Gems and Gemology

FALL 1955

See Inside Cover

Gems & Gemology

VOLUME VIII | FALL 1955 | NUMBER 7

IN THIS ISSUE

On the Cover

This charming little fingerful, designed by Schiffman's, Greensboro, North Carolina, received an award in the Diamonds, U.S.A. Awards sponsored by N. W. Ayer & Son, Inc. The gems are square-cut emeralds combined with baquette and marquise-cut diamonds.

Photo courtesy
Dorothy Dignam
N. W. Ayer & Son, Inc.
New York

GEMS & GEMOLOGY is the quarterly journal of the Gemological Institute of America, an educational institution originated by jewelers for jewelers. In harmony with its position of maintaining an unbiased and uninfluenced position in the jewelry trade, no advertising is accepted. Any opinions expressed in signed articles are understood to be the views of the authors and not of the publishers. Subscription price $3.50 each four issues.

The New Gachala Emerald Mine in Colombia

by

RUSS ANDERTON

President of the Anderton — Colombia Mines, Ltda.

Within the last year, a peasant farmer led his mule down a steep mountain in the Province of Cundinimarca, in Colombia. The animal tripped on a boulder on the trail, exposing the first rough emerald from the new mine of Las Vegas de San Juan. Within six months, contraband miners took an estimated million dollars worth of superb rough from the area shown in the photograph. Since that time, the government has prevented further mining and a legal concession has been applied for by the proper authorities.

The crystals tend to be large and surprisingly clear, of a better color than the usual Chivor. The best are on at least a close par with Muzo stones. The author mapped the location for the concession.

The new mine, known locally as Gachala (pronounced Gach a Lá) is about five miles distant from Chivor and in the same mountain formation. It is reached by several hours on horseback from the small Andean village of the same name, over narrow and dangerous trails.

It would appear that the present find was thrown down from the higher levels of the mountain. No Gangas (crystals in Matrix) have been found thus far in the workings, and the mother veins would seem to be situated much higher in the tropical forest which covers the top of the mountain. The gems were recovered by the simple shovel-and-bar method in the soft sand and gravels

which constitute what is now the mine.

Bloodshed and violence have already left their mark. Recently *contrabandistos* allegedly from Chivor, took over the mine for a period of four days at gunpoint and continued the diggings at a slightly higher level than previously. What they recovered is not known. During a visit to Gachala recently, the author learned that on the night of his arrival in the village three bombs had been placed outside the one building at the mine and destroyed it entirely.

Gachala rough still appears on the market here, although in diminishing quantities. The sale of such rough without a license is illegal and the rough is subject to immediate confiscation, as well as a fine or imprisonment for the offending person. However, once cut, the gem loses its illegal standing, although the government contemplates licensing and tracing the origin of all cut emeralds.

The cut gems command a higher price than those of Chivor, and the better quality is presently accepted as that of the Muzo Mines, in many quarters. The inclusions or *jardin* tend to settle at the bottom of the crystals and make for clearer cut stones.

Presently, the bankrupt Chivor Mines, operating under a permanent receiver, are producing no stones of gem quality due to the unsettled conditions at the mine and the paucity of workers. Muzo is about to operate again on a limited scale, and cut Muzo stones are practically nonexistent or fantastic in price. Cosquez, owned as is Muzo by the Government, has not been operated in many years.

The outlook for greater emerald production is poor. This is due not only to the above conditions but to the fact that the Government is about to issue a new decree covering emerald mining, in which restrictions and qualifications will be stringent and severe.

Some Freaks and Rarities Among Gemstones

by

COMMANDER JOHN SINKANKAS, C.G.

One of the most intriguing things about gem collecting and gem cutting is the never-ending variety of newcomers to the field. We may assume a hardened attitude after some years of experience and think that we have seen everything, but then our complacency is completely shattered by some freak or rarity which is trotted out from some totally unexpected quarter of the earth. Also, there is the ceaseless quest for those gemstones which appear ephemerally in the literature and then are never heard of again. Perhaps the original find was too small to provide more than a stone or two to the fortunate or aggressive collector. Collecting gemstones is truly a hobby which has no end; the vastness of the earth's crust promised this and experience proves it.

The following article discusses some of the gemstones in the author's collection which possess unusual interest, either because of their rarity, their beauty, or because of some phenomenon not ordinarily associated with the mineral in question.

GOLDEN BERYL CAT'S-EYE

Several years ago, Dr. Frederick Pough handed me a dull olive-green beryl crystal, several inches in length, and hailing from an old locality on the prolific island of Madagascar. This crystal was deeply and characteristically etched, both on the sides of the prism and on the basal terminations. The prism face etch marks were the typical elongated boat-shaped grooves tapering to points at either end and with half-hexagonal cross sections. Those on the ends of the crystal were hexagonal in outline and in general shape looked like nothing more than miniature trumpets with the gores made up of a series of steepening pyramidal faces. This type of etching is often indicative of the presence of cat's-eye material within the heart of the crystal, and it was this which inspired Dr. Pough to hand it over for cutting.

His suspicions proved correct. Upon sectioning the end of the crystal to go below the dull-green outer zone, a core of splendid pure yellow cat's-eye material appeared, which, even without polish, shimmered like satin. Unfortunately, the fibrous tubes were not evenly distributed throughout the core, and sawing had to be done with considerable judgment to isolate fragments suitable for making effective stones. Eventually a number of cabochons were cut and polished from this material, with the largest, a 44-carat stone, being disposed of to the U. S. National Museum, Washington, D.C., in whose collections it now rests.

Dr. Pough heat treated one stone from the lot in order to alter the color to aquamarine, a well-known reaction of many golden beryls. The experiment was successful but the purity of the color obtained was not comparable to the original in quality. Curiosity satisfied, no further attempts were made along this line.

In appearance, the finest beryls of this lot compare most favorably to cat's-eye chrysoberyls. This occurs when the fibers are most evenly distributed and the chatoyancy is not interrupted by the small greenish platy inclusions which lend their color to the outer zones of the original crystal. These greenish platelets, in contrast to the tubes, are oriented parallel to prism faces. In size, the tubes causing the cat's-eye effect are extremely fine but easily detectable by moderate magnification. Though productive of an excellent eye, the line of light is not quite so sharply defined as in chrysoberyls but still leads the uninitiated to assume that it is the classical cat's-eye which is being handed over for examination.

AQUAMARINE CAT'S-EYE

Shortly after moving to Washington, D. C., I had the pleasure of meeting Dr. William Pecora of the U. S. Geological Survey, who is well known in mineralogical circles for his strategic pegmatite mineral investigations in Brazil during World War II. On one of his visits to the pegmatite regions of Minas Geraes, he acquired a small sample of beautiful blue aquamarine which, because of its cloudiness, had been discarded on a mine dump. Upon being shown this specimen I was instantly struck by the silky luster which was easily visible even in subdued light. It spoke of cat's-eye material and so it proved upon cutting. The tubes in this material were extremely fine and quite uniform in their distribution through the groundmass of the gem — two vital requirements for the production of good cat's-eyes. It was a pity that the original bit of rough yielded only two stones of about four carats each. But in spite of the modest size, each stone is unmistakably a beautiful and rare specimen of cat's-eye aquamarine. While speaking of beryls, it may be appropriate to mention the rather better-known morganite cat's-eyes of almost vulgar size. Most morganite, unfortunately, is pierced by continuous tubes which are far too coarse to produce a really good eye. Furthermore, the whitish clay of the gem pockets in which these beryls are found often impregnates the openings and does much to disfigure the gem. Polishing powder is also troublesome in this respect and considerable care must be exercised by the lapidary to seal off the tubes beforehand to prevent ingress of the powder. Once the powder enters, it is virtually impossible to remove.

For the benefit of the collector who is in a position to inspect quantities of Brazilian beryl, it may be profitable to mention certain earmarks which may be indicative of cat's-eye material. First of all, a silky luster should be watched for and, if suspected, its presence should be confirmed by immersion of the fragment in bromoform. When the specimen is rotated in this fluid, whose refractive index almost exactly coincides with that of beryl (beryl 1.575 - 1.582, bromoform 1.588), the change in luster as the tubes are viewed from the end or side should confirm the suitability of the material for cat's-eyes, but the useful area may be confined solely to the ends and a short distance below. Thirdly, crystals with milky bases and clear terminations may yield cat's-eye material in the transition zone between the clear and milky portions.

STAR BERYL

About four years ago a most unusual and rare beryl was discovered at an unnamed locality in Brazil which yielded star stones when suitably oriented and cut. In appearance, these gems looked for all the world like Australian star sapphires, possessing the same dark-brown body color and brownish bronzy luster on the illuminated portions of the star. Recently I was able to obtain a considerable fragment of this material and proceeded to prepare some gems from it and, at the same time, learn a little about its nature.

