Gems & Gemology

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Hawaiian Peridot*

by

E. L. VAN PELT

U. S. S. Litchfield, Pearl Harbor, T. H.

Were tradition true, and peridot did glow at night, the Hawaiian Islands would indeed be well lighted. The mineral may be found on all the islands in most of the intrusive and extrusive lava. It occurs in the basalt and ranges from minute crystals to pieces one inch in diameter. Unfortunately the larger pieces are generally fractured and disintegrate as the lava exfoliates. In some localities, it is the only mineral which has crystallized in an otherwise fine-grained basalt.

On the island of Kauai, a cliff of basalt two or three hundred feet high and extending for several miles is impregnated with peridot of varying sizes. The Hawaiian Geological Survey has collected several pounds of peridot from Mauna Loa. Several of these, if cut, would be approximately three carats. Near Hilo in Hawaii, is a beach composed of black sand in which peridot can be found large and clear enough to be cut. This is the only spot, to my knowledge, where peridot is sought by local dealers. The hardness of the basalt in which peridot occurs prohibts mining in any other than alluvial deposits. Of the five large islands in the group, Hawaii seems to have the widest occurrence of the green mineral.

In Honolulu, Dawkins-Benny Company are the only people who have peridot cut. They have been sending these stones to the states for the last four years in lots of a hundred or more. Up to date, the demand is only in Hawaiian fraternity and lodge pins, very few of the stones being large enough for single ring sets. The average weighs about one-half carat. Mr. Benny informs me the supply is considerably greater than the demand. It may be of interest to know the clear, elongated crystals are circled in a gold band and used with other Hawaiian miniature articles in charm bracelets which seem to be popular at the moment. As far as they know, peridot from Hawaii has not been marketed in the United States.

In the Bishop Museum of Hawaiian Native History, there is a very complete collection of adornments and jewelry, but peridot has not been used. The only stones used by the native Hawaiian was nephrite, which is from a source further south.

Inasmuch as very little of the islands have been covered and the rocky interiors have never been surveyed closely, I believe Hawaii to be a probable source of gems. Corundum has been found. Nearly all types of metamorphism have occurred and most of the basalt is highly crystallized. No one has diligently searched for peridot because without trouble the supply can be found to meet the demand, and, as elsewhere, the people have not been educated to colored stones.

*G.I.A. Research Service.

The Detection of Synthetic Emerald*

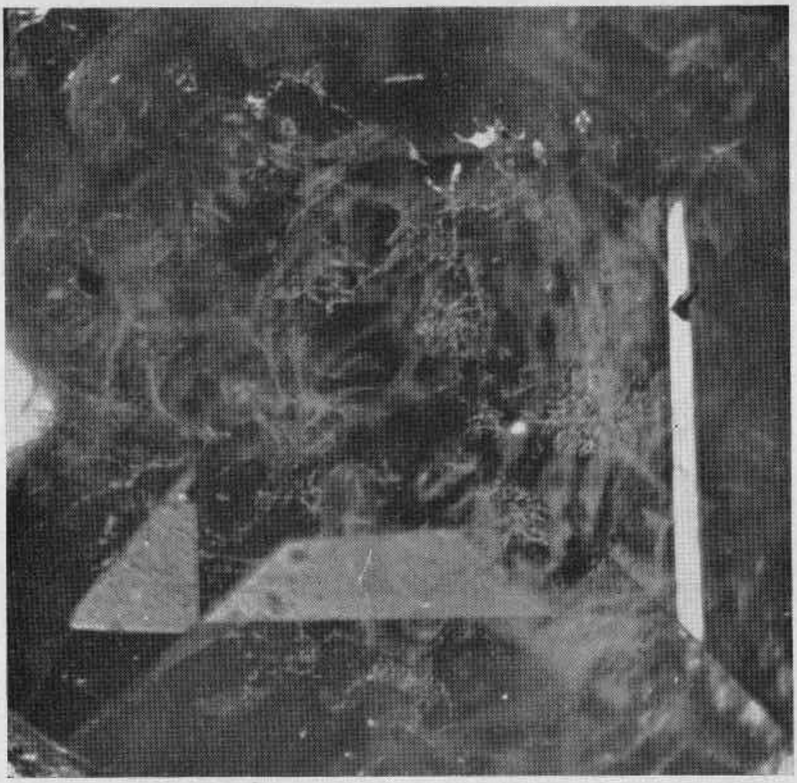

Figure 1. *Fashioned Specimen of Synthetic Emerald, Photographed by Dark-Field Illumination through Diamondscope, Showing "Wisp-Like" Inclusions.*

