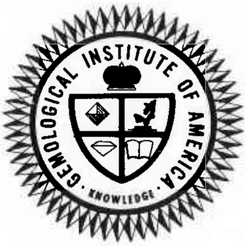
Gems & Gemology

WINTER, 1972-73



RICHARD T. LIDDICOAT, JR.
Editor

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WINTER, 1972-73

IN THIS ISSUE

SPECTROSCOPE: An Indicator of Variation

by B.W. Anderson

(Substance of a talk given at the XIVth International Gemmological Conference in Vitznau, Swizerland – September, 1972.)

As my contribution to this year's Conference, I've collected some more facts and thoughts on a theme that has fascinated me for years: those instances in which very slight changes in gemstones' structures are signalled by marked changes in their absorption or fluorescence spectra.

Scientifically speaking, such cases are significant because of the challenge to provide a rational explanation through the conventional means of crystal analysis, such as X-ray diffraction. On a more practical level, the effects themselves, although not understood, may provide a valuable means of discriminating between natural and synthetic gem materials, natural and treated, etc.

Zircon

Before discussing the more mysterious phenomena of this kind, however, it might be of interest to talk about the latest findings in the zircon problem – where structure variations are very clearly advertised by parallel alterations in absorption spectra.

The mysterious zircon has been the subject of investigation for more than a century. Five members, past and present, of this Conference, have consequently made considerable contributions in the zircon field. They include Professor Eppler (1), whose doctorate thesis was based on a study of zircon behavior, and Professor Chudoba (2), whose X-ray work with Stackelberg, led to our first real understanding of metamict zircon.

Also contributing significantly is Dr. Zwaan, who published an interesting description of one of the rare anomalous low zircons; Dr. Edward Gubelin, who carried out with Dr. Eppler a series of controlled heating experiments, and finally, myself (3), whose investigations on the subject have been – to use a Dickensian phrase – "extensive and peculiar."

Most of the problems with zircons have concerned Ceylon stones in particular. Before the Indo-China fields were discovered, Ceylon was virtually the only source of gem-quality zircons.

The lattice breakdown in Ceylon zircons, first reported by Chudoba, is now known to be caused by uranium, present in isomorphous replacement. The maximum uranium content measured amounts to 6500 parts per million, or 0.65 percent. Those used in the recent experiments of Vance and Anderson (4a) contained from 0.55 to 0.57 percent.

The thorium content, incidentally, was only 100 parts per million. It has been calculated that 160 MeV of kinetic energy is liberated in each fission event of U^{235} and U^{238}, and since this internal bombardment has been continuing for 570 million years, it is hardly surprising that the original tetragonal crystal lattice has become severely damaged.

The extent of the damage in any zircon on its long journey from normal, or high, towards the completely metamict state can conveniently be assessed by its density, sliding from a top figure of 4.7 to 3.95 in the process, or by X-ray diffraction. But we are concerned now in particular with the degradation signs evident from the absorption spectra of the zircons involved. To the discerning eye, these are quite clear.

Starting at the top end, Burma zircons—probably no richer in uranium than those from Ceylon—are not only stronger and more numerous, but are also noticeably sharper defined than even the "best preserved" Ceylon zircons. The density drop, however, may be only from 4.66 to 4.64.

Proceeding down the scale, the bands deteriorate more and more, until the stones are almost invariably green (the "metamict" color), showing merely smudged bands in the orange-red, near where the famous 6535 line appears in strength in normal zircon. The density of such stones is always near the 4.0 mark.

In this lower region, however, there are certain anomalous specimens of two types, including green or sometimes orange stones with a simple refractive index near 1.82 and 3.98 density. It shows, in addition to the vague broad band centered at 6560, a fairly narrow and marked band at 5200, not seen in any other kind of zircon.

The other kind includes green stones showing a powerful series of bands very similar in general appearance to those of uranium in the zircon lattice but, as we now know, this is, in fact, a sign that the uranium is now inhabiting a crystal lattice of zirconium oxide in its cubic modification.

My own discovery in 1962 – one of the most pleasurable and surprising of my life – showed that not only type "a" above, but any metamict zircon with an under 4.05 density, when heated for some hours at 800°–1000° C., developed the strong anomalous spectrum. By an extraordinary coincidence, the very first zircon in which C.J. Payne and I observed absorption bands, happened to be of this rare "anomalous" kind.

We accepted the bands for a long time as merely a variation in the zircon spectrum, and the stone was sent to Professor Chudoba to help him in his studies. On hindsight, it's interesting to study his 1936 paper, in which he remarks that whereas most of the low zircons appeared to be an amorphous mixture of $Zr0_2$ and $Si0_2$, this particular stone "provided evidence of the presence of a cubic modification of the oxide $Zr0_2$.

At the time, the connection between this newly developed $Zr0_2$ structure and the handsome, anomalous spectrum was not realized. Recently, however, both Claringbull (unpublished) and Vance (4b) have proved its validity, although Vance was unfortunately not able to account for the 5200 band in terms of structure.

It would seem that the few zircons found in nature showing the anomalous ZrO_2 spectrum represent very low-density zircons heated late in their geological history.

At the top of the scale, Indo-China zircons – providing practically all the blue and colorless stones used in jewelry – contain very little uranium. In fact, a Geiger counter, giving a Ceylon metamict zircon a count of over 300 per minute, gave a negative reading with typical Indo-China stones. It's not surprising, then, that the stones in the raw state show no signs of the uranium spectrum.

The heat-treated stones, however, and in particular the white zircons derived from this same rough, show invariably, in my experience, both the 6535 and 6590 absorption lines quite clearly by reflected light. A highly convenient fact for testing, this is difficult to explain theoretically since no modification would be expected in the fully crystalline zircon lattice simply from heating to 900° C.

The most probable explanation is that the heating allows the very small proportion of uranium present to take its place more regularly in the lattice, rather than being randomly scattered in the crystal. Much the same thing seems to happen with the sherry-colored topaz crystals from Ouro Preto, where heat treatment enables the trace of chromium present to enter the lattice and change the color of the crystal to pink.

It also allows a red fluorescence to appear under U.V.L. or crossed filters, revealing itself as a sharp line at 6820Å in the spectroscope.

Red Spinel

It is generally known that the beautiful "organ-pipe" group of fluorescent lines seen in natural red spinel proves not only that the stone is spinel but that it is also natural (5a). It plays an important dual role in gem testing.

In the seven or more bright lines seen in a brightly illuminated red-spinel's spectrum, the 6860Å line is noticeably stronger than its neighbors. In synthetic spinels, this is so dominant a line as to make the spectrum closely resemble the fluorescence spectrum of corundum.

In synthetic blue spinels made by the Verneuil process, where this effect was first noted by Robert Webster, it could be plausibly explained on the basis of the different stoichiometric proportions of alumina and magnesia inherent in that process. Since then, however, synthetic red spinels have to be made by other methods, including crystallization from a melt, and in these the normal $MgO.Al_2O_3$ formula may be presumed.

Yet the 6860Å line is just as pronounced. This is a clear instance of the spectroscope's sensitivity as an indicator of extremely small difference in structure – the theme of this discussion. A crystal of flux-grown synthetic red spinels was heated at 900° C. for two hours – this "annealing" treatment had no noticeable effect on the fluorescence spectrum.

Rare Earth Spectra in Apatite

Frank Hird, a former colleague, pointed out an interesting mauve-colored cut of apatite. The density, refractive indices, and typically small birefringence label its identity as a species, but its rich and startlingly clear-line spectrum labels the stone synthetic.

Natural yellow apatite ("asparagus stone") from Mexico or Spain is known to have a striking "didymium" spectrum, consisting mainly of two groups of narrow bands – one in the yellow, the other in the green – with the rare-earth ions presumably replacing the calcium in the mineral isomorphously, as they do to a lesser extent in several other calcium gemstones, including danburite and sphene (5b).

But in comparison with those in the synthetic, those rare-earth lines are diffuse and ill-defined. The explanation must lie in differences in the lattice, or in the positioning of the rare-earth ions within the lattice, causing the strikingly different spectrums.

On the assumption that by annealing the natural apatite, the neodymium ions might be able to settle more regularly in the crystal lattice and thus produce sharper bands, a yellow apatite crystal was heated for two hours at 900° C. The crystal lost most of its color and showed an increased fluorescence under ultraviolet light with a banded spectrum. The absorption bands, however, seemed no more clearly defined.

The problem then is open for suggestion and experiment. In the meantime, gemmologists can only be thankful for such small but revealing differences, adding valuable evidence for discriminating between natural and synthetic materials.

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Developments and Highlights at GIA's Lab in Los Angeles

by

RICHARD T. LIDDICOAT, JR.

Synthetic Alexandrite Finally Reaches the Market

For many years, various synthetic-crystal manufacturers have experimented with the production of synthetic-alexandrite chrysoberyl. Since most of those who produced such materials were doing so more with the aim of the production of laser crystals rather than the gem market, none became available commercially as gem substitutes. Now, a firm called Creative Crystals, Inc., in Danville, California, has produced synthetic alexandrite commercially. They are being marketed by Morris Hanauer, 607 South Hill Street, Los Angeles.