The rough section I obtained was a basal section with the surfaces showing excellent but interrupted cleavages corresponding to the face 0001. The inclusions giving rise to the chatoyancy are located in very sharply defined and extremely thin layers exactly parallel to this plane, and no doubt make prominent a cleavage which is ordinarily absent in most beryl specimens. The exact nature of the inclusions is not known, but under low-power examination they show dendritic patterns strongly reminiscent of snowflakes. The extensions of growth are oriented on axes 60 degrees apart, thus, under favorable conditions, giving rise to the aforementioned asterism. This phenomenon is not invariable, however, since some cut specimens fail to show more than a spot of chatoyancy on the apices of cabochons. This proved puzzling until it was noted that the color of the inclusions had a relation to the color produced — pure brownish-colored inclusions giving only a non-directional chatoyancy and inclusions with a bluish cast invariably producing a well-defined star. No cat's-eyes were noted; if a directional effect appeared, it was always a star. However, this statement is only applicable to the limited amount of rough which was available to the author. Other specimens may also display a cat's-eye effect.

Another interesting feature of this material is the abundance of the inclusions and their distribution within the crystal. A small section viewed normal to a prism face showed a deep-blue color in transmitted light, the intensity increasing in distinct strata until each horizon appeared black. The layers thus appear bronze when viewed from above in reflected light and deep blue to black when viewed edgewise in transmitted light.

Further work will be done with this material to determine the nature of the inclusions, if this is possible within the limited means available. Meanwhile, it is to be hoped that more of this unique material makes its appearance on the market.

ENSTATITE-HYPERSTHENE FROM INDIA

When passing through Colombo, Ceylon, in the Spring of 1954, I had the good fortune to procure some specimens of enstatite-hypersthene in rough fragments. The parcel contained a number of small stones which though not capable of yielding faceted gems in excess of one carat or so, still provided much interesting material for study. None of the fragments showed crystal faces but some possessed signs of extensive etching and others exhibited boundary growth marks indicative of constituency in a granular rock, as contrasted to growth in a cavity or other condition conducive to face development. The sharpness of the markings leads to the conclusion that this material has been extracted from a residual soil or clay resulting from complete disintegration of the original host rock. Although surprisingly hard under lapidary treatment, this gemstone may not be sufficiently durable to withstand much stream rolling, especially in view of the excellent and easily induced prismatic cleavage.

Although previous literature has described cut material as being of a rich brownish-red hue, the rough material, as well as specimens cut therefrom actually display a rather wide color range. In addition to the variation of color, pleochroism varies widely from specimen to specimen, while extremely fine olive-green hairlike inclusions were noted in at least ten percent of the fragments.

Colors noted varied from an intense brownish red to a pale orangy brown to an extreme of deep yellow-green of rather an unattractive sort. The reddish-brown specimens display an easily noted pleochroism of reddish brown, and dirty olive green. Light absorption is intense in all directions but especially along the deeper colored ones. As for the inclusions, they are so fine that one is aware only of their greenish color and remarkable straightness. They do not appear to be present except in one direction; that which corresponds to the lightest pleochroic color.

Enstatite-hypersthene from India is difficult to cut. It displays a lamentable tendency to rip along sharp edges due to its cleavage and also possesses an amazing variation in hardness depending on crystal direction. The hardness is estimated to vary from about 6½ to 7½ or perhaps even a trifle more.

SPHALERITE

Abundant in many mineral deposits, sphalerite is singularly rare in gemstone quality. It is often mentioned in gemological literature and allusions are made to its very high refractive index and dispersion, a pair of properties which would lead one to expect a dazzling stone when cut. Yet, unfortunately, cut sphalerites are not only rare, *per se,* but the ones which do exist seldom live up to expectations. The reasons for this disappointing state of affairs may be more readily apparent from the discussion to follow.

Sphalerite causes lapidary difficulties in polishing due to its softness and ease of cleavage. There are six dodecahedral cleavages, each of them perfect, and their geometry makes it almost inevitable that the lapidary will have several which will nearly coincide with some facets. When this happens, polishing, using standard techniques, is greatly complicated. Lacking the necessary knowledge, the lapidary may finally deliver a stone with dull facet surfaces at best. It is possible, however, to polish sphalerite to a brilliant finish and, with otherwise suitable material, the finished product will realize all expectations. The use of soft laps like leather, wood, or wax is mandatory, however, and any lapidary commissioned should be forewarned accordingly. Sharply cut facets are impossible to obtain using soft laps. But the minor loss in brilliancy due to this cause is more than compensated for by the greatly facilitated passage of light into and out of the gem because of the better polish.

Perhaps a word about surface finishes of gems may be appropriate at this time, since it may serve to point up the importance of a good polish on all gemstones particularly on those which are softer and more difficult to prepare properly. An examination of a number of ordinary sphalerites shows facet surfaces covered with extremely fine striae left by the polishing agent. The luster is generally dull, resembling a sheen more than a true adamantine reflection. Any striae, regardless of how minute, function exactly like a set of microscopic prisms and effectively scatter any light rays falling on the surface. As a result, much light is lost and the remainder is diffused within the gem, giving feeble reflections and scarcely any dispersive effects. In such stones, the facet surfaces are not truly polished; rather, they consist of fine grinding interspersed with polished areas. Naturally, since the striae are eliminated by proper polishing, the optical effects are heightened until a correctly prepared gem bears little resemblance to its former self. It is interesting to note the effect of facet striàe on corundum, especially synthetics which are often finished with fine diamond-polishing powder. Corundum, in contrast to sphalerite, is so hard that conventional polishing powders become effective only after prolonged and tedious polishing. The vastly more rapid diamond powder is now generally utilized to overcome the high costs of labor involved in polishing with the traditional agents. However, unless the finest grades of diamond powder are employed in touching up the facets, the minute striae previously mentioned will be left behind to the detriment of brilliancy. It is often possible for the practising gemologist to make a fair estimate of polish quality by evaluating the sharpness of the color bands noted when taking a refractive index reading. A moment's reflection will convince him that the clarity of the readings, like the clarity of reflections in the gemstone itself, go hand in hand, depending in each case upon the relative flatness of the facets.

One other factor should be mentioned in connection with the brilliance of sphalerite; that is, color. Ideally, pure sphalerite would be colorless but this is extremely rare in nature; even the so-called "colorless" sphalerite, cleiophane, is probably always somewhat tinted. Most faceting-grade sphalerite is brownish, reddish, reddish yellow, or green, sometimes with patches and streaks of different colors intermixed in the same specimen. It has been noted that of all colors, brownish and reddish seem most absorptive of light and may provide very disappointing gems after being cut. Greenish and yellowish material on the other hand, is more apt to produce satisfactory stones. Even a slight trace of red or brown seems to "kill" the reflection of light in the latter.

The best sphalerite I have ever seen is a specimen in the collection of Mr. Nicolas D'Ascenzo of Philadelphia. He had somehow procured a substantial clean piece of cleiophane from Franklin, New Jersey, and had it fashioned into an emerald-cut gem of about ten carats in weight. When first seen, the impression received was that a slightly greenish diamond was being observed, but the character of the surface polish with the slight rounding of facet edges soon dispelled this notion. It is difficult to describe such a stone. It was a delicate greenish aquamarine hue. Its dispersion was most effectively displayed by the exceptional transparency and clarity of the material, all the more so when one compared it mentally with the usual run of sphalerites from less-favored localities. Not all sphalerite from Franklin is as delicately tinted as this gem but, generally speaking, most is considerably more pale than material from Cananea, Mexico, or Picos D'Europa, Spain.

Ranking next to the truly exceptional Franklin material, which appears to be gone forever now that the producing mine has been permanently shut down, is the famous golden-yellow material from Spain. Occasionally, large cleavages of flawless rough are obtained from this locality which can furnish gems exceeding 30 carats or so. Reddish clouds are common in the Spanish material as well as numerous inclusions, which appear to be irregular hollow cavities. Almost as well known is the sphalerite from the Duluth Mine, Cananea, Sonora, Mexico. However, this locality has been shut down for many years and specimens are seldom seen nowadays. Cananea was famous for lovely green colors, verging from an oily green to a fairly vivid yellow-green but not, however, without some admixture of a less desirable hue. The effect of even a slight reddish or brownish spot of color in rough from Cananea is very pronounced in the finished gem and lessens its attractiveness remarkably.

Several other localities have produced their share of facetable sphalerite, among which may be mentioned a brownish kind from the mines of Neyhart in Montana and small red crystals of "ruby zinc" from Tiffin, Ohio. The latter can seldom provide a stone of more than a carat or two in weight but are attractive otherwise.