Detailed information concerning the synthetic emerald which is in process of development in Germany has spread more or less generally to the trade. As has been pointed out before in *Gems & Gemology* and in several other journals, this material—which is probably to be marketed under the trade term Igmerald, when and if it does reach the market—is truly green beryl produced by an artificial process and may take its place along with other synthetic reproductions of gem species.

It is quite doubtful that as yet any of this material has been released to the trade. Harold D. Feuer, C.G., of New York City, learned while in London last year, that the I. G. Farbenindustrie had sent a few cut specimens of this synthetic material to the firm of E. & E. Hopkins. These

*A.G.S. Research Service.

stones had been sent in order to obtain Messrs. Hopkins' opinion as to what method of handling them would be the most satisfactory and also what prices might be charged for them. Apparently the I. G. Farbenindustrie is feeling its way in an attempt to market the material profitably. From scanty information obtained regarding costs of production, it seems likely that a fairly high price will have to be charged for the material and this may be preventing its appearance on the market until more economical methods of manufacture, permitting sale at reasonable prices, have been developed. At the same time Mr. Feuer was in London, Messrs. Hopkins had sent one of the specimens of synthetic emerald in a paper of miscellaneous stones to the laboratory of the Diamond, Pearl and Precious Stone Section of the London Chamber of Commerce where it was promptly and accurately identified as synthetic emerald by B. W. Anderson, Director of that laboratory.

Unfortunately, either correct reports have been misunderstood or false reports have been circulated to the effect that the synthetic emerald is already available somewhat generally in the trade. Several known sales of green glass and doublets or triplets as the "new synthetic emeralds" have been made, probably upon the strength of these reports. These substitutes, of course, are very easily distinguished from genuine emerald, since their physical and optical properties are different from those of the genuine stone.

The synthetic emerald will not be distinguishable upon the same basis as these substitutes are, but will necessarily be detected by differences similar to those employed in distinguishing between natural and synthetic rubies and sapphires. Any jeweler who can learn to distinguish accurately between synthetic ruby and sapphire and the genuine material should be able to learn to distinguish the synthetic emerald with equal ease, unless the characteristics present in the stones produced to date are eliminated by vastly improved methods of manufacture.

The Gemological Institute first received specimens of synthetic emerald in 1935. These were not by any means the first synthetic emerald. As a matter of fact, tiny specimens of synthetic emerald were produced by Hautefeuille and Perry well before the end of the nineteenth century. The synthetic emeralds which are the subject of recent discussion are the result of a number of years' research on the part of Dr. Espig and Dr. Jaeger of the I. G. Farbenindustrie at Bitterfeld, Germany. The crystals produced by Hautefeuille and Perry were very tiny, whereas those produced by Espig and Jaeger are of sizes which permit cutting of gemstones.

The specimen of synthetic emerald which was first tested in the G. I. A. laboratory was a hexagonal prism, near the center of which was attached a large group of tiny crystals. Two stones fashioned from another prism of this description were tested at the same time. The research which was inaugurated on this material in 1935 has been conducted at intervals, and is still in progress today. During this three-year period, the manufacturers have effected a slight improvement in the rough form of the synthetic material, making it more adaptable to fashioning. The tiny crystals which were attached to the center of the prism and which made it impossible to cut the prism into a single stone have been eliminated, and, therefore, the rough synthetic crystal can be fashioned with much less waste than would have been possible with the older form. Prof. Dr. Schlossmacher has been informed by the I. G. Farbenindustrie that at the present time they can produce fair quality cut stones as large as 1.10 carats. However, very little improvement in physical and optical properties can be noted between the crystals and cut stones mentioned above (believed to have been manufactured prior to 1930) and those which have been secured most recently—perhaps having been manufactured as late as the early months of 1937.