The synthetic alexandrite is being made by a flux method. As might be expected, they show characteristics associated with that form of synthesis. We were able to examine about 100 examples through the courtesy of Morris Hanauer and Mr. Patterson of Creative Crystals. In general, they were very attractive, with a strong change – the colors being more reminiscent of the Russian alexandrites than of those from Ceylon. The change was from a violetish red to a bluish green. They did not resemble the synthetic alexandritelike sapphire that has been offered so frequently as synthetic alexandrite (or even just as alexandrite).

On the whole, the properties were very similar to those of natural alexandrite. The refractive indices and specific gravities were identical to those of the natural gemstone. The refractive indices were 1.746-1.755, and the specific gravity was 3.73.

There was a tendency to have a layer of dustlike inclusions *(Figure 1)*,

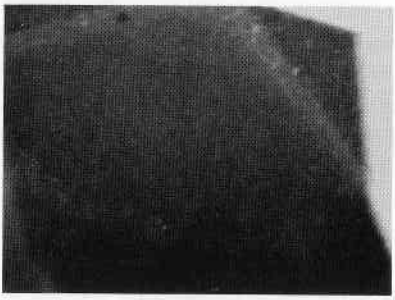

Figure 1

apparently parallel to the seed face, and a noticeable tendency for relatively strong banding. The typical veillike appearance at low magnification of either gas- or flux-filled spaces is shown in *Figure 2;* these also are frequently encountered. Typical banding, or growth lines, is shown in *Figure 3.*

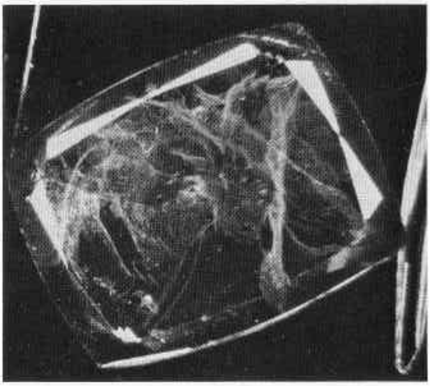

Figure 2

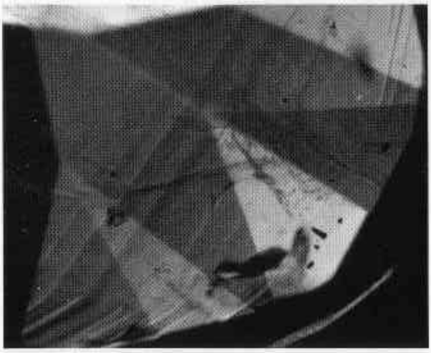

Figure 3

Some of the wisps bore a strong resemblance to fingerprint inclusions seen in natural stones; *Figure 4* is a good example. Usually, however, in some portions of the stone, rather coarse flux inclusions were evident. *Figure 5* shows veillike inclusions, some of which are natural-looking fingerprint types, but also coarse flux inclusions are shown in the lower-left portion of the photograph. *Figure 6* is dominated by coarse flux inclusions

Figure 4

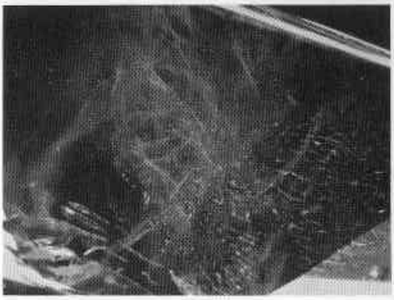

Figure 5

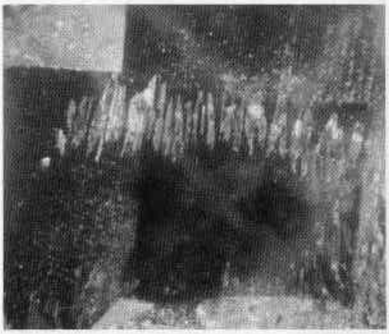

Figure 6

arranged in a parallel fashion across the center of the photograph.

The photomicrograph shown in *Figure 7* was taken in a direction that was more or less parallel to a veillike inclusion, but below it is seen a six-sided inclusion with three of the sides more developed than the other three.

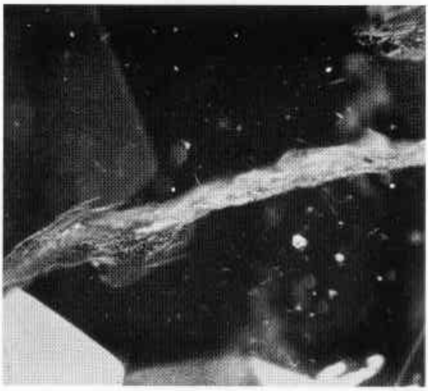

Figure 7

Hexagonal- and trapeze-shaped inclusions, usually in a thin plate form, were quite common. *Figure 8* shows the veillike pattern of inclusions that characterizes the synthetic alexandrite. *Figure 9* shows coarse flux inclusions.

We understand that this new synthetic is being offered to the retail jeweler at from $150 per carat in sizes under one carat, up to $250 a carat in sizes over two carats. Currently, it is available in sizes under three carats, but it is being anticipated that larger sizes will be available in the next several months.

It will be interesting to see how well received the first synthetic alexandrites will be.

Color Nomenclature

For the past six or more months, one of our most frequent identifications has involved East African corundum. We sometimes see dozens of stones a week that have a color that is on the ruby-sapphire borderline. The question asked is, "Is it a plum sapphire or a ruby?" Many of these stones are difficult to assess, because under red-rich incandescent light they do appear to qualify as ruby, whereas under fluorescent lights they are purple to violet in hue. There are others that are more toward the brown. Every one seems to present a new problem, because it is not quite ruby but often not quite far enough away from red to justify calling the stone a sapphire.

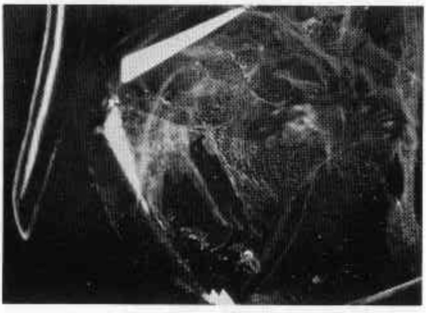

Figure 8

Figure 9

Corundum from the same Umba River locality presents another problem when it is in the orangy-brown color range. Traditionally, the term *padparadscha* was limited to the light reddish-orange stones that are typical of the Ceylon source. In the Umba River Mines, producers have been finding many orangy-brown stones that are much darker and much less appealing to the average person than the lovely Singhalese stones.

The padparadscha matter is an interesting illustration of the necessity for anyone defining terms for a dictionary or a course to make every effort to be precise, and to anticipate problems that might occur down the road.

In the gem field, perhaps the only constant is the everlasting change. The one thing that is totally dependable is that there will be new discoveries of gem materials from time to time that will be quite unlike anything that has been encountered in the past. Zoisite was certainly not regarded as of any importance in the gem field until the lovely blue variety was discovered in Tanzania. The Umba River sapphires, in those colors that border on ruby and padparadscha, are in some instances unique in the corundum deposits of the world.

The relatively new transparent grossularite, some of which are almost colorless, some medium green and some rivaling demantoid in their beauty, are certainly new in the gem firmament.

It would appear that areas such as East Africa and Pakistan, and perhaps in the future, Afghanistan, will continue to produce materials that are really quite different from anything seen before. Dark-blue beryl has been described in the past, as Mr. Crowningshield points out in this issue of *Gems & Gemology,* but certainly the market has not seen the type, except rarely in the past, of the new Brazilian finds that are such dark and richly blue stones.

Umba River Again?

In the past few weeks, we have seen some especially interesting materials and stones. We examined two rather small violetish-colored stones that we thought at first glance might be rhodolite but proved to be sapphire, probably from the Umba River or elsewhere in East Africa. They showed what appeared to be gas bubbles in the middle of larger irregular inclusions; several appeared as bright pinpoints *(Figure 10).* We found them quite unusual; in fact, we cannot recall having seen anything quite like them in the past.

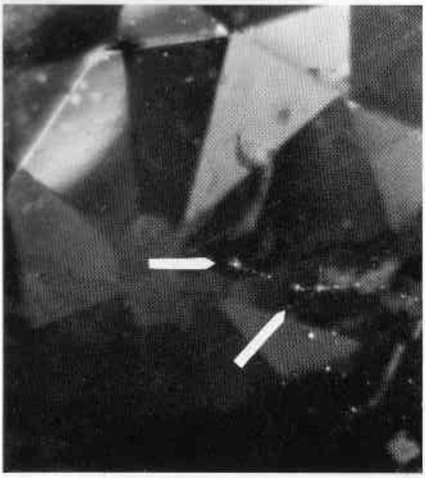

Figure 10

Banded Diamond

We received a very interesting diamond for examination, because the sender was puzzled as to what to do about a clarity grade, which was exceedingly milky to the unaided eye. Despite its milkiness, it emitted such bright flashes of dispersion that some observers compared it to strontium titanate and others to Mexican opal.