TREMOLITE

Tremolite, a species of the amphibole group, is seldom thought of as gemstone material except in connection with nephrite. Yet there are a few tremolites found from time to time which are sufficiently clear to afford faceted stones. One such kind is the lovely pink hexagonite from St. Lawrence County, New York. It occurs in granular aggregates, each granule being an individual crystal, devoid of external form and most flawed and filled with liquid inclusions. Breaking up such an aggregate sometimes yields a fragment suitable for faceting, if the very considerable difficulty of treating such a fragile mineral is conquered. Unfortunately, none of the granules are large, furnishing finished gems of substantially less than a half carat in weight. One such gem, a fine pink, quite flawless and transparent, is in the author's collection.

BORACITE

It seems a shame that the boracites from Germany are not more common. They are quite hard (7), transparent, tough, and of a lovely greenish-blue color. They polish easily and otherwise seem suitable for gem purposes. Although Dana's "Textbook" states that they alter slowly by taking up water, the cut specimen I own is now over six years old and its polish seems as pristine as the day it was finished. The specimen from which this stone was cut was a typical pseudo-cube from the salt and gypsum beds of Germany, deeply etched on the outside but with a solid center which could be cut. After the stone was completed, a curious phenomenon was noted in respect to optical properties. Close examination showed a series of fine parallel inclusions arranged in patches throughout the stone in sufficient number to give a "sleepy" look to the finished gem. To determine their nature, an even higher magnification was used and it was then discovered that the inclusions were not foreign matter at all. Rather, they were planes along which small changes of index occurred, much in the same manner as that noted in swirled glass except that the lines were straight instead of curved. This phenomenon is puzzling, because the slight difference in refractive indices for boracite (1.66 to 1.67) seems not sufficient by itself to account for the effect noted. In any case, the gem is quite handsome. It is hoped someday to cut a larger one than the 40-point stone now in my collection.

CALCITE

Seldom thought of as a faceting possibility, calcite can be made into a most attractive gem if material of suitable clarity and color can be found. Perhaps it is too common to receive serious consideration but at least one variety, a handsome rich orangy brown from a locality in Baja, California, is well worth cutting. Furthermore, the rough has been available until lately in large flawless pieces capable of furnishing finished gems of at least 45 carats.

The locality for this calcite was discovered several years ago in the hinterland behind Rosarita Beach, a hamlet on the West Coast of Baja, California, Mexico, and about 20 miles south of Tijuana on the border between Mexico and California. The occurrence is said to be in diabase, the crystals forming in cavities and heavily coated with a whitish mineral which must be removed by acid. Some groups almost ten inches across were found, with in-

(Continued page 219)

Notes on Microscopic Crystals Included in some Minerals

by

ISAAC LEA, February 16, 1869

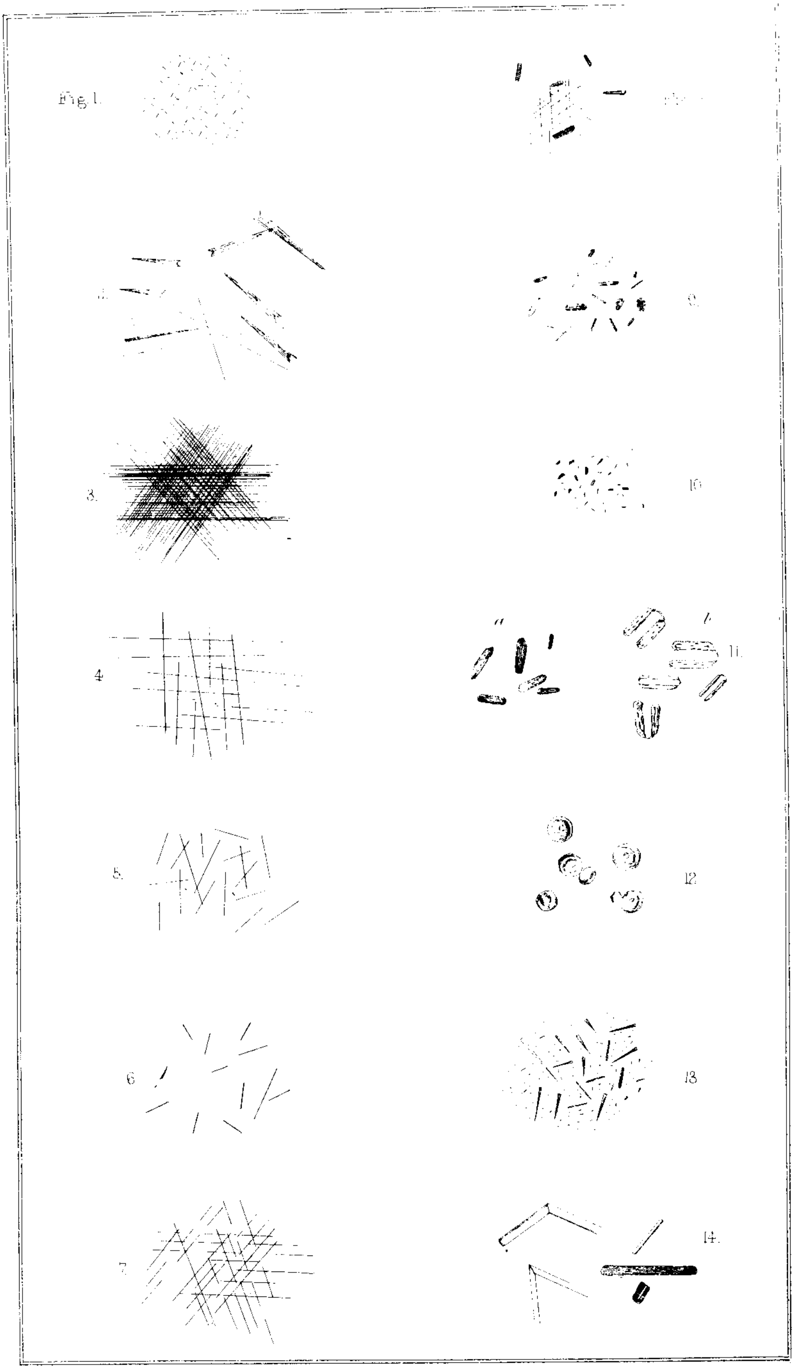
Note: The following article is a verbatim reprint of one of three papers written for the Proceedings of the Academy of Natural Sciences of Philadelphia by Isaac Lea. These papers probably represent the first work done in this country on gemstone inclusions. The earliest paper carries the date of February 16, 1869. The Isaac Lea gem collection is at the United States National Museum, Washington, D. C.

The articles were made available for readers of GEMS & GEMOLOGY through the courtesy of George Switzer, Ph.D., Associate Curator, Division of Mineralogy and Petrology, Smithsonian Institution.

During some years past I have given much attention to the examination of minerals under the microscope, and some of the observations were published in the Proceedings of the Academy in 1866.

About a year since, in the examination of a thin fractured piece of a large *garnet* from North Carolina, I was surprised to observe a number of very minute acicular crystals, which generally took two or three directions. This induced me to examine more closely into the varieties of *garnets* which were accessible to me, and supposing these crystals might have been observed by others, I referred to the principal works on mineralogy which have been published in France, Germany, and in this country.

In none of these have I found any mention of these inclusions. But in that excellent work "Repertoire D'Optique Moderne," by M. l'Abbe Moigno, where he treats of *optical mineralogy,* I found that he states M. Babinet to have examined *"star garnets" (Granats asteriques)* some with four and some with six branches. He says that the *star garnets* with four branches are not very rare, — 20 to 30 in 1000 to 1200 — but



• **Microscopic crystals in gems**

that the star of six rays he found only one in 6000 specimens. Whether the *filaments or fibers,* as M. Babinet calls the asteroid reflections, are the same as the acicular crystals observed by me I cannot say, but certainly these latter are more common so far as my observations has extended, and I have observed no asterisms whatever.

In 154 specimens of Bohemian polished *garnets,* I found 48 with acicular crystals! This far exceeds the proportion stated by M. Babinet.

In the precious garnet from Green's Creek, Delaware County, Pennsylvania, (uncut specimens), I found in the close examination of 310 specimens that 75 were possessed of acicular crystals, being nearly 25 per cent — a very much larger percentage than mentioned by M. Babinet. Of the Brazilian *Pyrope* I examined 40 specimens. They were very pure and free from spots and cavities. I could not find a single acicular crystal in any of them.

In *Essonite* I found no acicular crystals in the few specimens which I had it in my power to examine, nor in *grossularite, ouvarovite, colophonite* or *massive manganesian garnet.*

Cinnamon-stone from Dixon's, near Wilmington, Delaware was carefully examined in nearly 60 specimens, none of which showed any trace of acicular crystallization.