Fortunately for the emerald market, the characteristic inclusions of the synthetic stones are even more prominent in later specimens than they are in those of earlier manufacture. This may indicate that the manufacturing process is being speeded up and that more of these markings result from the increased difference between the synthetic production and the formation of the natural.

Altogether, the Gemological Institute laboratory has been able to make thorough tests on seven specimens of synthetic emerald. These were two of the crystals manufactured prior to 1930 and two cut stones fashioned from one of the prisms of this sort; a poorly formed rough crystal secured in Germany by Lala Penha, C.G., in 1937; and a comparatively perfectly formed hexagonal prism and a cut stone secured in Germany by Dr. Frederick Pough of the American Museum of Natural History in 1937.

All of the synthetic emerald specimens tested by the G. I. A. are measurably lower in refractive index than any genuine emerald which has ever been handled in the laboratory, and lower, in fact, than the values given by any reliable authority. The refractive index of the synthetic material varies between 1.560 and 1.565 for the ordinary ray. This is measurably lower than the average refractive index of 1.583 for the ordinary ray of genuine emerald and, in fact, is comfortably below the index of

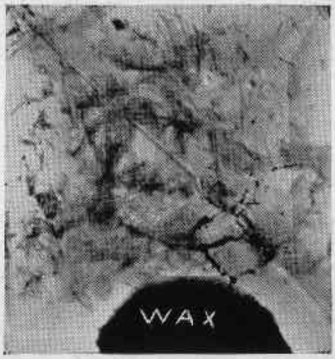

Figure 2. *Same Stone as Figure 1, Photographed by Transmitted Light.*

1.577 for the extraordinary ray. Since the extraordinary ray for each of the synthetic emeralds was definitely below the top limit of 1.565, there is a gap of .01, at the least, between the average reading for genuine emerald which would be obtained on a gemological refractometer and the highest reading which would be encountered with any of these synthetic specimens so far tested. This actually is not enough of a division to be relied upon *entirely* for distinguishing the synthetic material, but it does serve as a valuable indication. The most accurate refractive index measurement made on the synthetic emerald material in the G. I. A.

laboratory was that of the cut specimen lent by Dr. Pough, which was measured by the minimum deviation method with a Gaertner Research Spectrometer. The value 1.562 was secured for the ordinary ray and, since beryl is positive in optic sign, the extraordinary ray has a lower refractive index than this. The cut stone was oriented in such a way that it was not possible to make a definite measurement of the extraordinary ray, but the birefringence was measured as accurately as possible with a carefully adjusted refractometer and a value in the neighborhood of .004 was obtained. This would place the extraordinary ray in the vicinity of 1.558.

Several authorities have advanced the difference in dichroism in synthetic and genuine emerald as a possible means of distinction. In all the specimens tested in the G. I. A. laboratory it was found that the dichroism of the synthetics is somewhat stronger than that of genuine emeralds of similar color. However, this test is of doubtful value to the average jeweler since the difference in dichroism cannot be carried in the mind, and only a comparison of pleochroic colors with those of a genuine emerald of essentially the same color could be used even as an indication.

The fluorescence of the synthetic material is a valuable means of detection. The first experiments made in the G. I. A. laboratory in this connection were carried out with a carbon arc filtered through a Wood's filter. With the exception of one of the specimens (the one secured by Mrs. Penha), the fluorescence of all of the synthetic material is noticeably stronger than that of any genuine emerald ever handled by the G. I. A. laboratory. The Penha specimen also shows stronger than ordinary fluorescence under the carbon arc but considerable care is required in its observation. Recent experiments with a cold quartz tube produced by the R. & M. Manufacturing Company, Pasadena, California, discloses that this unit, filtered through the special Corning glass filter supplied with it, shows more difference between the Penha specimen and genuine material than the carbon arc does. Since its publication by the G.I.A. in 1935, the value of the fluorescent effect of the synthetic emerald as a means of its detection has been confirmed by several authorities.

The specific gravity of all seven of the synthetic emeralds tested by the G. I. A. is the same within very narrow limits. Unfortunately, however, this value lies well within the range of genuine emerald; and, although it is near the lower limit of the values obtained for the genuine material, the overlapping values of genuine emerald make it impossible to use this test as a means of distinguishing the synthetic.

