Gems & Gemology

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Gem Myths Common to the Peoples of Eastern Asia and The American Indians Suggest Possible Contact Between These Peoples

by

SYDNEY H. BALL, Ph.D.

Myths furnish us some of our most amusing tales about gems. For example, Abraham, according to the Talmud, seems to have been inordinately jealous of his rather ample supply of wives; in consequence, he immured them in a castle without windows. Nevertheless, the castle was brilliantly lighted by bowls of luminous precious stones placed in the various rooms.

Again, take Sinbad the Sailor's tale of the Valley of Diamonds. Abridged it is as follows: In his time, which long antedated that of meat rationing, diamonds occurred only at the bottom of an inaccessible canyon. The local "miners" took young lambs, skinned them and threw the carcasses into the abyss. Immense birds of prey swooped down into the valley and, seizing the meat in their claws, bore it to the adjoining heights. The "miners" then frightened off the birds and recovered the numerous diamonds which adhered to the carcasses. The earliest form of this myth is given by the old churchman, Epiphanius (4th century of our era), although in his version the stone recovered was the sapphire.

These myths in some cases are purely fabrications, like the so-called gem dealers' tales. The dealers considered that, by concealing the true source of their gems, they could charge their customers a higher price for the gems; other myths undoubtedly originated from some ancient religious ritual or some other tribal ceremony or custom; others were engrafted from the culture of nearby peoples.

Some of the myths are of practically world-wide distribution; for example, that rock crystal is merely hardened ice; that snakes and dragons and some other animals have luminous precious stones in their heads or in their mouths and that prehistoric axes fall from heaven with lightning. Other myths are known only to a single people or to perhaps two tribes usually adjacent to each other.

A fairly complete tabulation of precious-stone myths seems to indicate that a relatively large number are common to the American Indians and the peoples of Eastern Asia. A few instances might well be a mere coincidence, but the myths common to these two peoples are so numerous that they suggest possibly one or more, probably many contacts between the two peoples.

The forebears of the American Indian are supposed to have come from Asia across the Behring Strait some 15,000 to 20,000 years ago. Early in man's history he knew but few precious stones and most of these were of the quartz family. The earlier emigrants doubtless were followed by other bands at later dates.

One myth, however, may well have existed in Mongolia before the emigration, namely, that of the rain-making stones. This seems to be a very early concept among primitive tribes in arid or semi-arid regions, where a drought may threaten the very lives of the herds or the yield of the crops. A rain-making stone was, according to tradition, bestowed on Mongol, the ancestor of all Mongolians. Attila the Hun had a stone, Gezi, which excited rains and storms and later Tamerlane had a stone, presumably a jade, which caused rain. The myth of rain-making stones passed to the Chinese from Mongolia perhaps at a fairly early date, but in addition the Chinese themselves at an early date placed jade cut in the form of a dragon on their altars in time of drought to bring rain. The myth is also known to the Turks.

The myth was a common one among the American Indians, the Navajos (either the turquoise or a stone falling from heaven), the Delawares (mica, believed to be the scales of the Horned Serpent, a powerful rain-maker), the Pueblos (fossils and rock crystals), and the Santo Domingo Indians. The myth in one form or another, so far as I know, is elsewhere known only in Ceylon, among the upper Nile tribes (amethyst), among the Persians and Arabs and the Polynesians (quartz crystal) and the Australians (rock crystal). Also the Orphic poem (200-400 A.D.) and Damigeron, an Alexandrian of about the 5th century, considered bloodstone or jasper a rain-maker.

There are a number of other myths of precious stones common to the Eastern Asians and the North American Indians, but these must long postdate the first emigration. They were either independently developed by the two peoples or they indicate that contacts have existed between the two peoples within the last few thousand years. Several of the myths relate to jade, a gem known to the Chinese at least by 2284 B.C., although in America, the oldest known artifact is a Mayan statuette, dated 98 B.C.

Since the West has been known to us, say for somewhat over a century, it is reported that Japanese or Chinese junks, far off their course, have made a landfall on our Pacific shore line. It is reasonable to suppose that in the relatively recent past this has happened a number of times, establishing at least a short-lived contact between the two peoples. Whether such periods were sufficiently long to bridge the language differential between the two peoples, is of course a matter of personal opinion. In some cases, however, the junk must have been in no condition to return to the homeland and the crews must have lived out their lives on our continent.

Among the myths regarding jade, common to the two peoples, is the use by the Chinese of jade blocks to read the future and to determine the will of the gods. The Mayas used jade balls for the same purpose. The Chinese place a smooth piece of jade in the mouth of a dead man, a custom dating from at least 699 B.C. The custom was also followed by the more prosperous Aztecs, the jade being "his heart," and by the Mayas. By so doing, the Chinese mourners hoped to again hear the voice of their loved ones; the Indians, to speed the deceased's arrival into another world.