Spinelle ruby, of which I examined 28 specimens, produced no microscopic crystalized forms.

It will be difficult to ascertain what composes these microscopic crystals in garnets, but they may prove to be *rutile* when chemical analysis shall be able to resolve the difficulty.

Further Notes on Microscopic Crystals

by

ISAAC LEA

(Read May 11, 1869)

In a paper which I recently read to the Academy, I mentioned having found acicular crystals in *Precious Garnets.* Since then I have had the opportunity of examining a number of cut specimens of *Sapphire* in the forms of *Asteria, Catseye, &c.* I have also examined many specimens of *Cinnamon Stone* from Ceylon, brought by Dr. Ruschenberger, of the United States Navy, also, among others, a very fine specimen of bluish *Sapphire,* in the collection of Prof. Leidy.

Having made microscopic drawings of these and other species, having included microscopic crystals, I propose to present them with as nearly correct illustrations as possible.

The whole subject of microscopic mineralogy has been of great interest to me, and I hope these short notes may induce some student to pursue the subject to a greater extent than I have had it in my power to do. It cannot fail that, with the use of the numerous admirable microscopes now made in this country, working with so much more facility than with those we have been accustomed to from abroad, observers may continue to bring to our knowledge much that has been heretofore unknown and very little suspected in this branch of science.

In my former paper I stated the proportional number among *Bohemian Garnets* which I found to contain microscopic crystals. I now propose to give descriptions and figures of the appearance of these crystaline forms, and with this view I have made drawings of their apparent forms under a power of about 100 diameters.

Sapphire. A very remarkably beautiful *Asteriated bluish Sapphire,* procured by Dr. Ruschenberger when in Ceylon, presented to the naked eye the six rays which in the sun were sharp and of great beauty. The specimens being set as a gem of luxury, I could not get a view by transmitted light, but by reflected light, with great care, the exceedingly minute crystals were distinctly seen. They are very short, of pearly lustre, at three different equal angles, thus producing the bands which form the rays in three directions of 60° each. The reflection from the sides of these minute crystals cause, of course, the asterism of six rays over any point of the curved polished surface of the specimen. These rays are formed on the same principal precisely as the asterism in *Phlogopite,* which I have mentioned elsewhere.

Fig. 1 represents the delicate, numerous, minute crystals in the beautiful *Asteria* referred to above belonging to Dr. Ruschenberger. The acicular crystals are so small that it was with great difficulty I obtained their position as here represented.

The variety of *Sapphire* (Corundum) which goes under the name of *Catseye,* has irregular coarse striae, which have the appearance of being *Asbestus* as is generally supposed. In this gem there is a single band which varies according to the position it may be placed in, and by no means has the beauty of the asteriated *Sapphire.* Several of these are now before me which came from Ceylon.

Fig. 2 represents the crystals which I observed in a fine small bluish *Sapphire,* in Prof. Leidy's fine collection of gems. The cuneiform or arrow-headed crystals are very extraordinary, and they may be simply twin crystals of some substance of which at present we can have no perfect idea. They remind us in their form of Selenite crystals, such as are found in the Paris Basin, and at once we recognize the similarity to the cuneiform character stamped on the bricks of Babylon, and cut in the alabaster monuments of Nineveh. The group which I have drawn represents six of these cuneiform crystals, and six acicular crystals. Of the former six, four had a bluish tinge and two were pinkish. The acicular crystals were disposed to take three different directions, parallel to the primatic hexagon sides of *Corundum.* Both sets of these crystals are enlarged to about 200 diameters, for the purpose of giving distinctly their very singular form.

Specimens of *Garnet* examined from all localities obtainable, presented very different aspects. When crystals were found in them they always proved to be acicular in form, but by no means similarly regular or of the same length, direction, or of the same size.

Fig. 3. A Bohemian cut *Garnet* presented only two sets of acicular crystals, which were usually at right angles, but some were inclined from perpendicularity and they were not so long as those of figure 3.

Fig. 5. A Bohemian cut *Garnet* presented a very different set of crystals. They were generally short, comparatively, and pointed in every possible direction.

Fig. 6. *Garnet* from Ceylon — *Cinnamon-stone* — fractured portions, not cut and polished. The acicular crystals were much shorter, rather thicker and much more bluntly terminated than in Fig. 5. They are placed at all angles. Ten specimens only in 80 examined had anything like crystals,

while all had irregular rifts or cavities within.

Fig. 7. *Precious Garnet — Pyrope?* from Green's Mill, Delaware County, Pennsylvania, presented acicular crystals somewhat like Bohemian Garnet, fig. 3, but the three sets, while they take the same three directions, are shorter and left interspaces as shown in the figure.

Fig. 8. *Garnet* from North Carolina. A thin fracture from a compact garnet of large size, perhaps two inches in diameter. The acicular crystals are not very numerous — they are thin and not continuous. Connected with these are a few dark crystals. These take no particular direction like the others, but seem to be interspersed throughout.

Fig. 9. *Labradorite.* This specimen is a small polished one from Ceylon, and belongs to Dr. Ruschenberger. Besides the usual play of pavonine colors in *Labradorite,* I have found in all the specimens I have examined from various other localities, very minute reflecting crystals like those in *Sunstone,* and which are no doubt the same, but differing in size, being smaller so far as I have observed. The microscopic forms as figured will be observed to consist of two sets apparently distinct. The larger are rather irregular and black. The thinner are rather shorter and more delicate. These are not the reflection of the plates of *Gothite,** they are the black crystals which are usually in dark *Feldspar.*

Fig. 10. *Black Feldspar.* A small specimen of black *Feldspar,* translucent in thin pieces, from Chester County, Pennsylvania, presented quite a different appearance from Labradorite in its minute, black included crystals. They are very numerous, very short, opake black, and irregular in form. They are closely set and irregular in their direction. There were no reflections from any of these included crystals.

*The plates of Gothite when held at a proper angle may easily be seen by the naked eye.

Fig. 11. *Barite,* from Antwerp, Jefferson County, New York, *a* represents some opake crystals observed in a small prismatic crystal. They cannot be, I think, rifts, and yet they are evidently without planes. *b* represents singular impressions on the surface of one of the prismatic planes, and their singular form, like the common horse-shoe magnet, induces me to call attention to them.

Fig. 12. *Amethyst.* A specimen from Thunder Bay, Lake Superior, presents very remarkable globules, some of an orange-yellow and some of a dark green. These are very visible to the naked eye, and in the figure they are not very greatly magnified. They vary somewhat in size, and the orange-colored ones are most numerous in the specimen before me. There is a cloudiness in these yellow globules and a few are not completely spherical, presenting a cup-shaped form. To the naked eye the green globules appear to be black, but under the microscope they are evidently dark green. The composition of the two sets are no doubt the same, and the color probably depends on their being in a different state of oxidation. In a few cases I observed the two colors in the same globule. In another specimen from the same locality I found the globules to be much smaller and the green ones to prevail.*

Fig. 13. An *Asteriated Sapphire,* also belonging to Dr. Le Conte, of an obtuse conical form, and of unusual beauty, presented very remarkable microscopic crystals of a white silken hue. The larger of two sets were generally, though not always, cuneate and lay in three directions, differing somewhat in size. In the smaller set the crystals are very minute, having the same pure white, silken appearance. These fill up the interstices of the larger crystals.

A *Sapphire* of large size and peculiar

(Continued on page 218)

*The Amethysts of Chester County, Pennsylvania, very frequently have acicular crystals of *Rutile.*

Amblygonite
Old Mineral—New Gem

by

DR. E. GUBELIN, C.G., F.G.A.

Any keen gemologist's temperature rises whenever the earth's gemiferous surface discloses a new gemstone. What fun when, for a change, a new gem is not extracted from the soil but discovered in some dusty drawer in an old museum! This was the case when, early in 1953, G. Bottocher, a student of mineralogy at the University of Hamburg, in his search for adequate material on the optical properties and coloration of spodumene for the thesis for his doctor's degree, happened to come across some pale-yellow crystals which Dr. A. Schroder of the University of Hamburg identified as amblygonites. He described these gems in the Deutsche Goldschmiede Zeitung 1953 Heft 3.*

*"Edelamblygonite, ein neuer Edelstein" D.G.Z. 1953 H.3

Amblygonite is a well-known ore of lithium according to the formula of LiAl (OH,F). PO_4. In its usual formation it has a high commercial value and is important for various technical purposes. Occasionally clear, transparent crystals may occur which are of gem quality and lend themselves very well to cutting into faceted gemstones. Rough or cut they resemble very much the colorless to golden-yellow spodumene, but distinguish themselves from the latter, which shows cleavage along (110) and $(1\bar{1}0)$, by one single cleavage direction parallel to the basal plane (001). However, the cutting quality does not appear to be impaired by this distinct cleavage, as several very pretty gems have been faceted since the discovery.