The person who sent it was also wondering what color grade should be assigned to it. When examined under 10X, no inclusions were obvious, but when it was turned to view it through the pavilion a very strong banding was observed *(Figure 11)*. An observation of this strongly banded appearance and a view of the color suggested immediately that this was a Type 2b diamond. This surmise was confirmed by the fact that the diamond was a strong conductor of electricity when checked on the conductometer. The clarity grade that we felt was correct for so cloudy and nontransparent a diamond would have to be in the imperfect category, and we felt I_2 was a proper designation.

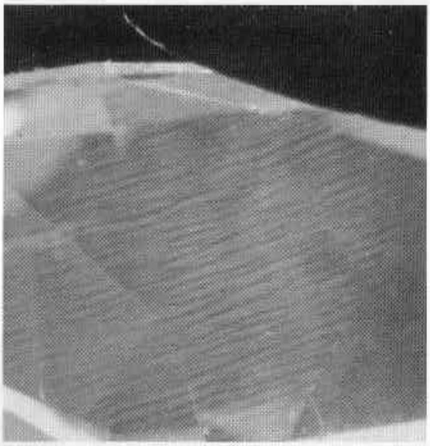

Figure 11

Since the cloudiness of this diamond greatly reduced its value, there is some question about whether it could not have been used more profitably for industrial purposes. Cut into many small pieces, the rough crystal from which the almost two-carat stone had been cut would have had great value in industry.

Type 2b diamonds are in great demand in industry and command premium prices, because they do conduct electricity. It is interesting to note that diamonds are in demand in the miniaturized electronics field, because they are so exceptionally heat conductive. They make excellent heat sinks, to avoid heat buildup in miniaturized circuits. It is not widely known that diamond is four times as heat conductive as copper, which is usually regarded as the best heat conductor.

We would be very interested to find out what would happen if this diamond were subjected to treatment in a nuclear reactor. We once saw a most magnificant blue color in a cloudy diamond that had been treated in a nuclear reactor. When it was removed from the reactor, it had a rich sky-blue color unlike anything the treating people had ever seen in a natural or treated stone before. It struck us that it was possible that no Type 2b diamond would be likely to be subjected to treatment, because the color would be such that there would be no temptation to try it. This cloudy diamond might have been similar to the sky-blue one described earlier, which might also have been a Type 2b. We did not have the opportunity to test it, nor indeed did it occur to us to do so at the time the beautiful blue stone was observed.

Diamond Doublets

The diamond doublet is mentioned frequently as a diamond substitute, but is exceedingly rarely encountered. Recently, we tested a large, hollow gold bracelet with seven bezel-set diamonds, most of which were oval in shape. The large diameter ranged from 7.9 to 10.3 mm.

At first glance, the colorless stones might have been synthetic white spinel, zircon or even white sapphire. The cutting was more oval old-mine cutting than brilliant. They did not exhibit much in the way of brilliancy, but they did show some fire. Two of them are shown in *Figure 12,* in which some details are barely noted near the culet in the right-hand stone.

The largest stone is considerably magnified in *Figure 13,* to show Newton rings and other evidences of separation between the diamond and substitute. The pavilion portion of each of the doublets was doubly refracting, and one appeared to show the bull's-eye uniaxial figure that would be expected from rock-crystal quartz. This might have accounted for the lack of brilliancy in the stones.

Figure 12

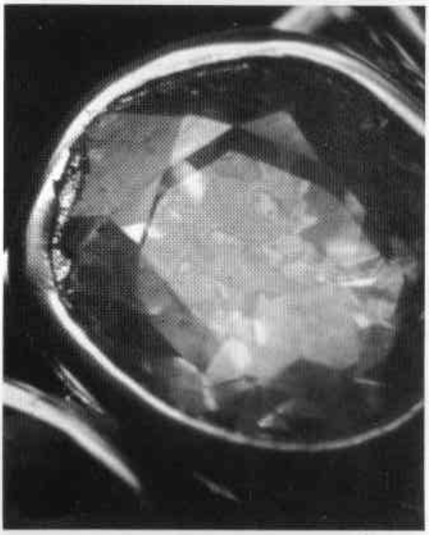

Figure 13

Probably the reason for the infrequency with which diamond doublets are encountered is that in almost every case the temptation to cut such a stone is the result of having a macle, or flat, with a large spread and no depth. It is therefore tempting to put a pavilion on what would appear to be a crown of a very large diamond. There is no temptation in the opposite direction, apparently; that is, to cut a pavilion of a diamond. The latter would be much more effective as a diamond substitute than a diamond crown. In addition, considering the poor appearance of the product, the expense of cutting such a diamond top in relation to the value of the finished product militates against use of the rough in this fashion.

Over the years we have seen many more bezel-set diamond crowns with only metal-reflector backs in a closed setting to simulate a pavilion than actual diamond doublets. Thus, to see a bracelet containing seven diamond doublets was indeed a rare occurrence.

Glass Cat's-Eye

A jeweler brought in a white cat's-eye for identification. As may be seen in *Figure 14*, the stone had a very strong eye that showed a milk-and-honey effect. It had a rather pleasing appearance. The jeweler thought perhaps it was a feldspar or a quartz cat's-eye, but on testing it proved to be glass. Most of the glass with a chatoyant effect that we have encountered in the past has had a fairly coarse eye. The tubes in this imitation were numerous and fine, so the cat's-eye effect was quite effectively imitated.

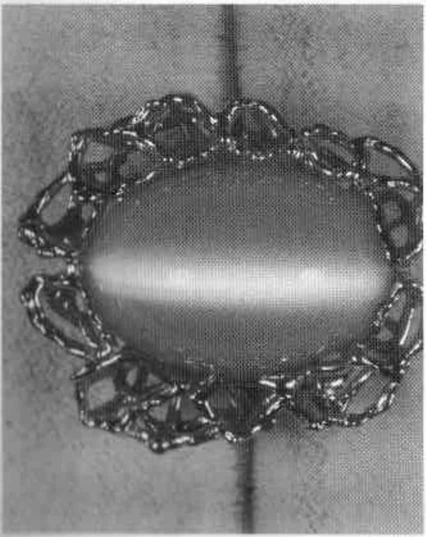

Figure 14

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Acknowledgments

Our sincere thanks for the following gifts:

Twelve small diamonds came from **Mark Schoenemann**, Gemcraft Jewelers, Chicago, Illinois.

Glenn Vargas, gem and mineral dealer of Thermal, California, gave us a large number of unusual gem materials for rare gem test sets.

Edgar Borgatta, Ph.D., of Gempro, Rutland, Vermont, also gave us a large number of rare gem rough plus many variscite cabs.

Ben Gordon, of Gordon's, Houston, Texas, provided us with many miscellaneous natural and synthetic stones.

Recent resident graduate, **Thomas Miller**, contributed a number of unusual specimens for our display cases, notably a pink smithsonite from Mexico.

From **Norm Cautin** we received a good assortment of cut stones.

Graduate **Arnold Baron** of Billings, Montana, sent a number of pieces of jade rough.

We received a quartz crystal and chalcedony from **Switzer's School** in Manhattan Beach, California.

From **Marvin Hime & Co.**, Beverly Hills, California, came three Lechleitner synthetic emerald-coated beryls.

Harry Levitch of Memphis, Tennessee, sent a broken opal, an opal doublet, a labradorite, a black sapphire, and three synthetic corundums.

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DIAMONDS OUST BEEF AS BOTSWANA'S REVENUE-EARNER

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"The opening of Orapa mine is a major achievement in the history of our nation," said the President of Botswana, Sir Seretse Khama, when he officially opened Orapa diamond mine. "Orapa is the first really significant mining project to be established in Botswana, and it constitutes a most important step forward in the diversification of our economy, ending our hitherto total dependence on beef as our biggest revenue earner and export commodity."

Sir Seretse expressed to all who were involved in this tremendous exercise, the appreciation of the Government and people of Botswana for the energy and skill expended in pursuit of the project. "I want to say also how pleased I am that the Government and De Beers have, despite occasional differences, succeeded in establishing a frank and friendly basis for our negotiations over the establishment of the mine and the taxation and marketing arrangements. I am confident that the same spirit of cooperation will continue to be a feature of our working relationship.

"Now that the problems of exploration and of the establishment of the mine have been overcome, it is all too easy to assume that we can simply sit back and enjoy the numerous benefits that this project will bring us. After the long years of hard work, uncertainty and rising expectations that preceded the discovery and ultimate establishment of this mine, it is very tempting to adopt such an attitude about its future. Some of us may find it difficult, perhaps understandably so, to admit that after such a dramatic breakthrough, there could be any more thorny problems ahead. But there are.

"It is very important also to train local people in the various skills required to run modern industries," said the President. "We would like to see citizens of Botswana involved at every level in the running of the various industries now being set up in our country. Botswana industries cannot and must not forever depend on expatriates to do all their skilled work and only employ local people for unskilled work. I am well aware of and very much appreciate the personal concern of the Chairman of De Beers and the Anglo American Corporation, Mr. Harry Oppenheimer, that people should be employed strictly according to merit, and that once employed their scope for advancement should be limited only by ability.

