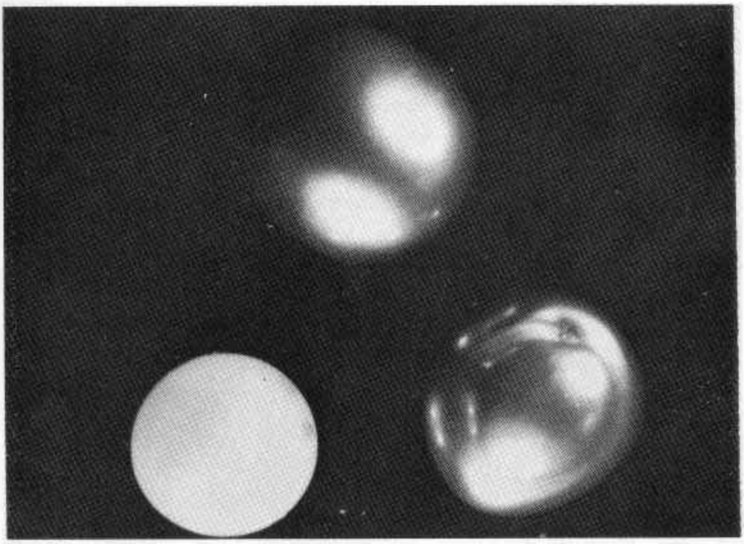


Figure 15

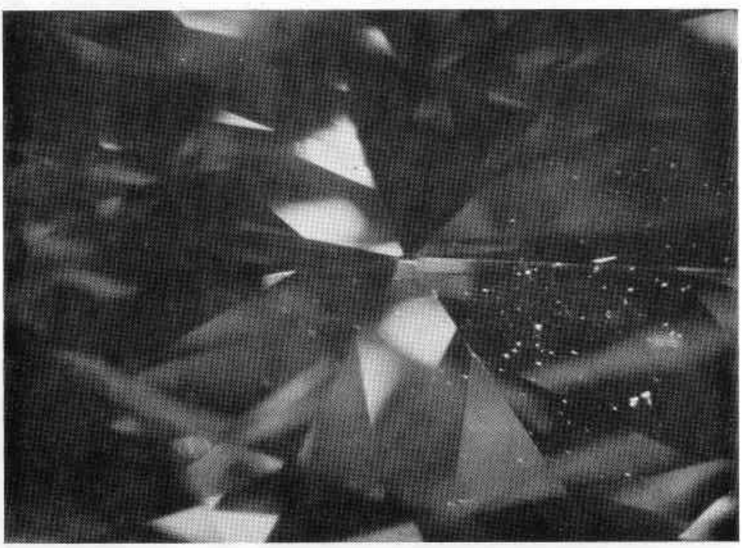


Figure 16

been subjected to cyclotron treatment is shown in *Figure 16*. It will be noted that the usual "cloverleaf" effect, or more aptly perhaps, the "umbrella" effect, caused by color concentration a short distance into the brilliant-cut diamond is not present here. Instead, two parallel lines are seen, one on each side of the keel line of the marquise.

Rounded Inclusion in Diamond

Figure 17 was taken of a .20-carat diamond given to GIA by **Ben Hammond** of B. M. Hammond, San An-