From the study made of the several specimens of synthetic emerald it is apparent to the Research Staff of the G. I. A. that unless radical changes are made in the manufacturing process, the inclusions will serve as the primary distinguishing feature of the synthetic material. The peculiar irregular crack-like or wisp-like markings clearly illustrated in the accompanying photographs are so different from any inclusions ever reported as occurring in genuine material, that a careful inspection of any of the synthetic material with a 10x loupe by a jeweler familiar with the differences in the inclusions should be sufficient to distinguish

Figure 3. *Synthetic Emerald Crystal, Photographed through the Diamondscope by Dark-Field Illumination.*

accurately between synthetic and genuine emerald. The fact that the characteristic inclusions are more pronounced in the more recent specimens than in earlier ones makes it reasonable to doubt that improvement of manufacturing processes is likely to make the material more difficult to distinguish from genuine emerald. The concern of the manufacturers, one may logically assume, is more to secure a product adaptable to fashioning at the lowest possible cost. If costs are to be reduced, it is essential that the manufacturing process be as brief as possible, and the hastening of the manufacture is likely to produce more rather than fewer of these distinguishing markings.

As pointed out at the first of this article, there is no reason to believe that synthetic emerald is yet available in the trade. However, it should be worth while for every jeweler who handles emeralds to study the inclusions both of his present emerald stock and those of any new material which he purchases. There is a possibility, however remote, that he may find a synthetic stone among new stock of emeralds around one carat which he purchases; but, of more practical value, he will thus familiarize himself with the appearance of the inclusions of genuine emeralds and will be able to recognize the synthetic emerald with greater ease when—and if—it does appear in the market.

ANOTHER STAR SAPPHIRE SUBSTITUTE*

A new variation of very slightly pinkish star quartz with blue backing to simulate a star sapphire is now on the market. This substitute, instead of being backed with a section of blue glass, as was the material reported in *Gems & Gemology* for Summer, 1936, is coated on the back with blue coloring. Tests in the G.I.A. laboratory indicate that this coloring is more resistant to the effects of heat and solvents than is the attached blue glass. However, the thin film of color has the disadvantage of being easily scratched; and the scratches may appear from the top of the stone to be flaws. The possibility of scratching can, of course, be materially lessened by setting the material in a closed mounting. Proprietors of retail jewelry stores should instruct their manufacturing or repair departments to use great care against scratching the backs when sizing or repairing.

This newer type of material is definitely not an assembled stone, but a stone with a color coating applied to the back. It is more related to foil backs or coated stones and probably will be classed with the latter. It is easily recognized when viewed from the base, since the coloring material is decidedly different in appearance from the surface of the stone. This coating may easily be scraped off with a knife.

Reports have reached us that there is a rumor that the Institute, Society or Robert M. Shipley has recommended this stone. It must again be stated that such recommendations are *never* given for *any* stones or jewelry. Recommendations of jewelers' merchandise are limited to gem-testing instruments.

It has been reported in the trade that a star sapphire doublet has been observed, set in a man's gypsy ring, backed with a natural rough sapphire with a top of "white" (presumably almost colorless) star sapphire. The edges of the separation plane were apparently covered by the mounting. The pieces were reported as joined by blue coloring matter.

Although this doublet was reported as having a white top of genuine sapphire, the colorless star quartz might also be used if the manufacture of star doublets with genuine backs is to reach any appreciable proportions.

The detection of such doublets would be to observe them for color from the side, by transmitted light. Also, the usual tests of observing the reflection from the separation plane and of immersion.

CULTURED PEARLS

An increasing number of reports are being received from members on the wearing off of the nacre of *small* cultured pearls in necklaces, with the resulting exposure of the mother-of-pearl base.

*A.G.S. Research Service.

GEMOLOGICAL GLOSSARY

(Continued from last issue)

(With phonetic pronunciation system.)

Terms in quotation marks are considered incorrect.

Noble Opal. Precious Opal.

Nodule (nod′ule). Small shapeless knot or lump of mineral or rock sometimes enclosing a foreign body in the center.

Nomenclature (noe′men-klae′ture). The system of names used in any science.

Nugget (nug′et or nug′it). Rounded, irregular lump, especially of a metal.