"We regret that it has so far not been possible, for obvious reasons, for

Mr. Oppenheimer to implement his enlightened ideals in his own country. I know that he takes comfort in the fact that he has here, next door, in Botswana, ample opportunity to put these ideals into practice. De Beers is already doing much to train local people for skilled jobs in the mining industry."

Speaking again of the mining project, the President added: "The achievement that we can see around is breathtaking. I have been advised that Orapa is the finest planned diamond mine in the world and I can well believe it. We must all now work together to establish a reputation for Orapa as the most efficient and harmonious mine in Africa."

"The starting point for rapid economic progress in Africa has typically been a great mineral discovery, and in this respect the new Republic of Botswana has certainly been born under an auspicious star," Mr. Oppenheimer told the large audience at the official opening of Orapa mine.

"It must surely be unique that the attainment of independence by a new – and until now a poor – country should have coincided with mineral discoveries of the magnitude of this diamond mine and of the nickel/copper deposits of Selebi-Pikwe," he said.

The attainment of political independence was a supreme moment in the life of a nation, but the attainment of economic independence also called for a long struggle and constituted a great achievement.

The establishment of Orapa was the result of a prospecting campaign lasting no less than 12 years and costing R5 million, all of which would have been lost had a payable mine not been discovered. This surely was risk-taking on a grand scale.

"You must not think that mining finance groups such as ours are incapable of thinking beyond the profits that we hope to earn or that we are insensible of the public obligations which rest upon us," said Mr. Oppenheimer. "We aim, of course, to make profits for our shareholders – that is our plain duty – but if I may quote the words used by my father some 20 years ago: 'We aim to do so in such a way as to make a real and permanent contribution to the welfare of the countries in which we operate.' That is what we shall try to do in cooperation with the Government of Botswana."

The rare degree of official help and encouragement De Beers had received from the Government in relation to Orapa had given the group the encouragement needed to expand its activities in Botswana from diamond mining into sharing on a substantial scale in the Selebi-Pikwe project, Mr. Oppenheimer said.

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Developments and Highlights at GIA's Lab in New York

by

ROBERT CROWNINGSHIELD

Dark-Blue Aquamarine

Late in 1972 we were shown a lot of very dark-blue aquamarine weighing from about ten carats to well over 25. Most were free from inclusions and the color reminded us of Ceylon sapphire, or even tanzanite without the purple. That they were beryl was established by Chuck Fryer with X-ray diffraction. The most unusual property we noted was the absorption spectrum *(Figure 1)*. By searching the literature and writing to good friend Robert Webster in London, we learned that the so-called Maxixe beryl was reported to be very dark-blue, and the absorption spectrum, although reported to be not precisely the same, was drawn by Basil Anderson in 1934.

That the new stones may be from a different source is thus indicated, and also by the refractive indices, which are more normal for beryl than the higher indices Anderson reported. The disturbing note that Anderson records in his review of unusual absorption spectra in 1956 is that the Maxixe beryl fades on exposure to sunlight. Since the Brazilian dealer who had shown us the new stones sold all of them within a short time, it was clearly seen that we should try to determine if these stones also had this unfortunate property.

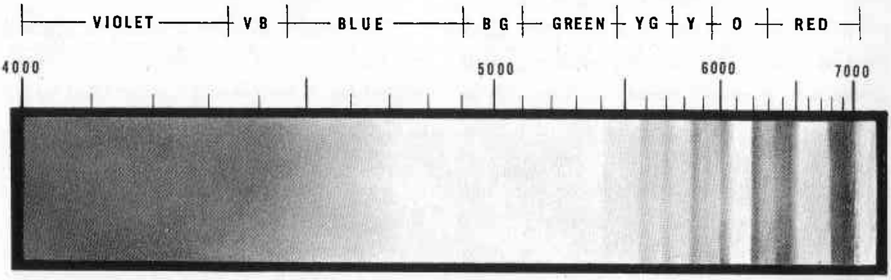

Figure 1

Early in 1973, we were allowed to examine several fine crystals of a peculiar blue-green beryl that had the same absorption spectrum seen in the dark-blue cut stones several months before. We were puzzled that such fine rough would be offered in New York City, and still more puzzled when Brazilian gem dealers we asked had never seen such rough or cut stones, at least since World War II. Could this mean that the rough may not be from Brazil, or that the stones do indeed have the property of fading?

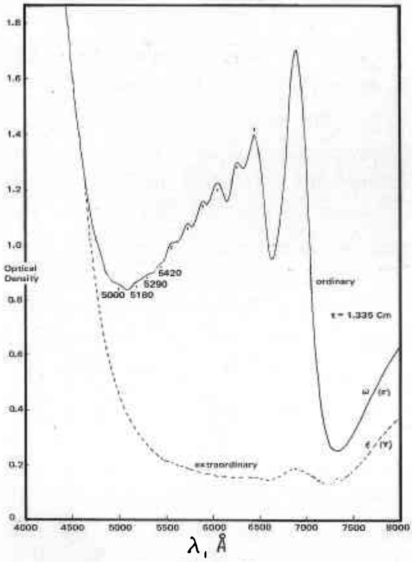

Figure 2

We enlisted the aid of Dr. Kurt Nassau, who is, at this writing, still conducting experiments in heating as well as an analysis of the crystals. *Figure 2* is an absorption spectrum of one of the crystals taken by Dr. Nassau. Note how the peaks of the ordinary-ray spectrograph coincide with the absorption bands of the drawing made with a hand-absorption spectroscope. The recording spectrometer is more sensitive than the eye using the hand instrument, since the faintest band the writer could see was at 5420 A.U. Two other observations on the cut stones we saw last year were the greenish fluorescence under short-wave ultraviolet and the red appearance under a color filter.

Carvings

For the past few months, an increasing number of carved items have been presented to the Laboratory for identification. Some were clearly labeled Peoples' Republic of China; others marked Taiwan. Many of the carvings have proved to be serpentine, green quartzite or the unnamed rock mixture containing feldspar, zoisite and serpentine. Some, however, have been nephrite.

Figure 3

One such modern carving is shown in *Figure 3.* The mottling was produced by a dark-brown stain that came off on a cotton swab moistened with fingernail-polish remover. A similarly stained animal carving had other areas that were quite translucent with a chatoyant property; it proved to be nephrite.

Figure 4 is a translucent, green, chatoyant stone purchased as a "jade cat's-eye." We immediately thought of the chatoyant areas we had seen in the carving. However, our tests, and later X-ray diffraction by Chuck Fryer, indicated the mineral actinolite. Although nephrite is a member of the tremolite-actinolite series of minerals, we have never encountered nephrite with the absorption spectrum shown in *Figure 5.* It is evidenced by both the unknown cat's-eye and the crystal of actinolite shown beside it in *Figure 4.* Of course, the mystique of the term jade is a great incentive to have the stone called jade. We were unable with the magnification available to determine the cause of the chatoyancy.

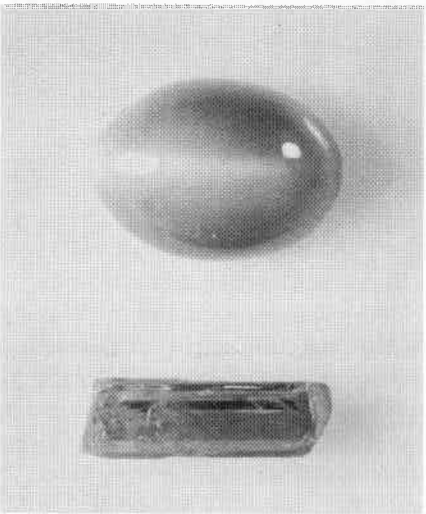

Figure 4

Chrysoberyl Cat's-Eye

A reader who owns a chrysoberyl cat's-eye submitted it to the Laboratory because it appeared to be a doublet, and one such stone was reported by the Los Angeles Lab some years ago. *Figure 6* illustrates the clear area just above the girdle of the stone. The plane separating the clear and silky areas is a very flat fingerprint that covers the entire plane at this level. The black arrow in the photograph indicates a zone of silk that traverses both sections, proving that the stone is indeed one piece.