There is a rather amusing old Chinese variant of the custom: that of a dutiful son who was misled by an unscrupulous jeweler; therefore, he placed a counterfeit pearl in his father's mouth. The corpse continued to spit up the false gem, a process which ceased only when a real pearl was substituted. The Hindoos had a rather similar custom. They placed a small bit of gold in the mouth of the dying to avert evil spirits, while the Greeks put a coin in the dead man's mouth to pay the ferryman Charon. The ancient Egyptians placed a scarab—often of green jasper—on the mummy as a symbol of the heart.

Among both the Chinese and certain American Indians, jade was the symbol of perfection. In a Toltec's advice to his son, it is stated that the gods listened to the prayers of the wise men of old, as they were "of a pure heart, perfect and without blemish, like Chalchihuitl (jade)." The Chinese character for jade means "perfect."

The Chinese loved the sonorous notes emitted by chimes made of thin slabs of jade and the Venezuelan Indians used thin pieces of jade as musical instruments. The sonorous quality of jade may well have been independently discovered by the two peoples.

The Tlingit Indians' (Alaska) name for jade was *tsu* (green), a close approximation of the Chinese word for jade, *yu*.

The Mayas and the Toltecs, and the Eskimos of Kodiak Island "killed" the trinkets buried with the dead. Almost every article in the cenote at Chichen-Itza is broken. The Ainus break all things buried with the dead. The Hindoo's widow breaks her jewels and buries them with her dead husband.

The Shasta Indians have a myth that the earth was created by Old Ground-Mole, a huge beast that, digging deep into the earth, heaved the soil up on his back. This parallels the myth of the Chinese subterranean dragon who, by his wiggling underground, causes earthquakes.

The Peruvian Indians were able to record chronological events crudely by a rather intricate knotting of the quipu; long before the Christian era the Chinese, in a somewhat similar way, recorded dates.

Among the Chinese the location of a quicksilver mine is divulged by a mist which rises from it; among the Toltecs a slight smoke overhung deposits of precious stones. Father Sahagen says the Indians of Mexico believed that the location of a jade deposit was marked by the cool and moist exhalations rising from it and the green grass that grew upon it. In medieval Europe it was believed that a blue flame marked the location of rich veins of ore or of other treasure. The Peruvian Indians believed that a wavering white light flickered above buried treasure.

The idea that spirits owned or presided over ore deposits of various kinds was widespread, not only among the peoples of Eastern Asia but also among the natives of America. The people of the Malay Peninsula believe that if tin is to be mined, the spirit of the mine must be propitiated, as did the diamond miners of India and Borneo. The Burmese ruby and jade miners propitiate the mine nats (or spirits), and if satisfied by their worship, the production of the mine is sure to be good. The California Indians who sought the obsidian of Sugar Hill and the Eskimos who mined soapstone, before mining began, left a gift for the spirit of the mine. Among the Indians of the northern part of our country, the spirits were conciliated by many tribes before mining of flint began, for example, and by the Sioux before they mined catalinite.

Religious ceremonies in instances preceded the mining, not only among the American Indians, but among the jade miners of Turkestan. The Borneon diamond miners not only conciliated the spirits of the mines but, while mining, preserved silence. If one laughed, no diamonds would be found. When the Chinese lapidaries cut jade, no women are to be present. Of somewhat similar import, we may say that among the Pueblos, those miners of salt who were frivolous died in their tracks, and among the Alaskan Indians (the Tlingit), if his wife laughed while the warrior was using his jade knife, it at once broke.

It is difficult to believe that so many similarities are all coincidences and to me the common features suggest at least an interchange of ideas through physical contact either by the late emigrants or by shipwrecked Chinese. This much is certain: between the peoples of Eastern Asia and our American Indians there are more similarities in their myths than between most distantly separated peoples. It is believed that this is more than a series of coincidences.

Gifts to the Institute

From Lazare Kaplan & Sons an important addition of two diamonds to be added to the Master Stones of the Institute, used in grading sets of Master Stones sent in by our members.

★ ★ ★

From Mr. George H. Marcher, Los Angeles gem dealer, a most interesting selection of seven doublets. These will be of value to the Institute's Research Department in that they are all glass rather than the usual type of doublets encountered in the trade, generally composed of a top of some genuine material.

★ ★ ★

From Theodore Schraft an unusual diamond showing a black inclusion around which the diamond has started to crack owing to the coefficient of expansion.