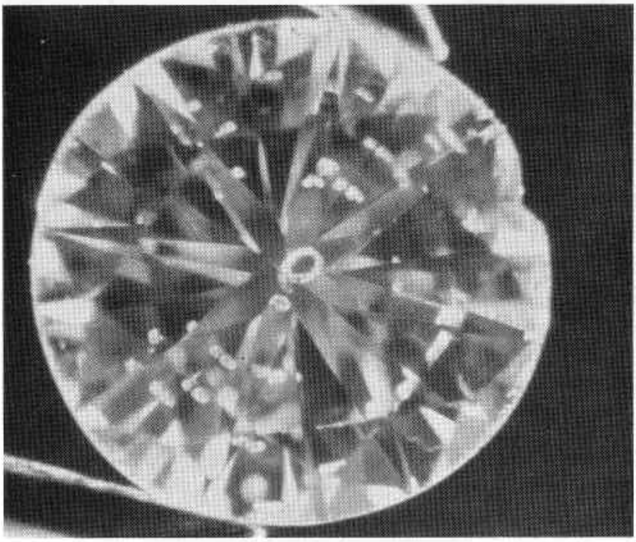


Figure 17

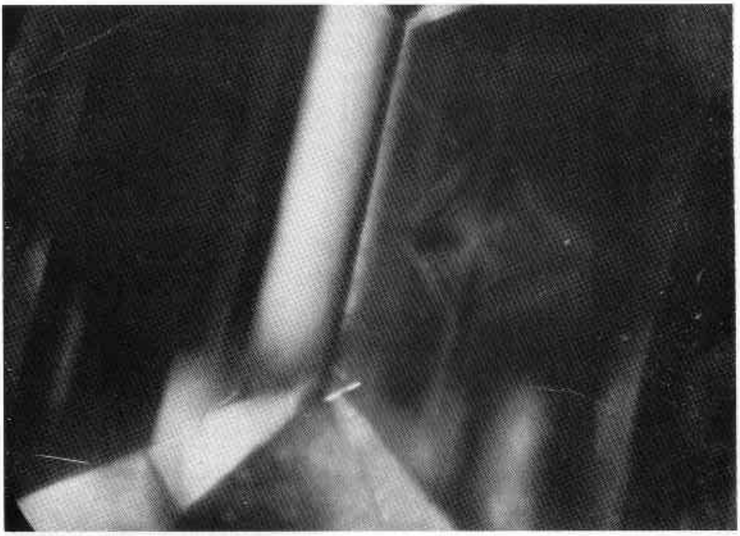


Figure 18

tonio, Texas. The oval doughnut-shaped inclusion struck his fancy—as it did ours. We appreciate the gift.

Maltese-Cross Inclusion

A maltese-cross pattern, shown by a cloudy or cottony inclusion in a diamond *(Figure 18)*, was the subject of the photograph taken by student Herb Rosenfield of Bayside, Long Island. He noted it as he was grading a 1.55-carat emerald cut.

Irradiated Topaz

Recently we heard that topaz had been irradiated probably in a nuclear reactor to change the color to a dark yellowish brown. We just had our first opportunity to examine one. The colors seen or described to us are not as attractive as the finest sherry topaz, but they are certainly saleable. Ordinarily, it would seem that they would be very difficult to distinguish from stones that had not been irradiated, but in those examined to date the initial material was blue topaz, and therefore it had the properties not of sherry topaz but of the high S. G. —low R. I. of blue or white topaz. The refractive index for the sherry-colored material is ordinarily about 1.629-1.637, and the S. G. about 3.52 or 3.53. The white or blue has indices of 1.609-1.617 and an S.G. of about 3.56 to 3.57. Thus, if a brown topaz has refractive indices in the low range and specific gravities in the high range, the color must have been artificially induced.

Acknowledgements

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

To **Ben Gordon,** student, for mixed synthetics, imitation and natural stones, including quartz, opal and peridot.

To **Lee Sparrow,** San Francisco cultured-pearl dealer, for a grossularite cabochon.

To **Karl Schwemmer,** Reading, Pennsylvania, gemologist, for a broken diamond.

To **Adolph Schauer,** student, for a .36-carat old-mine-cut diamond.

To **C. D. Parsons,** Burbank, California, cutter, for a .46-carat siderite.

To **Donald Fogg,** Albuquerque, New Mexico, gemologist, for a diamond for class use.

To student **Tim Wilson,** Covington, Louisiana, for petrified-wood and moss-agate cabochons.

To **Herb Walters,** Craftstones, Ramona, California, for a number of attractive tumbled idocrases.

To gemologist and colored-stone wholesaler **Martin Ehrmann,** for rough dioptases.

To **Mort Lippman** of Felco Pearls, for approximately 100 three-quarter cultured pearls.

Gemological Digests

Nature of the Plastic Deformation of Diamond Crystals

(The following is an abstract of a paper by A. A. Urusovskaya and Y. A. Orlov, published in the Earth Sciences Section of the Doklady Academy of Sciences, USSR, and copied from the December, 1966 edition of Mineralogical Abstracts.)

Interpretation of Laue photographs of diamond crystals with (111) planes and curved faces shows that the (110) lines on octahedral crystals and on curved faces result from the same kind of plastic deformations. The photographs reveal disoriented regions in the diamond structure due to polygonization, a process occurring at high temperature in which the dislocation in glide planes are redistributed from horizontal series into vertical partitions, which form the boundaries of the polygonization blocks. The pinkish, violet, slightly smoky and dark-brown hues of diamonds are probably due to finely dispersed inclusions of graphite formed along glide planes, as suggested by the zonal distribution of the color and the direct relation between color intensity and degree of plastic deformation.

Attempt to Revive Whitby Jet Market

According to the *Retail Jeweler,* a British jewelry-trade publication, an attempt is presently being made to revive Whitby-jet jewelry in modern designs and to destroy its Victorian image. The company that seeks to accomplish this, Whitby Jet Ltd., has no connection with the tourist trade nor with the old established jet shops in the town. Instead, they plan to sell high-quality jewelry through retailers.

Mr. William Cornforth, a director of the new company, states that the tedious hand carving of the past century will be replaced with modern, high-speed machinery, because the firm is aiming at world-wide markets, where skill and speed of production are vital. Competent jewelry designers have been engaged.

Mr. Cornforth further states that hundreds of pounds of raw jet, stockpiled since Victoria's times, have been found, and that a geologist has been employed to seek new deposits. His report is encouraging.