Figure 6

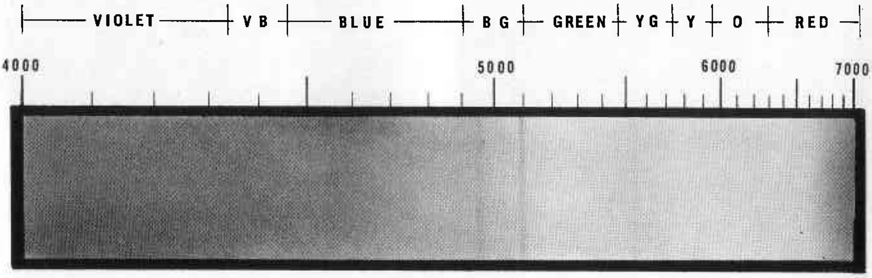

Figure 5

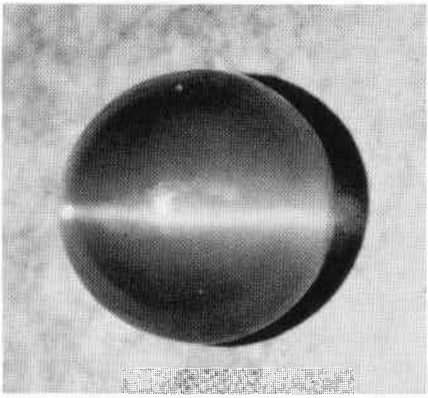

Figure 7

Apatite Cat's-Eye

Figure 7 shows a beautiful cat's-eye apatite weighing more than 40 carats. It was purchased at a customshouse auction without a close examination by the purchaser. From the six-foot limit at which prospective buyers were kept, it certainly looked desirable,

The disappointed owner decided to put it into a ring, despite being warned of the fragility of the mineral. The setter succeeded in hammering the stone into a man's gypsy ring, but the slight temperature change occasioned in cleaning up after polishing the gold caused the fracture shown in *Figure 8.*

Probably no other mineral with any pretense of a gem is as heat sensitive as apatite. In addition, it is extremely brittle, as well as being #5 on Mohs' hardness scale.

Deep Laser Hole

Until now we were given to understand that the limit of penetration of a laser beam in treating a diamond was approximately 2mm. We were therefore quite surprised to see a 6-carat pear-shaped diamond in which a laser hole perpendicular to the table, and originating on the table, penetrated nearly 4 mm. to reach an inclusion that lay nearly against a back facet.

Obviously, the reason for making such a long drill hole was to prevent a reflection from spoiling the appearance of the stone. As it is, one is not aware of the hole until he views the stone from the side *(Figure 9).*

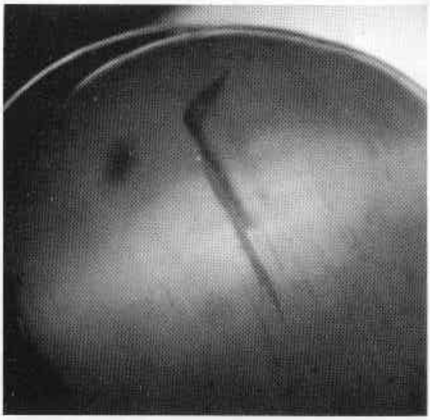

Figure 8

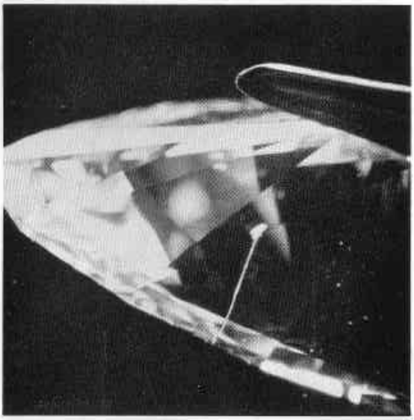

Figure 9

Botryoidal Diamond

Another surprise in the diamond field is shown in *Figure 10.* It is a photograph of a rough diamond with areas that appear botryoidal, something like the form of prehnite – or some goldfish!

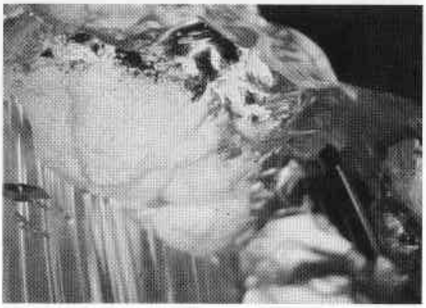

Figure 10

Fingerprint Inclusions in Synthetic Ruby

Occasionally, we encounter an inclusion in a stone that belies completely its nature. For instance, in *Figure 11* is shown a perfectly good fingerprint inclusion in a Verneuil synthetic ruby.

Figure 11

Hardness of Strontium Titanate

Figure 12 illustrates the result of rubbing the table of a strontium-titanate brilliant, which is presumably #5 on Mohs' scale, on a hard plastic workcounter with a common kitchen cleanser. We have found that a sliver of apatite will scratch stontium titanate in some directions but not all, and still feel that the hardness of the material is fairly expressed as 5-6.

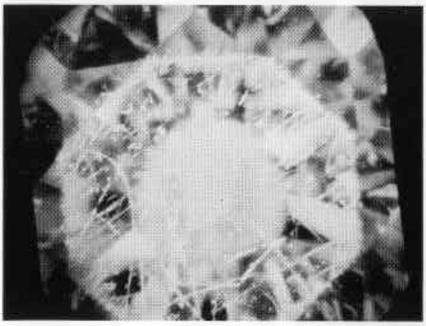

Figure 12

THANK YOU

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

*To **Murray Darvik,** I. Morgenstein, Inc., New York City, for a round brilliant YAG with some of the most intriguing inclusions we have ever seen, in either natural or synthetic material.

Figure 13 does not do justice to what seems to be a host of tiny crystals with identically arranged fingerprint inclusions that look like gossamer insect wings. Certainly, the inclusions do not suggest a synthetic stone.

*To **Marvin Zuckerman,** G.G., of Jewelmetics, Inc., Cedarhurst, N.Y., for a gift of various amber products. Marvin visited one of the largest amber works in Germany and learned firsthand about "the stone that burns." Pressed amber is a product of the firm that tests for it by using ether. The pressed product softens, whereas block amber does not.

Another test is shown in *Figures 14* and *15. Figure 14* shows two specimens from Marvin. The larger is pressed; the other is a freshly carved block. Under the polariscope, the pressed piece behaved as a doubly refractive aggregate, whereas the block shows the normal strain pattern that one would expect in amber.

Figure 13

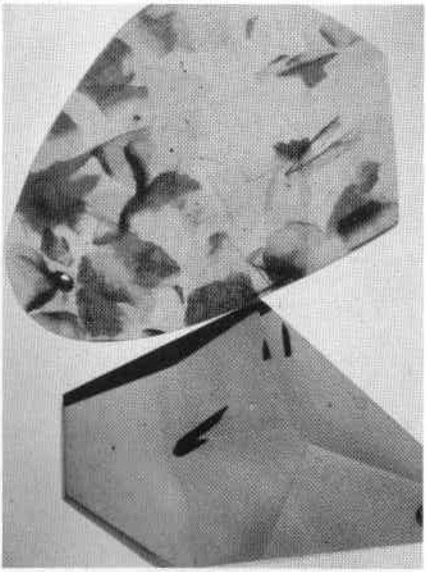

Figure 14

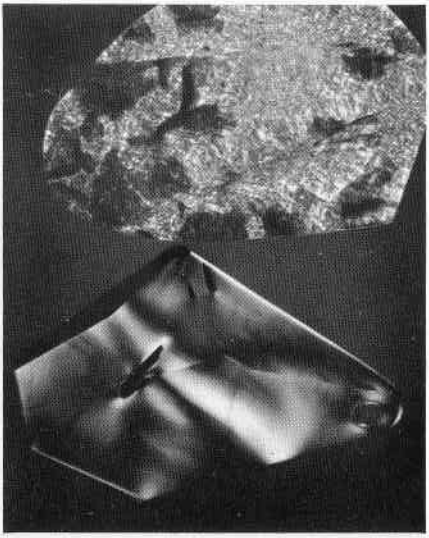

Figure 15

*To **Allen Ward**, News Editor, Jewelers' Circular-Keystone, from whom we received a beautifully cut, colorless, round brilliant of the orthorhombic yttrium aluminate. This stone seemed to have been cut to minimize the double refraction, which has been reported to be .017 (R.I., 1.938-1.955). Viewed slightly from the side, the doubling of the back facets is quite apparent *(Figure 16)*.

Figure 16

*To **Wilford Rose**, G.G., of Dover, Massachusetts, for a display for each office, in which black-treated opal is explained. It has been his observation that the kind of whitish material that takes the sugar/sulphuric-acid treatment best is one in which the opal is distributed in a kaolin matrix. The kaolin takes up the sugar and turns black after heating with sulphuric acid, thus providing a trap for stray light and allowing the play of color in the opal areas to become visible. *Figures 17* and *18* show a specimen that was sawed in two, one part treated and then cemented back together. Included in the display is a specimen of untreated oolitic opal.

*To student **Maurice Shire**, Sandawana Emeralds, Ltd., New York City, for a set of colored inclusion slides produced by the *Association Francaise de Gemmologie* in France. The great emphasis on inclusion study given by that Association showed to good effect in this project.

*To diamond cutter **Sam Horowitz,** New York City, for a cabochon of green YAG, a surprising and not unattractive use of this material.

*To **Stanley Marcus,** G.G., of Marcus Jewelers, Rutherford, New Jersey, for a 4-rayed light-orange moonstone.

*To manufacturing jeweler **Kurt Wayne,** New York City, for a greatly appreciated gift of rubies, sapphires and diamonds.