As stated above, the color of amblygonite varies from colorless to golden yellow,

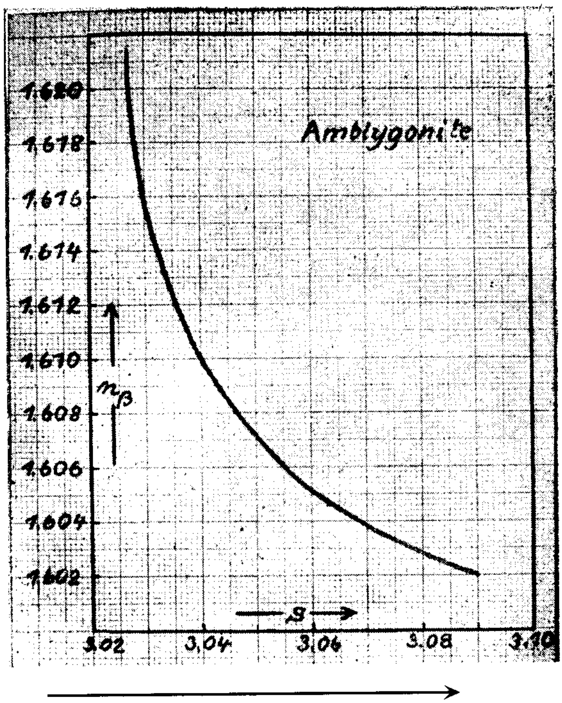


Figure 1

the most common hue being a pale yellow. The crystals show triclinic symmetry and develop after a "slab" habit, measuring one or two square inches and about ⅓ inch thick.

With regard to its hardness being 6 on Mohs' scale, it ranks well among the more resistant and better wearable gemstones.

The study of the physical properties is particularly interesting because, as a result of its variable chemical composition, amblygonite belongs to an isomorphous series, within which the refractive indices diminish while the specific gravity increases with an increasing amount of fluorine (see Figure 1, made by Dr. Schroder).

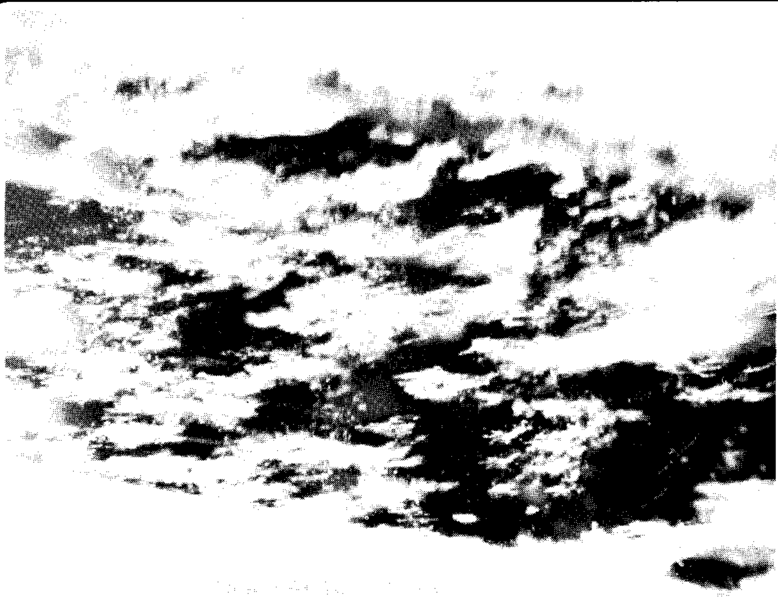
However, those precious amblygonites which have been cut and measured so far seem to be fairly constant. For the convenience of readers the optical data and specific gravity are given in Table 1.

On the basis of these data the following average values may be established:

$\alpha = 1.612$; $\beta = 1.621$; $\gamma = 1.636$
$\alpha - \gamma = +.026$
Specific gravity = 3.01 — 3.03

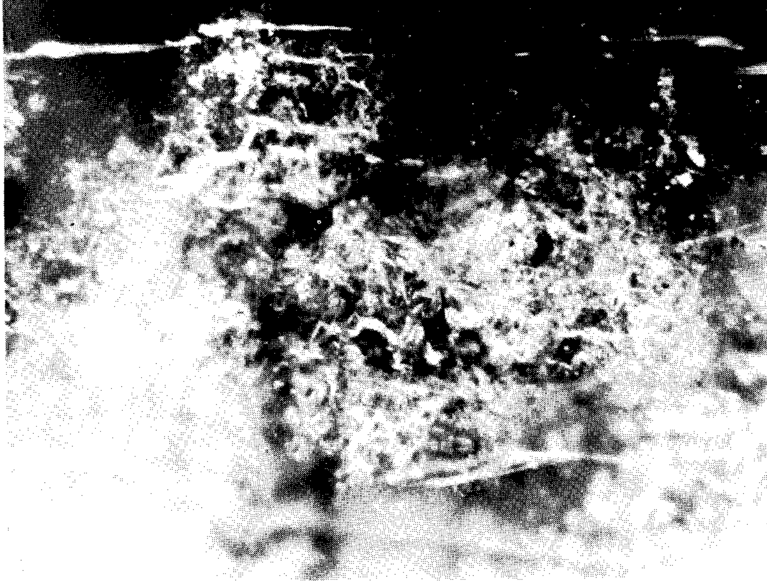
The positive axial angle 2V = 79°44′, as calculated by A. Schroder, is rather high and distinguishes itself from that of spodumene (2V = 58°) as well as all the other values given in Table 1.

It is rather difficult to give a clear description of the phenomenological picture manifested by the inclusions. The study of various stones nevertheless led to the conclusion that there exists a definite con-



• *Figure 2*
20x

• *Figure 3*
20x



• *Figure 4*
40x

• *Figure 5*
40x

sistency in their formation: under weak magnification they seem to form a pattern of parallel clouds, either filling the whole stone or arranged in bands (Figure 2 and Figure 3). These bands either run parallel to each other or intersect each other. Strong magnification reveals that these clouds consist of a multitude of tiny cracks mixed with impure matter, looking like fine grains of brown and black sand (Figure 4 and Figure 5).

In longwave ultraviolet light of 3650A, amblygonite shows a faint, dirty, greenish-yellow fluorescence.

Since no X-ray powder photographs of amblygonite had been published in any literature, it seemed appropriate to profit from this occasion to establish a powder diagram of the newly discovered material. In order to compare it with a known specimen, a second diagram of Spanish amblygonite (from Trasquilon) was made under the same conditions. Both powder patterns are depicted in Figure 6. Comparison between them reveals that the diagrams agree exactly, thus proving that the new gem is a real amblygonite.

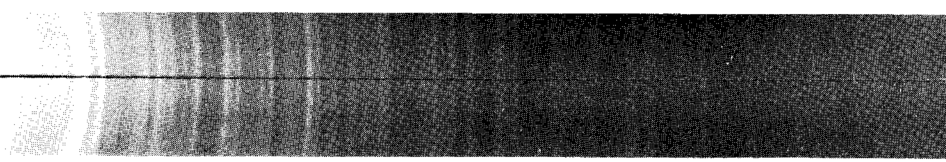
The powder photographs were made with unfiltered Cu-K radiation in a 114-mm. diameter Debye-Scherrer camera. The diagrams thus obtained showed numerous interference lines. These lines were measured and the lattice intervals appertaining to the individual lines were computed in kX. The intensity values (I) and the lattice spaces (d) are tabulated in Table II.

Since amblygonite is triclinic, it is impossible, without very special effort, to determine the lattice constants from these powder diagrams. It would be necessary to make rotation photographs of a small single crystal with well-developed crystal faces; the rough fragment on hand could not be sufficiently exactly orientated to enable rotation photographs.

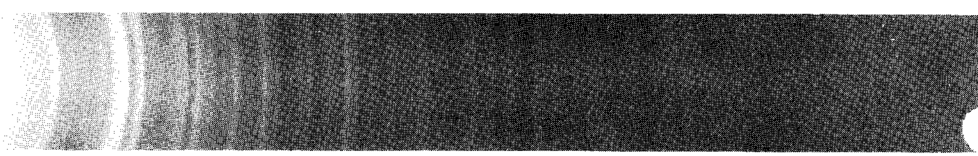
The author is indebted to Dr. A. Schroder, Prof. Dr. W. F. Eppler and Mr. Hintze for supplying him with additional stones, and to Mr. B. W. Anderson for communicating his findings and his advice.

Gemology has become richer by one more interesting gemstone which, though it will never be abundant enough on the market to create public interest, may nevertheless be cherished and appreciated by collectors and keen gemologist

Figure 6



• **Precious Amblygonite**



• **Amblygonite (Spain)**

TABLE I.