A market-research consultant believes there is a large potential for modern jet jewelry, and further agrees that such jewelry must come from the center of the jet industry, Whitby, long known as the source of the world's finest material.

World's Largest Star Sapphire

The prolific Mogok, Burma, area has produced what is claimed to be the world's largest star-sapphire rough. Weighing 63,000 carats (27. 783 pounds), the stone is bluish gray in color, is pyramidal in shape, and measures 6¾ inches high, 14¼ inches in circumference at the top and 27 inches at the widest place (see accompanying photograph). It is presently owned by the Myanma Export-Import Corporation, Rangoon, Burma. The company has not disclosed plans for its sale or cutting.

World's Largest Star Sapphire

Book Reviews

PRACTICAL GEMMOLOGY (Fourth Edition), by Robert Webster, FGA. Published by N.A.G. Press, Ltd., London, 1966. 209 pages. Clothbound. Illustrated with black-and-white photographs and line drawings. Price : Approximately $4.20.

In 1943, *Practical Gemmology* was first published as a concise handbook on the fundamentals of gemology. In this first edition, the chapters were referred to as "lessons," because they were originally published serially in the *Gemmologist* (a now-defunct gemological journal) under this name. In subsequent editions, including the fourth, this lesson system continues to be followed.

The present volume contains 21 chapters, covering concisely all the elements that are pertinent to a study of the science of gemology. It has been updated and revised extensively, with much added material to cover modern requirements. A new chapter has been added on the chemistry of gemstones. Little change has been made in the sections on refractive index, specific gravity and color.

A new section on luminescence and electrical effects provided a more modern approach to these subjects. More information is given on gemstone inclusions, and the newer synthetic stones are included and discussed. A better coverage is given to the various kinds of assembled stones and to the modern methods of artificially coloring diamonds. Additional information is given on lapidary techniques, and details on more of the unusual gemstones now cut and polished are provided.

To quote from the author's preface, "the book has been kept within manageable size by omitting the more intricate, scientific tests and long descriptive chapters on gems, all of which are available in other existing textbooks." Further, it is intended . . . "to complement the information and data contained in *The Gemmologist's Compendium*" (another of the author's books).

It is refreshing to see another edition of an exceptionally good text from one of the men in the world truly qualified to write on this subject with authority. From the viewpoint of knowledge and experience, Robert Webster is one of the outstanding gemologists in the world today. This fine text is one more testament to his value to our field.

MINERAL RECOGNITION, by Iris Vanders and Paul F. Kerr. Published by John Wiley & Sons, New York City, 1967. 316 pages. Clothbound. Illustrated with black-and-white photographs, line drawings and color photographs. Price: $11.95.

This book is planned to train the reader in the sight identification of minerals. With this in mind, the first portion is concerned with background information on mineralogy. The first chapter covers the history of the use of minerals and present-day uses, then crystal nucleation and growth is explained, with an emphasis on recognition factors in crystal growth. Such features as striations caused by oscillation in growth and by twinning are explained. Different kinds of aggregates and different kinds of oddly shaped crystals are discussed, as well as the effect on appearance of different growth rates on different faces.

Throughout the book, the subjects given the greatest attention are those that affect the appearance of minerals, and the features that characterize the various species. In addition, crystal chemistry is covered to the point of explaining kinds of bonding and structures. Symmetry is discussed and related to surface features, and crystal recognition is very well handled. Approximately the first 100 pages are devoted to background information, and the last 200 pages, approximately, are devoted to mineral-identification tables and descriptions.

Throughout the book, excellent illustrations help to clarify the text. There are 289 photographs printed in color; they are good choices of specimens and nicely reproduced.

In our opinion, *Mineral Recognition* is a worthwhile addition to any gemological library.

PRODUKTIONS UND HANDELSGESCHICHTE DES DIAMANTEN, by Dr. Godehard Lenzen. Published by Duncker & Humblot, Berlin, Germany, 1966. 280 pages. Clothbound. Illustrated with black-and-white photographs and line drawings. Price: 48 Deutsche Marks.

This new book, received from West Germany and written by GIA Gemologist Dr. Godehard Lenzen, covers in German the production and trade in diamonds, starting with the earliest knowledge of the gem in the Western World. The author discusses diamond as a mineral and a gemstone, with an historical review of its value, and then he describes the various sources of diamonds from the earliest days.

He covers India in detail, including sources, production in ancient times, trade and prices. Similar statistics are quoted for the Middle Ages and up to relatively recent times. He considers Brazil, its production of rough, and its diamond trade from 1725 to 1870.

The Brazilian study is followed by an analysis of African production, starting in the late 19th century and continuing to the present. Lenzen reviews the sources of rough diamonds in the Union of South Africa, and the influence of this production on prices in the early days. He also gives facts on methods of recovery, structure of the diamond market, and further information on the foundation of the Diamond Corporation and the Diamond Producers' Association.

The book should be of interest to those who are able to read German.