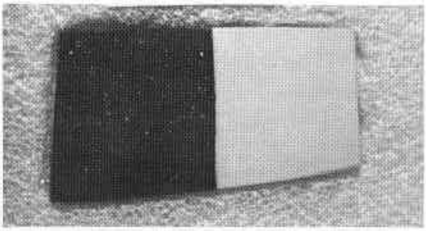

Figure 17

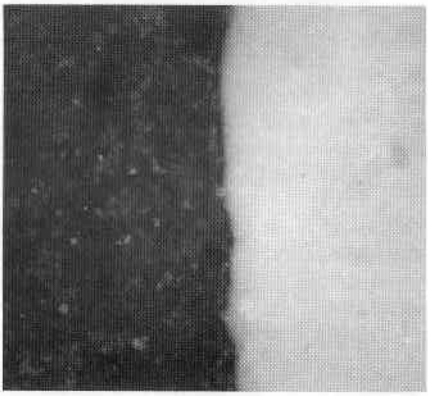

Figure 18

THE DERIVATION OF GEM NAMES

by L.L. Copeland

Having an understanding of etymologies, or derivations of gemstone names is not necessary for a person to be a competent gemologist, but it can make his knowledge of species and varieties more interesting and well rounded.

Although a few contemporary gemological texts include derivations, none carries a separate listing that permits one to read about these intriguing word origins with ease and convenience; hence,the following compilation.

This includes all of the better-known gemstones, as well as many of the lesser-known gem materials and rare collector's items for which etymologies are known. Some gems, such as sunstone, do not have a derivation given, because their names are self-explanatory.

achroite (a variety of tourmaline). From the Greek *achroos,* meaning *without color,* in allusion to its colorless crystals.

actinolite. From the Greek *actinos,* meaning *ray,* because of the radial habit of prismatic crystals.

adularia (orthoclase moonstone). After the Adula Mountains, a group of mountains in the Swiss Alps, an early source of moonstone.

agalmatolite. From the Greek *agalmatos,* meaning *image,* because of its long usage by the Chinese for carving purposes.

agaphite (a variety of Persian turquois). After a Demetrios Agaphi, who examined the Persian deposits in 1806.

agate. Through the Latin from the Greek *achates,* the name of a river in southwestern Sicily (the modern Drillo River), where the material was first found in quantity in the time of Theophratus, the Greek philosopher (372 B.C.-287 B.C.).

alabaster (a variety of gypsum). From the Latin, which was adapted from the Greek *alabastros,* said to have been derived from the name of a town in Egypt.

alalite (a variety of diopside). After the Ala Valley, Italian Tyrol, where it has been found.

albite (a species of the feldspar group). From the Latin *albus,* meaning *white,* in allusion to its common color.

alexandrite (a variety of chrysoberyl). From its supposed discovery on the 21st birthday of Count Alexander Nicolaivich, Crown Prince of Russia (later Czar Alexander II), in 1830.

algodonite. After the Algodones Mine, Chile, one of its sources.

allanite. After mineralogist T. Allan, who distinguished it as a species.

almandite (a species of the garnet group). Originally, from the Latin *alabandicus,* a name given to garnets found in ancient times in Alabanda, a town in Asia Minor.

almashite (a variety of amber). After the Alamash Valley, Moldavia, Rumania, where it is found.

amatrice (Utah variscite). A contraction of *American matrix,* sometimes spelled *amatrix.*

amazonite (a variety of microcline feldspar). After the Amazon River, South America, although none is found there.

amber. Through the French from the Late Latin *ambar,* which is derived from the Arabic *anbar.* The Greek word for it was *elektron,* because it produces a negative charge of electricity when rubbed. The German name for amber is *Bernstein,* derived from the Low German *bernen* (to burn), so called because it burns readily.

amblygonite. From the Green *amblys* (obtuse) and *gonia* (angle), in allusion to its obtuse angle of cleavage.

amethyst (a variety of quartz). From the Greek *amethystos,* meaning *not to intoxicate,* because the ancients believed it had the power to prevent drunkenness.

analcite. From the Greek *analkes,* meaning *weak;* by friction, it develops a weak charge of electricity.

anatase. From the Latin word for *extension,* meaning that its bi-pyramidal habit in the tetragonal system gives its crystals the appearance of an octahedron with one axis extended.

andalusite. From the Spanish province of Andalusia, where it was first found.

andradite (a species of the garnet group). After J.B. d'Andrada, a Portuguese mineralogist, who made a study of garnet early in the 19th century.

anglesite. After the Isle of Anglesea, Wales, where it was first found.

anhydrite. From the Greek *anhydros,* meaning *waterless,* because of the lack of water in its composition.

anorthite. From the Greek *an* (not) and *orthos* upright, in allusion to its oblique crystals.

anthophyllite. From the Latin *anthophyllum,* meaning *clove,* in allusion to its common clove-brown color.

antigorite (a variety of serpentine). After the Antigorio Valley, Piedmont, Italy, where it is found.

apatite. From the Greek *apate,* meaning *deceit,* because some of the crystals resemble those of other minerals.

aphrizite (a variety of tourmaline). From the Greek *aphrizein,* meaning *to foam,* because it produces a gray froth when heated.

apophyllite. From the Greek *apos* (off) and *phyllon* (leaf), because it exfoliates when heated before the blowpipe.

aquamarine (a variety of beryl). From the Latin *aqua* and *marine,* meaning *sea water,* in allusion to its color.

aragonite. After Aragon Province, Spain, one of the classic localities.

arendalite (a variety of epidote). After Arendal, Norway, where it is found.

argillite. From the Greek *argillos* (clay) and *lite* (rock), because of its claylike nature.

aschentrekker. The Dutch word for tourmaline, meaning *ash drawer,* referring to the gem's capacity for attracting ashes as it cools.

Ashover spar (a variety of fluorite). After the Ashover Quarry, Derbyshire, England, where it is found.

asparagus stone (apatite). From its yellowish-green color.

astridite (a mixture of jadeite, picotite, opal, quartz and limonite). After Queen Astrid of Belgium.

augelite. From the Greek *auge,* meaning *brightness,* in allusion to the usual transparent, colorless crystals.

australite (a tektite). After its occurrence in Australia.

aventurine (quartz and feldspar). The name aventurine was applied to these two mineral varieties *after* the discovery of the imitation goldstone by the accidental mixing of copper filings and molten glass in a Venetian glass factory. The Italian word used for this new material, *avventura* (meaning *chance* or *accident*) eventually evolved to the present spelling and came to be applied to the quartz and feldspar varieties that exhibit aventurescence.

axe stone (nephrite). Because of its use for axes and clubs by the Maori natives of New Zealand.

axinite. From the Greek *axine,* meaning *axe,* in allusion to its axelike or wedge-shaped crystals.

azurite. From the word *azure,* meaning *blue,* in allusion to the mineral's color.

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barite. From the Greek *barys,* meaning *heavy,* in allusion to its high specific gravity.

basanite. From the Greek *basanos,* meaning *touchstone;* of Oriental origin.

bastite (bronzite). After Baste in the Harz Mountains, Germany, the original source of the material.

beekite (silicified coral). After a Dr. Beek of Bristol, England.

benitoite. After San Benito Co., California, the only known source of the mineral.

beryl. From the ancient Greek *beryllos,* referring to any green stone. Later, it came to be applied to beryl only.

beryllonite. From the beryllium in its composition.

billitonite (a tektite). From its occurrence on Belitung (formerly Billiton) Island, Java Sea, Indonesia.

binghamite (a silky variety of quartz). After William J. Bingham of St. Paul, Minnesota, who discovered it in 1936.

blackmorite (hyalite). From its occurrence on the summit of Mt. Blackmore, Gallatin Co., Montana.

bonamite (smithsonite). A coined name derived from the two French words *bon* and *ami,* meaning *good friends.*

boracite. For the borate in its composition.

bowenite (a variety of serpentine). After mineralogist George T. Bowen.

brazilianite. After the country of Brazil, where it was first found.

briethauptite. After J.A.F. Briethaupt, German mineralogist.

bronzite (a variety of enstatite). After its bronzelike appearance.

brookite. After H.J. Brooke, English mineralogist.

burmite (a variety of amber). After the country of Burma, where it is found.

burnite (a mixture of cuprite, malachite and azurite). After a Frank Burnham, who discovered it in 1952.

bytownite. After Bytown (now Ottawa), Canada, where it was first found.