Specimen	Color	α	β	γ	△	Spec. gravity	19°30-4°
A. Schröder	Golden yellow	1.6101	1.6208	1.6364	+.0263	3.033	
B. W. Anderson	Colorless	1.6123	1.6176	1.6383	+.0260	3.011	
B. W. Anderson	Colorless	1.6111	1.6208	1.6373	+.02617	3.017	
B. W. Anderson	Pale yellow	1.6120	1.6210	1.6375	+.02545	3.017	
Rutland		1.6126		1.6392	+.0266	3.033	
W. F. Eppler	Pale yellow	1.6119	1.6212	1.6377	+.0258	3.028	
E. Gübelin	Pale yellow	1.6120	1.6207	1.6375	+.0255	3.033	
E. Gübelin	Pale yellow	1.6119	1.6211	1.6373	+.0254	3.0295	
E. Gübelin	Pale yellow	1.6119	1.6209	1.6377	+.0258	3.0235	

TABLE II.

I	d(kX)	I	d	I	d	I	d
s	4.65	vw	1.924	vvw/b	1.304	w	0.9784
w	4.13	w	1.888	mw	1.282	vw/b	0.9664
w (? β)	3.51	w (? β)	1.784	vw	1.269	vw	0.9554
m/b	3.32	mw	1.742	mw/b	1.250	mw	0.9452
vs/b	3.17	vw/b	1.675	mw/b	1.218	vvw	0.9380
s	2.947	vw	1.643	mw/b	1.172	vw	0.9327
w/b	2.77	ms	1.605	w/b	1.164	w/b	0.9118
w/b	2.55	mw	1.576	mw	1.145	vvw	0.9022
mw	2.486	vw/b	1.528	vvw	1.131	vvw	0.8949
mw	2.384	vvw	1.503	vw	1.115	vw	0.8845
vvw	2.351	vw/b	1.473	vw/b	1.097	vw/b	0.8752
w	2.285	w	1.436	vvw/b	1.082	w	0.8639
vw	2.192	vw	1.418	vvw	1.069	vw	0.8532
mw	2.120	w	1.400	vw/b	1.047	vw	0.8495
vw	2.097	vw	1.384	vw	1.013	w/b	0.8428
vw/b	2.036	vw	1.358	w	1.005	vw	0.8249
mw	1.954	vvw/b	1.337	w/b	0.9911	vvw	0.8202

NOTE: **The symbols of the intensity values in the order of decreasing intensity mean:**

b—broad
vs—very strong
s—strong
ms—medium strong
m—medium
mw—medium weak
w—weak
vw—very weak
vvw—very, very weak

Electron-Microscopic Observations of Aragonite Crystals on Cultured Pearls

by

NORIMITSU WATABE

Reprinted from Report of the Faculty of Fisheries, Prefectural University of Mie, Vol. 1, No. 3, pp. 449-454.

The surface structures of pearls, or shells, of marine and fresh-water mussels have been observed and reported by Boutan (1925), Hessling (1859), Möbis (1858), Römer (1903), Rubel (1911), Schmidt (1921), (1923), and other research workers. The present writer (Watabe, 1950) also previously studied cultured pearls and distinguished the volute, parallel, and irregular surface-patterns caused by different modes of aggregation of aragonite crystals. However, the crystals are so small (2-5μ in diameter) that they could not be studied in detail with an optical microscope; so an electron-microscope was used to study the details of these crystals. This paper is concerned with these observations on three pearls.

The writer wishes to express his sincere thanks to Dr. Y. Okada, Dean of this Faculty, for his kind direction and encouragement. Thanks are also due to Dr. K. Omori, Professor of Tohoku University, and Dr. R. Kiriyama, Professor of Osaka University, who gave the writer kind and useful advice.

MATERIALS AND METHODS

Pearls

No. 121. Cultured from August, 1951 to March, 1952; Pinkish cream in color with shiny luster. Under an optical microscope, the surface showed a volute pattern with well-defined crystals along the margin.

No. 122. Cultured from August, 1951 to April, 1952; Pinkish cream in color with a splendid luster. Under an optical microscope, the surface showed a parallel pattern.

No. 123. Cultured in the same period as No. 122; White in color. Under an optical microscope, no distinct pattern was discernible on the surface.

Preparation of specimens

After cleaning the surface of the pearl with alcohol, it was placed on the polymerizing methylmethachryl on a slide glass.

After polymerization was accomplished, the pearl was removed. The methylmethachryl, which then bore the imprint of the pearl's surface, was then plated with a thin membrane of aluminum. Thus an aluminum replica of the pearl's surface was obtained and this replica was electron-micrographed at 50 K.V. Direct magnification was x2000. (Photographs were taken at the Electron-microscope Laboratory of Shimazu-Seisakusho.)

OBSERVATIONS

Pearl No. 121. (Plate-Figure 1 and 2; Text-Figure 1)

As seen in Figure 1, the surface is composed of typical idiomorphic, hexagonal, platy, straightedged aragonite crystals (1-4μ in diameter) and their aggregates. As this photograph was taken horizontally to the quite narrow area (with the radius of about 15μ) of the surface, 001 plane seems to indicate the original shape. Therefore, the angle between the two lines(crystal edges) shows the angle between the two planes joining at right angle to 001 plane with these edges. Measuring these angles, about 116° and 123° were found to be dominant. Therefore, the dominant planes of aragonite crystals of this pearl are, as in the case of the common platy aragonite, (110), (010), and (001). The presence of these planes is shown in Text-Figure 1.

The 010 planes being thus decided, orientations of the *a*-axes of the crystals in the dotted part in Text-Figure 1, have two common orientations, (a_1, or a_2) and (a'), the former being dominant. In the same way, those crystals in the part noted with + have their *a*-axes oriented equally either as a_3, or as a_4. The presence of these common directions shows that the crystals in each part developed by parallel growth.

Judging from this fact, and in addition, that the intercepting angles of a_1 and a_3, and a_2 and a_4 are equal (about 63°), and, further, from the branch-like shape of the whole view, this surface must have been formed by the dendritic growth of aragonite crystals.

As the main stem will probably be a_1, the crystallization must have taken place in the direction of the volute line of the surface. Strictly speaking, as described before, the orientation of the *a*-axes in the dotted part is not uniform, but expressed in two lines a_2 (or a_3) and a', so the aggregates do not show the parallelism. This is often seen in the dendritic growth. According to Buckley (1951), a slight disturbance may cause fracture of the dendritic limb, and this will lean at a slight angle to the rest. When the large crystals grow on such a bruised dendrite, they show the slightly deviated parallelism. The deviated crystals are shown in Text-Figure 1 with the notation of "*D*".

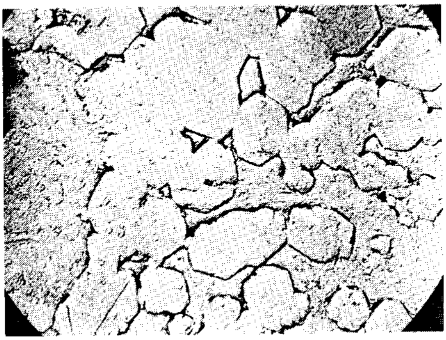
Secondly, triple-twins (*T*) can be seen. Three types of triple-twins may appear in aragonite aggregates, and all of these types appear in the photograph.

Papapetrov (1935) stated, when the solution is in the higher supersaturated condition, that is, in the labile condition, the rate of the crystal growth and the rate of the dispersion of the solvent come to be unbalanced and this results in the formation of the dendrite. Twins, too, result from the labile condition of the solution.

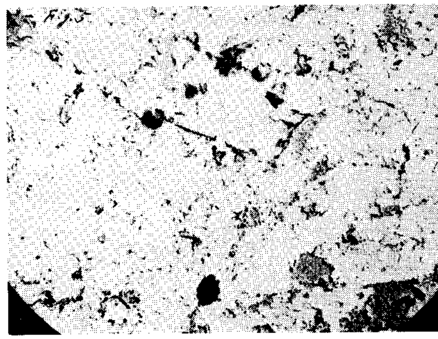
From these facts, it seems that the surface of this pearl has been formed from highly supersaturated solution of $CaCO_3$.

As the surfaces of the crystals are quite even, and the crystals are well shaped, this part of the surface shows the final stage of the crystal growth or aragonite. This is the type of surface most commonly seen in pearls.