Nyf (nif). Outer coating or "skin" of an uncut diamond crystal.

Obsidian (ob-sid′i-an). A natural glass, sometimes cut as gems. Opaque to transparent black, gray, yellow, brown, or red; also greenish or bluish. Hardness, 5 to 5½; Specific Gravity, 2.3 to 2.6; Refractive Index, 1.5 to 1.6.

Occident (ok′si-dent). Europe and America, as differentiated from the Orient.

Occidental Amethyst. True amethyst (quartz).

Occidental Cat's-eye. Quartz Cat's-eye.

Occidental Chalcedony. More opaque than Oriental Chalcedony.

"Occidental Diamond." Rock crystal (quartz).

"Occidental Topaz." Citrine (yellow quartz).

"Occidental Turquoise." Odontolite.

Occurrence (o-kur′ens). The manner in which gem-minerals are found in the earth's crust.

Ocherous or Ochreous (oe′ker-us). Earthy and usually red, yellow, or brown in color.

Octahedral (ok″ta-hee′dral). Referring to or resembling an octahedron.

Octahedron (ok″ta-hee′dron). A crystal form in the cubic system having the appearance of two four-sided pyramids united base to base.

Odontolite (oe-don′toe-lite). Fossil bone or tooth colored blue by a phosphate of iron. Known incorrectly as "bone turquoise."

Odor. A test made by heating, breathing upon, rubbing, or striking a mineral. Rarely of value in gem identification except in distinguishing amber and its substitutes.

Oeil de Boeuf (Fr. "Bull's-eye" or "Ox-eye"). Labradorite.

Off Color. Having a tint of undesirable color.

Old Mine. Refers usually to old-style deep cut and (usually unevenly) cushion-shaped diamonds.

Old Rock. A term applied to turquoise which holds its color more or less permanently.

Oligoclase (ol′i-goe-klase″). A mineral of the feldspar group; most sunstone and, rarely moonstone, is oligoclase. R.I. 1.543, S.G. 2.65, Hardness 6-7. Triclinic crystal system.

Olivine (ol′i-vin or vene). A mineral species. Same as Peridot.

"Olivine." Incorrect name for demantoid (andradite garnet).

Once. The square of the weight of a pearl, used in calculating the value. Also known as the "dollar base."

"One Year Pearls." Cultured pearls with exceptionally thin nacreous layers.

Onyx (on'iks or oe'niks). A variety of quartz arranged in alternate straight parallel layers of different colors.

Onyx Marble. A translucent compact calcite with straight parallel markings.

Onyx Opal. Opal, usually common opal, with straight parallel markings.

Oolitic (oe"oe-lit'ik). Containing or consisting of small rounded particles, suggesting fish roe.

Opacity (oe-pas'i-ti). State of being opaque.

Opal (oe'pal). A gem mineral characterized by play of color due to interference of light. R.I. 1.45, S.G. 2.2, Hardness 5-6½. Amorphous.

Opal Agate. Banded opal having alternate layers of opal and chalcedony (agate).

Opal Dirt. The opal-bearing layers of soft material like clay, or clayey sand, usually less than three feet in thickness, underlying a sandstone cap in most Australian deposits.

Opalescence (oe"pal-es'-ens). A milky or pearly appearance, not to be confused with the *Play of Color* exhibited by opal. See also *Girasol.*

Opalescent Cat's-eye. A somewhat misleading term sometimes applied to chrysoberyl cat's-eye.

"Opalescent Chrysolite." Greenish chrysoberyl or corundum, exhibiting opalescence.

Opaline (oe'pal-in or ine). (1) Opal Matrix. (2) Pale blue to bluish-white opalescent corundum.

Opaline Feldspar. Variety of Labradorite.

Opalized Wood. Wool opal. Silicified wood. Xylopal. A variety of common opal in which wood has been petrified by opaline material retaining the woody structure.

Opal Matrix. Opal with portions of matrix included in the fashioned gem.

Opal Onyx. Alternate layers of common and precious opal.

Opaque (oe-pake'). Transmitting no light, opposite of *transparent.*

Optic Axis (op'tic ak'sis). In any doubly refractive substance, a direction along which no double refraction occurs.