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cachalong (common opal). Adapted from the Tartar word *kaschtschilon,* meaning *beautiful stone.*

cacoxenite. From the Greek *caco* and *xenos,* meaning *bad guest,* because the phosphorous content injures the quality of the iron from the limonite ore in which the mineral occurs.

cairngorm (a variety of quartz). After the Cairngorm Mountains, Scotland, one of the classic sources.

calcite. From the Latin *calyx,* meaning *lime;* originally from the Greek *chalx,* meaning *burnt lime.*

californite (a variety of idocrase). After its occurrence in California.

callainite (closely related to variscite). From the ancient Greek word *kalais,* of obscure origin.

cancrinite. After a Count Cancrin, Minister of Finance in Imperial Russia, where it was originally discovered.

carbuncle (a cabochon-cut red garnet). From the Latin *carbunculus,* meaning *little spark.* In ancient times, all glowing red gems were referred to by this name.

carnelian (chalcedony). Cornelian, the original but now obsolete spelling, comes from the Old Latin word *cornum,* meaning *cornel berry* or *cornelian cherry.* The newer spelling came into existence during the 15th century, as a result of the mistaken belief that it originated from the Latin word *carneolus,* after *carnem,* meaning *flesh.*

cassiterite. From the Greek *kassiteros,* meaning *tin,* because it is the principal ore of tin.

catalinite (variegated jasper). After Santa Catalina Island, Southern California, where it is found.

catapleite. From the Greek *kata* (with) and *pleion* (more), because it is found with other rare minerals.

catlinite (pipestone). After George Catlin, the eminent American artist, who found it being used by the Indians of the Great Lakes region in 1836.

celestite. From the Latin *caelestis,* meaning *of the sky,* because of the typical blue color of some specimens.

cerulene (a variety of calcite). From the Latin *caeruleus,* meaning *sky blue,* referring to one of its usual hues.

cerussite. From the Latin *cerussa,* for *ceruse,* a white-lead pigment.

ceylonite (a variety of spinel). After the country of Ceylon, where it is found.

chalcedony (quartz). Thought to be derived from *Chalcedon,* a seaport in Asia Minor near Byzantium, and a probable early source. The Greek word is *chalkedon;* Latin, *chalcedonius.*

chalcocite. From the Greek *chalkos,* meaning *copper,* because of the copper in its composition.

chameleonite (alexandrite tourmaline). After the chameleon, a lizard that has the ability to change its skin coloration depending on mood and surroundings.

chemawinite (a fossil resin). From the Indian name of a Hudson's Bay trading post.

chessylite (azurite). After Chessy, France, one of the notable localities for the mineral.

chiastolite (a variety of andalusite). From the Greek *chiastos,* meaning *arranged diagonally,* because of the crosslike patterns of carbonaceous inclusions of crystals cut crosswise.

chlorastrolite. From the Greek *chlor* and *astro,* meaning *green star,* because of its green stellate structure.

chloromelanite (a variety of jadeite). From the Greek words *melanos* and *chloro,* meaning *black* and *green,* respectively, because of the black or dark-green color of the mineral.

chondrodite. From the Greek *chondrodes,* meaning *granular,* because the mineral often occurs in granular form in crystalline limestones.

chrysoberyl. From the Greek *chrysos* (golden) and *beryllos* (beryl), of which mineral it was once thought to be a variety.

chrysocolla. From the Greek words *chrysos* (golden) and *kolla* (glue), because it was used to solder gold. It originally referred to borax and other greenish minerals.

chrysolite (peridot). From the Greek *chrysos* (golden) and *lithos* (stone), in allusion to the color of the mineral.

chrysoprase (chalcedony). From the Greek *chrysos* (golden) and *prason* (leek), in allusion to its yellowish-green color.

chrysotile (a variety of serpentine). From the Greek *chrysos* (golden) and *tilos* (fiber), in allusion to the color and structure of the variety.

cinnabar. From the Latin *cinnabaris,* the original meaning of which is uncertain.

citrine (a variety of quartz). From the French word *citron,* meaning *lemon,* in allusion to the color of the variety.

clinozoisite (a member of the epidote group). From the Greek *klinein,* meaning *to incline* (because of the inclination of one axis), and *zoisite,* after Austrian Baron Zois von Edelstein (1747-1819).

cobaltite. From the German *Kobold,* meaning *underground spirit* or *goblin,* in allusion to the refusal of cobaltiferous ores to smelt properly.

cobaltocalcite. From the cobalt-carbonate composition.

colemanite. After William T. Coleman, the owner of the California mine where the mineral was first found.

coral. Through the Latin *corallium* from the Greek *korallion.*

cordierite (iolite). After the French geologist P.L.A. Cordier (1777-1861).

corundum. From the old Hindu word *korund,* the original significance of which is unknown.

covellite. After N. Covelli (1790-1828), an Italian mineralogist.

crocidolite. From the Greek *krokis* and *idos,* meaning *nap of woolen cloth,* apparently in allusion to its fibrous nature.

crocoite. From the Greek *krokes,* meaning *saffron,* in allusion to the color resembling the deep orange produced by saffron dye.

cuprite. From the Greek *cuprum,* meaning *copper,* because of the copper in the mineral's composition.

cymophane. From the Greek *cymo* (wave) and *phane* (to appear), in allusion to the chatoyant or girasol effect sometimes possessed by chrysoberyl.

cyprine (a variety of idocrase). From the Latin *cyprine* (Cyprus being the ancient source of copper), because of the copper content in the mineral's composition.

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danburite. After Danbury, Connecticut, where it was first found.

datolite. From the Greek *dateisthai,* meaning *to divide,* because granular aggregates crumble readily.

davidsonite (a variety of beryl). After a Professor Davidson, a Scottish mineralogist.

delatynite (a variety of amber). After Delatyn, in the Galician Carpathians.

delawarite (aventurine feldspar). After Delaware Co., Pennsylvania, a source of the mineral.

demantoid (a variety of andradite garnet). From the Dutch word *demant,* meaning *diamond,* because of the variety's outstanding dispersion, brilliance and luster.

Derbyshire spar (a massive variety of fluorite). After Derbyshire, England, its principal source.

diallage. From the Greek *diallage,* meaning *change,* alluding to its dissimilar planes of fracture.

diaspore. From the Greek *diaspora,* meaning *scattering,* referring to the violent decrepitation of crystals when heated in the flame of the blowpipe.

dichroite (iolite). From the Greek *dichroos,* meaning *two colored,* because of its strong pleochroism.

diopside. Through the French from the Greek *di* and *opsis,* meaning *double* and *appearance,* in reference to the confusing effect produced by its double refraction.

dioptase. From the Greek *dia* and *optazein,* meaning *to see through,* because its cleavage plane can be seen in the crystals.

ditroite (sodalite). After Ditro, Rumania, where it has been found.

dolomite. After Deodat de Dolomieu (1750-1801), French mineralogist.

domeykite. After I. Domeyko, a Polish mineralogist.

dravite (tourmaline). After its occurrence in the Drave district, Carinthia, Austria.

dumortierite. After the 19th-century paleontologist, Vincent Eugene Dumortier.

durangite. After Durango, Mexico, where it is found.

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egeran (a variety of vesuvianite). After its occurrence at Eger, Czechoslovakia.

eilatit or Eilat stone (azurmalachite). After its occurrence near Eilat, Israel.

ekanite. After F.L.D. Ekanayake, gem dealer of Colombo, Ceylon, who discovered it in 1953.

elaeolite (a variety of nephelite). From the Greek *elaion,* meaning *oil,* because of its greasy luster.

elbaite (tourmaline). After the Isle of Elba, Italy, where it is found.

El Doradoite (quartz). After El Dorado Co., California, where it is found.

elixirite (a variety of wonderstone). In allusion to its hot-springs origin.

emerald. From an ancient Persian word that was later translated into the Greek *smaragdos,* which evolved through such corruptions of the later Latin *smaragdus* as *esmeraude, emeraude* and *esmeralde.* The present spelling did not become a part of the English language until the 16th century.

empirite (tektite). After its occurrence near Empire, Dodge Co., Georgia.

enhydros (chalcedony containing water). From the Greek word meaning *holding water.*

enstatite. From the Greek *enstates,* meaning *adversary,* because it is infusible before the blowpipe.

epidote. From the Greek *epididonai,* meaning *to give besides*, because the base of the prism has one side longer than the other.

euclase. From the Greek *euklasis* meaning *good cleavage,* because of its one direction of highly developed cleavage.

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feldspar. From the older German *feldspath* (now *feldspat*), which meant *fieldspar. Spar,* which comes from the Anglo-Saxon *spaeth,* means any easily cleavable mineral, such as calcite, fluorite or feldspar.

fluorite. From the Latin *fluere,* meaning *flow,* because it melts easily when used as a flux.

fowlerite (a variety of rhodonite). After a Dr. Samuel Fowler.