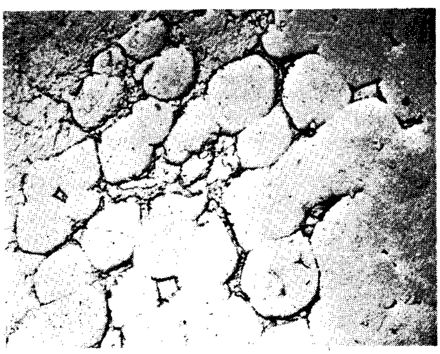
But another part of the same specimen shows a quite different view. As seen in Plate-Figure 2, though the surface is even and the mode of the aggregation of the crystals looks like that of Figure 1, the margins of the crystals are eroded. This figure shows that the crystals are dissolving. Examples of dissolving crystals can be seen more clearly on pearl No. 122, and most clearly on pearl No. 123.



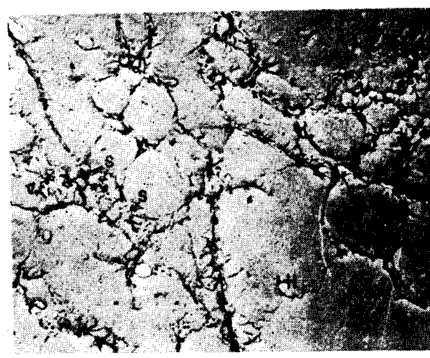
• *Figure 1*



• *Figure 2*



• *Figure 3*



• *Figure 4*

Pearl No. 122. (Plate-Figure 3 and 4; Text Figure 2).

Figure 3 shows that this surface is composed of rather rounded, semimorphic, aragonite crystals (1-5μ in size) and their aggregates indicate a different arrangement from that of pearl No. 121. This must have been caused by the irregular growth of the aragonite, as there is no regularity in the aggregates. Any other planes than (001) could hardly be decided, as these crystals show semimorphic forms.

In Figure 4, taken at another part of the same specimen, vicinal faces (*V*), and small rounded hill-rocks (*H*) are seen. Miers (1903) found that vicinal faces appear at an early stage of the dissolution, and rounded hill-rocks, too, are formed by dissolution. On the other hand, Borgström (1911) and others reported that the rounded

• *Figure 5*

• *Figure 6*

(curved) faces are often formed by the presence of impurities in the solution. Rounded hill-rocks often appear in many growing crystals. The presence of the vicinal faces is not rare.

But, in the present case, half part, or inner part of the crystals are destroyed. (*"S"* in Plate-Figure 4.) (Sketches of the destroyed crystals and their original forms are shown in Text-Figure 2.)

By these facts, the surface crystals in Figure 4 are considered to be partially dissolved.

Pearl No. 123. (Plate-Figure 5 and 6)

The surface of this pearl is composed of the aggregates of numerous fine nuclei of aragonite crystals (Figure 5), and no large, well-shaped crystals are observed. This figure may indicate the first stage of the crystallization of aragonite.

SIX—6154—Gemology—ft(2

Examples of partially dissolved crystals can be seen clearly in other parts of the same specimen (Figure 6).

SUMMARY

1. The surface of three cultured pearls were electron-micrographed.

Pearl No. 121:—the surface was formed by parallel dendritic growth of aragonite crystals with hexagonal idiomorphic forms. Triple-twins could be observed.

Pearl No. 122:—the surface was formed by the irregular growth of aragonite crystals with rounded semimorphic forms.

Pearl No. 123:—the surface was composed of the aggregates of the fine nuclei of aragonite crystals.

2. The dissolving figure could be observed in all of these pearls.

This will prove the writer's idea of pearl formation that the nacreous layer of pearls are formed by the repeated crystallization, partial dissolution and recrystallization.

NOTES ON MICROSCOPIC CRYSTALS

(Continued from page 207)

beauty, in the possession of Dr. Le Conte, presented a few distant, white silk-like lines, running in one direction, and parallel to each other. It is of unusual brilliancy and fine color and is thirteen-twentieths by eleven-twentieths of an inch in size.

Fig. 14. A *Pyrope* from New Mexico, in which the microscopic crystals differ from any of the many *Garnets* I have examined. In other specimens from this locality — of which I have examined twenty in the collections of Prof. Frazer and Dr. Le Conte — acicular crystals alone were found. In this specimen the crystals are much larger, less

in number and of an entirely different character. Some are geniculate and transparent, while some are dark or semi-transparent. A very short and rather thick crystal seems to present three sides of an hexagonal prism. These New Mexico *Pyropes* are of uncommon beauty and perfection. This specimen is in the collection of Prof. Frazer. His other seven specimens have acicular crystals. Of Dr. Le Conte's twelve specimens, six had acicular crystals, and six presented no appearance of inclusions. When the acicular crystals are examined in the direct rays of the sun at right angles to their axis, they reflect all the spectral colors in a very beautiful manner.

A small brilliant Ruby, which has the appearance of being oriental, but which may be a *Spinel Ruby,* was found to be very full of long acicular crystals which were observed to be in all directions, and were to all appearances the same as observed in *Precious Garnet.* A larger specimen has the same kind of acicular crystals, but in this specimen these crystals take generally two directions and are oblique to each other.

Two out of four other very beautiful small *Oriental Rubies — Sapphire* were found to have very minute acicular crystals. In one of them these crystals were in three directions; in the other they were in two directions. Both these gave that peculiar changeable band observed in the "Catseye" Sapphires. All these rubies were cut as brilliants and were of great beauty.

It is apparent that the microscopic crystals in the various minerals above described, cannot all be of the same substance. Their forms and appearance forbid that, and chemical analysis will never probably reach, with any degree of satisfaction, their ultimate constituents. Spectral analysis may, however, be able to give us some results when properly applied, which may in some measure satisfy us in regard to the composition of these interesting included microscopic crystals.

Some Freaks and Rarities

(Continued from page 202)

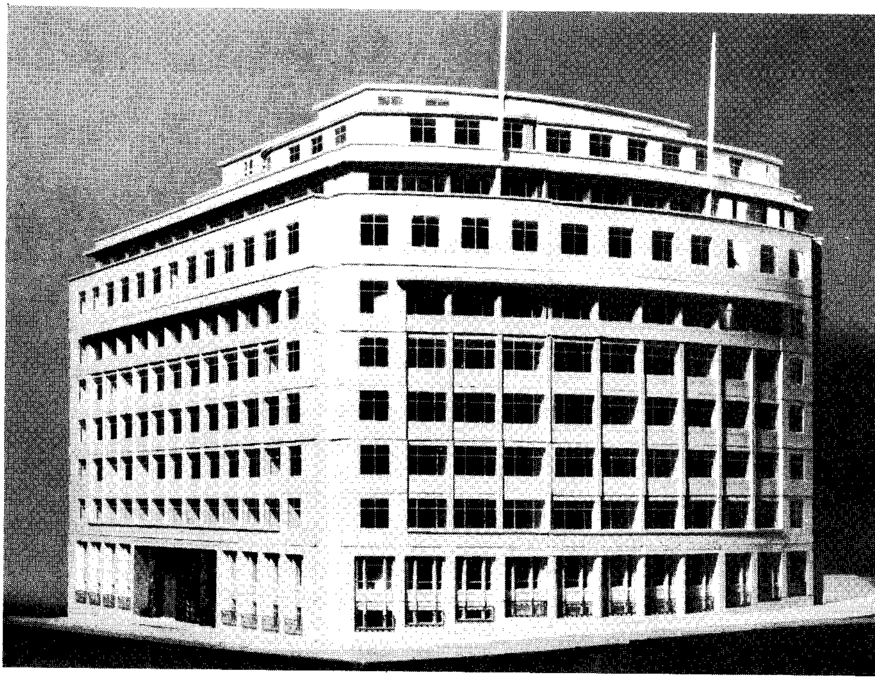
dividual crystals reaching four inches in length. A substantial number were perfectly clear inside and afforded excellent rough. Occasionally, color zoning is noted, generally in lighter shades of the basic brown.

Calcite is quite difficult to cut and polish; its softness, coupled with its three perfect cleavages, make the entire process one of considerable hazard. With a little foresight, the lapidary can orient the rough so as to place the principal axis of the crystal normal to the table facet. This has the effect of reducing the blurry appearance caused by high birefringence. When finished, the gem looks very much like a citrine of good quality with perhaps somewhat greater brilliance. A step-cut octagon of 44.5 carats is now in the collection of the U. S. National Museum.

MAGNESITE

Another carbonate worthy of mention is magnesite, not because it furnishes anything spectacular but because clear material large enough to facet is extremely rare. Accordingly, when transparent crystals of unprecedented size were obtained in Bahia, Brazil, during World War II, it created considerable interest in mineralogical circles. The occurrence was an isolated one, apparently, and the material brought to the United States soon disappeared into various public and private collections. A small cleavage rhomb of this material was cut into an octagon step of about five carats. It is absolutely colorless and, with the exception of several partially developed cleavages, is also flawless. During cutting, the greater hardness over calcite was easily apparent, as well as the increased difficulty in initiating cleavages.