Optic Character. Refers to the optical properties in general of a mineral, especially the number and position of the optic axes, and the type of double refraction.

Optical Properties. The various effects of a given substance upon light. Refractive index (R.I.), birefringence and double refraction, dispersion, pleochroism, and color are the most important of these from a gemological standpoint.

Optics. The division of physics which covers the behavior of light.

"Orange Topaz." Same as "Spanish Topaz" (quartz).

"Oregon Jade." Californite (vesuvianite) or green Grossularite Garnet.

Organic. Belonging to the animal or vegetable kingdoms.

Orient (oe'ri-ent). A literary word meaning Asia. Also, a term applied to the play of color on the surface of pearls.

(to be continued)

BOOK REVIEWS

***Praxis der Edelsteinbestimmung*, by Prof. Dr. Karl Schlossmacher. w.w. Ed. Klampt, Neurode (Eulengebirge) Germany. 1937.**

The above is an extremely practical book on the identification of gem stones, prepared by a man who, since his masterful revision of Bauer's *Edelsteinkunde*, is recognized as one of the foremost international authorities on gemology. Prof. Schlossmacher develops his text after a manner which we feel is ideal. In a simple and easily understandable manner he first describes the various properties upon which tests depend, then proceeds to the actual use of instruments in gem identification, and finally to the method of identifying an unknown stone from tests made.

The book is a small one of 128 pages, is intensely practical throughout. It concerns itself only with the simple instruments, and with methods which the average jeweler might reasonably be expected to use. In fact, it is so arranged that even though the jeweler may have but a few dollars' worth of instruments, he can secure the identity of a considerable proportion of unknown stones. Particularly praiseworthy is the system of identification which, if followed at all carefully, will prevent incorrect identifications even though only the simpler instruments are used. This is a great failing in almost every book or article covering determinative gemology which we have ever seen.

Prof. Schlossmacher's tables are arranged according to his system of identification and in such a way that they can be used for reference during the identification procedure. In addition to the tables themselves, each of the important gem species is described in sufficient detail to aid materially in recognizing it.

The only possible criticism which we might make of *Praxis der Edelsteinbestimmung* is that it is not written in English. We hope that before long an English edition may appear.

***Jewelry, Gem Cutting, and Metalcraft*, by William T. Baxter, New York, McGraw Hill, 1938.**

Although this book has been prepared for the amateur, the information in it concerning jewelry manufacturing is very practical, even as a basis for one who desires to go into practical shop work. The material is carefully written; much attention is given to the working details which often are so difficult to pick up from a textbook.

Another commendable feature of the book is that it describes methods of working with simple and inexpensive equipment, making it practical for the amateur who does not wish to invest heavily in equipment. Undoubtedly, many jewelers receive requests from customers who wish to secure a book of this sort, and Mr. Baxter's work can surely be recommended.

The chapters on gem cutting are likewise full of detail. Most of the equipment described is not too expensive and some jewelers might find the process valuable in repairing or refashioning the less expensive gems which they may have to mount.

The section on gem identification leaves much to be desired. Some of the tests are good, but unfortunately many of them have already been found impractical, others unreliable. No definite system to be followed in identification is described and without tables of gem properties the section is quite useless for any practical purpose.

Much of the material included in *Jewelry, Gem Cutting and Metalcraft* will already be familiar to the readers of the excellent journal, *The Mineralogist,* in which certain chapters have previously appeared.

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THE END

The Westward Course of Zircon*

by
C. A. ALLEN, J.G.
Cranbury, N.J.

I have known some Bankok dealers to keep these stocks for several years, but I have never known of anyone who made money by doing so, while I have known several who have lost a great deal. No one yet has been able to control the market; he usually runs up the prices so high that he is finally left high and dry.

The gamble of dealing in zircons is twofold: first, a knowledge of the rough is essential. There are rough stone experts who will act as consultants, and unless a dealer is confident of his own ability it is well to employ such an expert. While all the rough has much the same appearance, some of these people are able to tell approximately the source, and it is well known that stones from certain districts are of a better quality than others when heated. These stones command high prices.

Second, and this is of supreme importance, one must know how to heat the rough. Much has been written concerning this, so it would only be repetition to give further detail here, but this is the test of a dealer's ability to remain in the business or to close up shop. The average zircon dealer does not remain in business more than a few months. The successful, and reputable, dealers in Bangkok can be counted on the fingers of one hand.