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gahnite (a variety of spinel). After J.G. Gahn (1745-1818), the Swedish chemist.

garnet. From the Latin *granatus,* meaning *seedlike* or *having many seeds,* because garnet crystals in a rock reminded early scientists of the shape and color of pomegranate seeds (Latin, *granatum*).

gedanite (a fossil resin). After *Gedanum,* the Latin name for Danzig, Poland.

girasol. From the Italian *girare* (to turn) and *sole* (sun), to describe any gem that exhibits a billowy, floating light effect.

goshenite (a variety of beryl). After Goshen, Hampshire Co., Massachusetts, where it has been found.

greenovite (a variety of sphene). After G.B. Greenough (1778-1855), an English geologist.

griqualandite (crocidolite). After Griqualand West, South Africa, its principal source.

grossularite (a species of the garnet group). From *grossularia,* the botanical term for *gooseberry,* in allusion to the appearance of many of its crystals.

grothite (sphene). After P. Groth, a German mineralogist.

gypsum. Probably from the Arabic *jibs,* meaning *plaster,* and from the Greek *gypsos,* meaning *chalk.*

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hambergite. After A. Hamberg, a Swedish mineralogist.

hauynite. After Rene Just Hauy (1743-1822), a French mineralogist.

hebronite (amblygonite). After its occurrence at Hebron, Maine.

heliodor (a variety of beryl). From the Greek *helio* (sun) and the French *dore* (gilded), in allusion to its brownish-yellow color.

heliotrope (bloodstone). From the Greek *helio* (sun) and *trepein* (direction). It was originally applied to green chalcedony with such a great quantity of red spots that, when placed in water in the face of the sun, it appeared uniformly red.

hematite. From the Greek *haimatites,* meaning *bloodlike,* because its streak is brownish red.

hemimorphite. From the Greek *hemi* (half) and *morphe* (form), because the crystals are unsymmetrical on opposite ends.

herderite. After S.A.W. von Herder (1776-1838), a mining official of Freiberg, Saxony.

hessonite (a variety of grossularite garnet). From the Greek *hesson,* meaning *inferior* or *less,* because its hardness was thought to be inferior to that of true hyacinth (zircon), which is often of similar color.

hexagonite (a variety of tremolite). First described as hexagonal (hence the name), but was later shown to be monoclinic.

hiddenite (a variety of spodumene). After William E. Hidden (1853-1918), American mining engineer, mineral collector and dealer.

hodgkinsonite. After H.H. Hodgkinson of Franklin, Sussex Co., New Jersey, where it is found.

howdenite (the chiastolite variety of andalusite). After Mt. Howden, near Bimbowrie, South Australia, where it is found.

howlite. After Professor H. How of Nova Scotia, a source of the mineral.

hyalite (common opal). From the Greek *hyal,* meaning *glassy,* because of its glasslike appearance.

hydrophane (common opal). From the Greek *hydro* (water) and *phane* (to appear), because, when immersed in water, it becomes more transparent.

hypersthene. From the Greek *hyper* and *sthenos,* meaning *very strong,* referring to its strong pleochroism.

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idocrase. From the Greek *eidos* (form) and *krasis* (mixture), because its crystal form resembles that of other minerals.

ilmenite. After Russia's Ilmen Mts., one of the sources of the mineral.

indicolite (a variety of tourmaline). From the Latin *indicum,* meaning *indigo,* in allusion to the color of the variety.

iolite. From the Greek *ion,* meaning *violet,* in allusion to its common color.

ivory. From the Latin *eboreus* through the Old French *yvoire.*

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jadeite. The original Spanish name from which the words jade and jadeite evolved was *piedra de ijada.* Meaning *colic stone* or *stone of the flank* or *loins,* it was supposed to relieve the pain caused by kidney ailments if applied to the side of the body. The Spanish name was translated into French *(pierre de l'ejade* and, later, *le jade)* and subsequently simplified to *jade* by the English. The word *jadeite* was not coined until about 1863.

jasper (a variety of chalcedony). Through the Latin from the Greek *iaspis,* which is of Oriental origin but unknown significance.

jeremejevite. After Pavel V. Jeremejev (1830-1899), Russian mineralogist and mining engineer.

jet. From a Greek word for an unspecified place in Asia that was then known as Lycia, progressed through the Latin from *gagates,* and came to us eventually from the Old French *jaeit.*

[Editor's note: to be continued in a forthcoming issue.]

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EDWARD H. KRAUS

A grand old man passed away February 3, 1973. Dean Emeritus Edward H. Kraus of the University of Michigan was for many years the honorary president of the Gemological Institute of America and in the early days of this organization, a key advisor to Robert M. Shipley, GIA's founder.

Edward H. Kraus, one of the better-known and respected mineralogists in the world in his time, was successively professor of mineralogy, chairman of the department, dean of the College of Pharmacy, dean of the summer school, and dean of the College of Literature, Science and the Arts – all at the University of Michigan.

After graduating from the University of Rochester in New York, he earned a Ph.D. degree at the University of Munich. Later he joined the faculty of the University of Michigan, where he became preeminent in the mineralogical field and then in 1925 with Edward Holden wrote a key text in the gem field, *Gems and Gem Materials.* Later he collaborated with Chester B. Slawson on other editions of that well-known text, which is still in print. He was author of a number of other books and a large number of articles which added to his outstanding reputation in the mineralogical field. Recipient of the Roebling Medal for outstanding contributions to the mineralogical field, Professor Kraus also served as President of the Mineralogical Society of America, and for many years as President of the Gemological Institute of America.

Edward H. Kraus was a remarkable man in many ways. He contributed materially to many fields other than gemology and mineralogy. He and his lovely wife, Lena Hoffman Kraus, who survives him, continued to live in their home on a hilltop in Ann Arbor until his death at 97 years of age.

Book Reviews

* *TREASURE FROM LAND, SEA & LAB, yearly supplement, by Jewelers Circular-Keystone. Published by Chilton Publications, Philadelphia, Pennsylvania, 1972. Magazine format. 132 pages. Price: Yearly subscription $6.00.*

New sales approaches, store-lighting techniques, and twelve feature articles are all highlighted in the latest magazine supplement of *Jewelers Circular-Keystone.*

The opening article by George Holmes, "Gemstones: Supply and Demand" points out the lucrative increase in colored stone demand over the past several years, with mention of the six-fold increase in the importation of Colombian emerald. "Does The Public Know You're An Expert?" by Roslyn Elkins suggests refreshing advertising approaches, making use of the vehicles of mass media. Dr. Edward Gubelin, in his article "Inclusions: Clues to Gem Growth" discusses various characteristic gem inclusions, distinguishing between those present before crystallization, those forming simultaneously with the growth process and those occurring after crystal formation is complete.

"Gemstone Genesis" by Dr. C.S. Hurlbut, Jr., is a mineralogist's approach to the geological classification as it relates to the gemologist. Captain John Sinkankas then discusses gem-rich areas in the United States, listing the larger and more significant specimens discovered at each locality. This article is aptly entitled "From America's Rocks and Rills." In "The Almost-Real Market" Dr. Frederick Pough summarizes the historical growth and current situation of the synthetic gem market.

In addition to the above, four of the articles were contributed by GIA staff members. Richard T. Liddicoat, Jr. in "It's Green: But What Is It?" emphasizes the present-day necessity for proper gem identification procedures, stressing each individual piece of gem-testing equipment and its usage. Accompanying this article is an excellent chart with over 40 gems and gem materials that will serve the jeweler with a ready convenient reference. "The Great Stone Face Lift" by Robert Crowingshield is a revealing look at where man starts to improve the cosmetics of gems once nature has stopped. Heat treatment improves color, as does dyeing, oiling, waxing and irradiation. Recently, the laser technique is being used to improve diamond clarity. Charles Fryer clearly categorizes cutting styles in "Of Cuts, Facets and Cabochons." He further delineates the finer points of the brilliant cut, the step cut and possible combinations. Included with the text are numerous diagrams, each labeled with correct names. "Gifts From The Sea" by Jill Fisher both summarizes and clarifies the pearl. After distinguishing the three types – natural, cultured and imitation – the finer nuances of pearl grading involving luster, body color, overtone, blemishes and shape are outlined.

Full-color photographs and illustrations supplement many articles. Multiple advertisements are indexed at the close of the issue.

Jewelers will unanimously find *TREASURE FROM LAND, SEA & LAB* a useful and informative volume.

S.K.

* *DESCRIPTIONS OF GEM MATERIALS by Glenn & Martha Vargas. Published by the authors, Coachella, California, 1972. 155 pages. Clothbound. Price: $7.50.*

As the authors – Glenn and Martha Vargas – point out in their introduction, "This book is intended as a reference for gem or rough material identification, or in preparation for gem cutting. It is hoped it will be of value for the student of gemology in finding the identity of an unknown gem. It should be of value to the cabochon or faceted gem cutter to help him identify or check the identification of rough material, and give him information as to the possible behavior of the material when he begins to cut it." As an appropriate companion volume to their already popular book – *Faceting For Amateurs* – this work accomplishes all that it intends.

Following a brief introduction, this book is divided into six sections containing descriptions of more than 220 natural gem materials, and 30 synthetic materials. The synthetic gem materials, Section 2, is exceedingly up-to-date, including items such as yttrium aluminum garnet (YAG), yttrium aluminate, yttrium oxide, linobate, quartz, and fluorite. For all gem materials, both physical and optical properties are listed, with special emphasis on those factors that should be considered when cutting a stone such as critical angle and cleavage.

The following three sections are each arranged in a table format, of ascending order, dealing with the hardness, specific gravity and refractive index of those gem materials outlined in Sections 1 and 2. The final section could be considered an accessory to the entire work, serving as a partial index and also containing 360 names applied to alternate, varietal and incorrect gem and mineral names. The GIA particularly commends this portion, as we have often noted the chaotic situation regarding mineral nomenclature.

DESCRIPTIONS OF GEM MATERIALS is indeed a worthwhile publication combining gemology with the basic technological information required by the lapidary craftsman. Both its thoroughness and logical arrangements combine to make this book a practical one for the gem field.

S.K.

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