(to be continued)



ARCHITECT'S RENDERINGS OF THE NEW BUILDING OF THE DIAMOND TRADING COMPANY

The new building of the Diamond-Trading Company, London, having frontages to Holborn Viaduct, Holborn Circus, Charterhouse Street, and Shoe Lane, is fast nearing completion. The northern half of the building is being erected by the Diamond-Trading Company, Limited, for their new London offices; their former offices on part of this site were destroyed by enemy action in May 1941. The southern half of the building is being erected by the Holborn Viaduct Company, Limited, and is being leased to the Anglo-American Corporation of South Africa, Limited.

The new nine-story structure is of reinforced concrete, the foundations being in the form of "cellular rafts," which, owing to the load of the building and restricted load on the subsoil, will cover practically the whole of the site. The external facing of the building will be of Portland stone. The Diamond-Trading Company's offices will be entered from Charterhouse Street, and those of Anglo-American Corporation from Holborn Viaduct.

The heating of The Diamond-Trading Company's part of the building will be by concealed radiant panels in the ceiling, controlled thermostatically for variations in outside temperature on each face of the building to ensure maintenance of an even temperature throughout.

Both parts of the building will be served by interconnected passenger elevators running 300 feet per minute, with power-operated doors.

The building will have two basements which will include a fully equipped garage, to be approached by a ramp from Shoe Lane. The basement adjoining Charterhouse Street has been constructed so that it would be easily converted into an air-raid shelter of the latest design.

Dining rooms and kitchens will be provided on the top floors of both parts of the building.

The floor areas of the two parts of the building are approximately 75,000 square feet for The Diamond-Trading Company and 62,000 square feet for Anglo-American Corporation. The building is expected to be completed by the end of 1955.

SIR JAMES WALTON
A PERSONAL TRIBUTE

We regret to announce that Sir James Walton died at his home in Mayfield, Sussex, England, on August 26, at the age of 74. On his retirement, after a very distinguished career during which he was surgeon to the Royal Household during three reigns, he became interested in gemology and took the gemological courses given by the Gemmological Association of Great Britain at Chelsea Polytechnic, London, with students from the trade. This hobby he encompassed with so much enthusiasm that he was soon elected an official of the Gemmological Association, and later was asked to become President of the National Association of Goldsmiths. He wrote several books on surgery and two on gemology; the most recent, *Physical Gemmology,* was published in 1952.

We, at the Institute, did not have the pleasure of knowing Sir James personally. The following is quoted from *Sir James Walton — A Personal Tribute,* which appeared in the September *Gemmologist,* and which was written by one who knew him well, Mr. B. W. Anderson, Director of The Precious Stone Laboratory of the London Chamber of Commerce, Hatton Garden, London.

". . . When the news went around at Chelsea that a Royal Surgeon was joining the gemmology classes, we wondered how so distinguished a person would mix in with the classes of far younger students. We need not have worried. Sir James was blessed with external youth and a zest for knowledge which made him an ideal student even though he was in his middle sixties. His friendliness and natural, easy good manners enabled him to mix well in any company.

". . . He was generous in his appreciation of other people's work, and never failed to make due acknowledgment for any data or ideas he might have borrowed in his lectures or writings. I have never known a man who was less of a snob nor one of such attainments who displayed so little awareness of his own importance. Though he was late in entering the brotherhood of gemmologists, he quickly gained the affection and esteem of us all. The gap in our ranks left by his passing will be sadly in the minds of many for a long time whenever gemmologists are gathered together."

DR. RAYMOND JENNESS BARBER

It was with deep regret that the Gemological Institute learned of the death of Dr. Raymond Jenness Barber, who passed away suddenly of a heart attack, October 28, in his home in Los Angeles. He was 70 years of age.

Dr. Barber, before his recent retirement, was Curator of Mineralogy and Petrology at the Los Angeles County Museum. After thirty years of mining engineering and fifteen years of university teaching, he devoted most of his time to mineral sciences. Barber was graduated from Massachusetts Institute of Technology in 1906. He had traveled to many different countries in his mining practices and geological explorations. A special lecturer at Stanford University, Dean of the School of Mines at the University of Alaska and, at one time, Barber was on the staff of the School of Engineering at the University of Southern California. During various sojourns in Old Mexico, he became interested in the "jade question." Opposed to those who thought the stones must have come from central Asia, because that was the only known source of jadeite, he advocated the existence of local quarries as yet not rediscovered. In 1951 and 1952 he spent most of his time in Oaxica, Mexico, investigating this question for the Los Angeles Museum. His article on *Jade in Mexico* appeared in the Spring 1952 issue of GEMS & GEMOLOGY. A later article on the *Nature of Jade* appeared in the Summer and Fall 1954 issues of GEMS & GEMOLOGY.

Contributors in this Issue

EDWARD J. GUBELIN, Ph.D., C.G., F.G.A., of the Editorial Board of GEMS & GEMOLOGY and a Research Member of the Gemological Institute of America, is the founder of the Gemological Institute of Switzerland. Born in 1912 Dr. Gubelin's interest in gemological research started in 1925, when his father provided a gemological laboratory for his use. Edward Gubelin has been conducting experiments and research ever since. Dr. Gubelin studied mineralogy at the University of Zurich. In 1936 he was sent into the Campolungo Domomite region to prospect for minerals occurring there. Following this, he spent a winter term with Professor H. Michel in Vienna, and in 1937 he attended a special course with Professor Dr. K. Schlossmacher in Konigsberg. Receiving his doctorate in 1938, he began his studies with the Gemological Institute of America, becoming a Certified Gemologist in 1939. In 1946 he received a fellowship from the Gemmological Association of Great Britain. He lectures yearly on gemology in both Britain and Sweden. He has done outstanding work with photomicrography and his book, *Inclusions as a Means of Gemstone Identification,* is well known by students of gemology. His article entitled, *Amblygonite Old Mineral—New Gem,* appears in this issue.

RUSSELL W. ANDERTON, while serving as a crash-boat skipper and stationed at Trincomalee, Ceylon, during 1944-45, did exploration of the Ratnapura gemming section. After the war he returned to Ceylon to study gem mining and local trading

Contributors in this Issue

methods. Returning to New York early in 1950, he was placed in charge of the Chivor-Somondoco Emerald Mines, Boyaca, Colombia. He experienced attempted murder, blackmail, pistol fights, and was arrested and held incommunicado for three days while working at Chivor—the result of using the wrong type of visa. After a struggle for control of the mine, it was closed and Anderton returned to New York. His article entitled, *Report on Chivor Emerald Mines,* appeared in the Winter 1950-51 issue of GEMS & GEMOLOGY, shortly after his return to the United States. At the present time Anderton is president of the Anderton-Colombia Mines, Limited, which presently holds concessions on assorted minerals in the Province of Cundinimarca, which is located close to Chivor on the Haciena de Monte Cristo. His latest article entitled, *The New Gachala Emerald Mine in Colombia,* appears in this issue of GEMS & GEMOLOGY.

COMMANDER JOHN SINKANKAS, U. S. NAVY, now stationed at Coronado, California, joined the Navy as an Aviation Cadet in 1936, following his graduation from the New Jersey State Teacher's College, Paterson. In 1937 he received his Naval Aviator's wings at Pensacola, Florida.

He had already developed a keen interest in the science of gemology and was an amateur collector of minerals. Realizing the impracticality of this phase of his hobby when he joined the service, he decided on a new approach to the subject, and in 1947, he began a study of gemstones and lapidary craftsmanship. He received his gemologist diploma March, 1951.

Commander Sinkankas specializes in the cutting of extremely soft, brittle, and difficult gemstones. A number of cut specimens of his work are presently in the collection of the United States National Museum, including a 578-carat oval brilliant-cut aquamarine and a 50-carat step-cut rock crystal. The rock crystal is unique in that it is cut from synthetic quartz, perhaps the first of such size ever to be cut. Just recently the Museum was the recipient of a 20-carat zincite and a 327-carat yellowish-green spodumene of his cutting. He is the discoverer of the third known source of rhodolite garnet. This latest source is located in a fjord known as the Sondrestromfjord, just above the Arctic Circle on the West Coast of Greenland. The discovery was made in the summer of 1942.

In addition to maintaining and adding to his fairly extensive collection of rare and unique gemstones, Commander Sinkankas has found time to write numerous articles for *Rocks and Minerals* magazine. His article, *The Gem and Ornamental Stone Market in Hong Kong Today,* appeared in the Summer and Fall issues of GEMS & GEMOLOGY. He is also the author of *Gem Cutting, A Lapidary's Manual,* which is just off the press. His article, *Some Freaks and Rarities Among Gemstones,* appears in this issue.