With regard to the cutting and polishing, good cutters can be obtained, but it is a matter of years to gradually build up an expert—and honest—staff. The average cutter requires constant supervision, otherwise he will switch the good pieces of rough handed him and dispose of them on the side. There is no dishonesty if one is not caught; it is looked upon as a matter of wits. When an employer is able, over the years, to get together, by a weeding-out process, a dozen men at the wheels whom he can rely upon, not only to cut well but to hand back the results of the rough given them to work on, that employer has a group he is loath to let go when business, as at the time of writing, is poor.

All in all, zircons involve the risks attached to dealing in other gems plus the added risk involved in the process of heating, for all zircons, today, are heated. Could a process be discovered which would eliminate this latter risk, it would save many native dealers from becoming prematurely aged.

The lovely blue, or brown, or colorless gem that has so captivated the imagination of people as to be in increasing demand is thus seen to have come a long way from the small pit in the jungles of Annam, where it was first picked out of the earth by the "wild men." It has been handled, and haggled over, by Burmese, Siamese, Indian, and Chinese. It has been the cause of disastrous failures on the part of those who do not understand its properties. It has successfully experienced a beautifying process that has conquered about sixty per cent of its fellows. And it now flashes its brilliance in all parts of the world where, justly, it is still considered the "Gem of Mystery."

(The End)

*G.I.A. Research Service.

A NOTE ON DIAMONDS*

The following paragraph, including an important definition, has just been added in the textbook "Gemology," used in the A.G.S. and G.I.A. courses:

"The color of a diamond, as it is seen by the eye, may be affected (1) by the comparative amount of the various spectrum colors which it disperses, and (2) by the color of the light reflected from sky, walls, ceiling or other objects. Upon examination by transmitted light against a white, neutral gray, or black background, the true color of the diamond itself is observable, and the resulting appearance is known as the BODY COLOR. However, if colored reflections fall upon those surfaces of the diamond which are toward the eye, the true body color may not be observable." (If colored reflections fall upon a white background against which the diamond is being examined, they will also affect the body color.)

NEW G.I.A. HAND LOUPE

The Gemological Institute, in response to many requests, has just placed on the market a special registered *hand* loupe. This is a 10x triple aplanatic lens corrected for spherical and chromatic aberration, just as is the registered eye loupe. The lens itself has a usable diameter of five-eighths of an inch, appreciably larger than any other diamond loupe on the general market. It will cover a very large field, a great convenience in examining gems, as even the largest stone commonly handled will be easily seen in its entirety through the lens and, in the case of jewelry pieces, several mounted stones can be seen at one time. The lens, of course, passes the critical tests for sharpness of focus and flatness of field given to all lenses before they are registered by the G.I.A. The hand mount folds to protect the lens from damage, and the unit is furnished with a handsome leather case. The price is the same ($12.50) as that of the registered eye loupe.

TOUGHNESS OF SPINEL

It has proved extremely difficult to obtain accurate or detailed information regarding the comparative toughness of genuine spinel. This is probably due to the comparatively small number of genuine spinels sold in the U.S.A. Several reports received are from jewelers whose past experience has indicated to them that spinel lacks toughness; others state that in their experience spinel has proven unusually tough. We solicit information as to the actual experience in:

(1) the liability of genuine spinel to break.

(2) its liability to surface fracture or "pitting."

(3) whether genuine spinels of certain colors are less tough than others.

*A.G.S. Research Service.

A GEMOLOGICAL ENCYCLOPEDIA

(Continued from last issue)

HENRY E. BRIGGS, Ph.D.

CORUNDUM (Continued)

Colorless sapphires are met with which are of natural origin, but they are never entirely pure. However, the synthetic colorless sapphire is so nearly entirely pure that it is difficult to detect the impurities. All colored corundums owe their color to the presence of some foreign matter or mineral such as iron, chromium, titanium, soda, etc. When magnesia is present it changes the crystalline structure of the gem to form spinel.