Summer 1945

A Cat's-Eye Emerald[1]

by
E. P. HENDERSON
Associate Curator, Mineralogy and Petrology
U. S. National Museum

An emerald displaying a cat's-eye has recently been added to the Roebling Collection of the United States National Museum, and the chief interest is in its uniqueness. It is cut in cabochon style, measures .79 x 1.07 x .84 mm and weighs 4.56 carats. This emerald has a very attractive green color and displays a sharply defined chatoyant band lengthwise at the long axis of the stone. The dealer from whom the stone was obtained was unable to supply the locality.

Several different minerals have been cut into cat's-eye stones but in none of the available reference books on gem-stones in the National Museum's libraries has any specific account been given of a cat's-eye emerald. Emeralds have been described as possessing a 6-rayed star. A. H. Church[2] in "*Precious Stones*" lists an emerald in the Townshend Collection "with 6-rayed black star, subglobular with face and back centrally flattened, circular, one half inch in diameter, plain swing mount." This stone is illustrated in Plate II of the book but from the illustration it appears that the star is more likely to be an accidental arrangement of dark inclusions within the emerald than to the normal internal development of zonal lines which defract the light within the stone.

Some of the gem dealers who have seen this cat's-eye emerald remarked that they have heard of emeralds which display a star but as yet none of these men acknowledge having previously seen any stone which can be classified as a cat's-eye emerald.

The primary purpose of this note is to list the apparently rare occurrence of a cat's-eye emerald and to invite anyone who knows the whereabouts of one to notify the Division of Mineralogy and Petrology, U. S. National Museum, Washington 25, D. C., or to publish a brief description of the stone.

[1]Submitted with the approval of the Secretary of the Smithsonian Institution.
[2]"*Precious Stones, considered in their Scientific and Artistic Relations,*" published by Chapman and Hall, London, England, 1882.

Editor's Note.

A ten-year investigation by G.I.A. has failed to reveal any verification of the previous occurrence of either true chatoyancy or epiasterism (asterism by reflected light) in an emerald. Shipley's "Dictionary of Gems and Gemology" states that Schlossmacher's reference to asteriated emerald seems to have been due to his misunderstanding of a report by Bernauer and that Halford-Watkins's report of star emeralds was unsubstantiated. The latter were seen by him only in a temple and may have been beryl diasteria backed with a green mirror, or may have contained inclusions which formed a star somewhat like the one described by Church and mentioned in this article by Dr. Henderson.

GEMOLOGICAL DIGESTS

The Tiffany Yellow Diamond, Facet Correction

All records show 101 as the number of facets placed upon the famed Tiffany yellow diamond. This number had been established in gemological texts and articles from a description written by the late George Frederick Kunz, mineralogist and gem expert, whose statement appeared in "*Science*" for August 5, 1887.

An inquiry, incident to revision of material on hand for the Diamond Glossary, later to be printed in book form, brought the following reply from the diamond's owners, Tiffany & Co., of which firm Dr. Kunz was at one time vice-president:

"We have been frankly puzzled by the discrepancy between the present cutting of the Tiffany diamond and that which is described by Dr. Kunz in 1887. Those who have been most closely associated with the House since that time have been consulted, and none have any recollection of a recutting of the diamond.

"A careful recheck of the diamond confirms . . . the number of facets. There are 90 in all. In addition to the table and the culet, there are 40 facets on the crown of the stone and 48 on the pavilion. There are no true facets on the girdle. It is the unanimous conclusion of all those consulted that Dr. Kunz was mistaken in his original statement about this subject."

Correction should be made to the Fall 1938 issue of *Gems & Gemology*, page 183, line 5, of the description of The Tiffany Yellow Diamond, to read *90 facets.*

Gemstones in 1944

Excerpts from Material Prepared by Sydney H. Ball

According to data compiled by the Bureau of Mines, United States Department of the Interior, the value of uncut stones, from domestic sources, used in jewelry and related industries approximated $41,000 in 1944, which is substantially lower than the $67,000 and $150,000 reported in 1943 and 1942, respectively.

Turquoise was the leading gem produced, its value being about $17,000. Miami, Ariz., is a new locality. The Castle Dome Copper Co., Inc., states that in its open pit "occasional specimens of turquoise are uncovered during routine mining operations. Occurrence is in the form of small veinlets. Although of sufficient hardness for gem purposes, most of this material is of a very pale green or blue color, requiring impregnation with oil to darken the stones before they are of commercial value." Presumably, the better stones are collected and perhaps sold by miners.

The King mine, 11 miles southeast of Manassa, Colorado, was worked for about 3 months in 1944. The Navajo and Pueblo silversmiths look to Colorado, Arizona and other states for the turquoise used in their jewelry.