Corundum is often found which, due to peculiar crystallization, will exhibit a six-rayed star (asterism) when cut en cabochon. Such stones are called asteriated gems, or star gems. These are most often met with in the sapphires, although they are not uncommon in the ruby-colored stones. The specific gravity of corundum is variable, ranging from 3.9 to 4.15. The principal localities for corundum are: Montana, Burma, Ceylon, Australia, Siam, Siberia, and North Carolina.

Ruby is one of the most valuable of all the gems and second only to the priceless emerald. It is rarely found in a perfect gem and any gem which appears to be very transparent should be carefully examined to make sure it is not a reconstruction or a synthetic. Silky looking streaks, inclusions of other mineral and white opacities called "chalcedony patches" are the most frequent imperfections in ruby. Sapphires usually lack transparency and seem to be filled with shining silky looking streaks; however, really fine stones do occur, and more often in a high degree of perfection than the ruby. Such stones, when of good color, are usually quite valuable, especially if of any great size.

Really fine gems in either sapphire or ruby are rather scarce and when a stone offered for sale is apparently of fine quality, it should be carefully examined according to the directions given in this volume for determining the genuine from the artificial before any purchase is made. Corundum is artificially made today, perhaps the most skillfully of any of the artificial gems. And for this reason it is necessary for the buyer to fortify himself with means for discriminating between the genuine and the artificial.

Ruby of fine quality and color will often bring as much as $1800 per carat, and cases are on record where they have sold for much more. Sapphire is of far less value, being worth, in fine quality and color, about $125 to $150 per carat. The poorer qualities and colors of both these stones will sell for much less, running as low as $5 per carat for poor grade of sapphire.

Corundum is usually cut brilliant, or trap cut, but of late many fancy shapes in both sapphire and ruby have been put on the market. The stone has little or no fire and depends entirely on color for its charm. A cut which shows the color to best advantage is the most desirable. The color in corundum is often patchy and in bands and a cut which will tend to disperse this color throughout the stone is the most desirable in such stones; the brilliant pattern would probably be the most effective in most cases.

PEARL

The gem of the sea is one of the most beautiful of gems and one which is surrounded with more lore than any of the others, with perhaps two exceptions. It has enjoyed popularity down through all the ages. It has always marked the ensemble of the wealthy and aristocratic and to possess fine pearls seems to have always been a mark of distinction. What queen's jewels would be complete without the ropes of pearls? Or, indeed, what woman does not crave a beautiful string of pearls?

The ancients, no doubt, were more impressed with the gem of the sea than with the mineral gems, because of the fact that it was difficult for them to distinguish between the different varieties of mineral gems, while the pearl always stood out alone. To them it was inimitable, and, indeed, it remains so even today, the paragon of excellence, truly worthy of its place in the precious gems beside the other gems of glory.

From the viewpoint of the mineralogist the pearl is merely a concretion of conchiolin (organic matter), aragonite (orthorhombic calcium carbonate), and calcite (hexagonal calcium carbonate). The greater part of the pearl consists of aragonite and a small amount of conchiolin in alternating layers. However, occasionally, we will find the calcite form in pearls also.

The beautiful luster of the pearl is due to the breaking up of light by its laminar structure. The indices of refraction of the organic matter and the aragonite are different and, consequently, interference of light will occur, accounting for the beautiful, changing colors we see in a fine pearl. The tint of the gem is always due to some of the common pigments and the colors which are commonly found are pink, cream, bluish, reddish, violet to purplish, and, rarely, greenish to black.

The pearl, being mostly aragonite, would, of course, be orthorhombic in form crystallographically; its hardness is 2.5 to 3.5; specific gravity, 2.5 to 2.7; streak white; luster nacreous in quality and shining to dull in intensity.

The pearl is formed by the intrusion of a particle of foreign matter or of some parasite into the body of the mollusc. To protect its tender body from the irritation of the intruder, the mollusc secretes a deposit about the particle, and thus starts the pearl. Eventually, as the shell of the mollusc is worn down it is necessary for nature to replace this wear. This is accomplished by the mollusc's secreting a deposit over the inner surface of the shell. If the pearl is started within the shell it, too, will receive a coat of this substance, and thus it will go on growing in size until the mollusc is gathered by the pearl-divers, or dies of natural causes, or is consumed by one of its enemies.

(to be continued)