Chinese agents purchased 5,890 pounds of Wyoming jade during the year, to be shipped to China after the war.

Clay Canyon, Utah, variscite deposit was worked for a short time in 1944 and some good nodular variscite was shipped to the East. Smaller amounts were recovered from the Grantsville (Tooele County) and Lucin (Box Elder County) deposits.

Some fine green smithsonite was produced in the Magdalena district, Socorro County, New Mexico.

Up to the end of 1939, Australia had produced opals valued at £1,987,090. Incomplete returns for 1939 follow: New South Wales £1020; Queensland £50 (only seven miners); South Australia (Coober Pedy field) £6020—a total of £7090. In 1944 it was reported that the black opal fields were no longer operated.

Rubellite (red tourmaline) of excellent quality is reported to occur in Mozambique (Portuguese East Africa).

Precious and semiprecious stones (exclusive of industrial diamonds) imported for consumption in the United States, 1943-44[1]

Commodity	1943		1944	
	Carats	Value	Carats	Value
Diamonds:				
Rough or uncut (suitable for cutting into gem stones), duty free	751,240	$37,443,240	896,547	$43,445,219
Cut but unset, suitable for jewelry, dutiable	193,701	31,458,089	169,097	29,263,121
Emeralds:				
Rough or uncut, free	8	248	1,966	1,668
Cut but not set, dutiable	3,194	32,508	38,666	81,233
Pearls and parts, not strung or set, dutiable:				
Natural	—	167,284	—	242,221
Cultured or cultivated	—	107	—	15,394
Other precious and semiprecious stones:				
Rough or uncut, free	—	47,726	—	105,401
Cut but not set, dutiable	—	2,590,931	—	3,725,453
Imitation, except opaque, dutiable:				
Not cut or faceted	—	2,621	—	14,550
Cut or faceted:				
Synthetic	—	167,166	—	503,718
Other	—	102,450	—	23,887
Imitation, opaque, including imitation pearls, dutiable	—	8,149	—	23,113
Marcasites, dutiable: Real	—	96,154	—	84,828
	—	$72,116,673	—	$77,529,806

[1]Figures compiled by M. B. Price, of the Bureau of Mines, from records of the U.S. Department of Commerce.

Recent Rulings and Recommendations of the American Gem Society

Rulings are binding upon all Registered Jewelers, Graduate Members and Wholesaler Members of the A.G.S., with loss of membership the penalty for violation. Recommendations are not binding, but the great majority of A.G.S. members and member firms observe them.

The International Committee of the American Gem Society in March approved the following ruling to be presented to the entire membership of the Society for vote. The Board of Directors of the Society canvassed the votes at their meeting June 13, 1945, and found that the 95 per cent of affirmative votes necessary for its passage as a ruling had been cast.

Advertising New Novelty Style Brilliant-Cut Diamonds

Governs all Registered Jewelers, A.G.S.

Ruling A-12 (1945). **Until the submission to the Society of what it considers to be proof of the increase in brilliancy of standard brilliant-cut diamonds by virtue of (1) the girdles of such stones having been polished (including the polishing of any number of flat surfaces or facets upon them) or (2) the addition of any number of facets upon the crown or pavilion or both, Registered Jewelers shall not advertise that such stones are more brilliant or imply in any advertisement that such polishings or facets increase the brilliancy of such stones.**

Rulings and recommendations of the A.G.S. which concern nomenclature, definitions or trade use of terms relating to gemstones, which have not previously been reported in *Gems & Gemology* are:

Unqualified Superlatives

Governs all Registered Jewelers, A.G.S.

Ruling A-10 (1944). Because unqualified superlatives, if used in describing merchandise, are usually misleading and cannot be proved if challenged: **The terms *the finest, the best, the most beautiful* or other unqualified superlatives in such phrases as "the finest amethysts ever shown," "the best cut diamonds," "the finest colored diamonds," "the most beautiful emerald," etc., may not be used in advertising by Registered Jewelers.**

Diamonds as Distinguished from Diamond Chips, etc.

Governs all A.G.S. Members

Ruling A-11 (1944). Because National Better Business Bureau, for its own guidance, desires A.G.S. to establish a definition of diamonds as distinguished from diamond chips, etc.: **No uncut diamond nor cleavage of diamond or diamond chip, nor any cut diamond which has not been symmetrically fashioned with at least sixteen facets and a table, may be de-**

(Continued on Page 239)

Inclusions as a Means of Identification

by

EDWARD GÜBELIN, Ph.D., C.G.

Lucerne, Switzerland

In his unusually comprehensive and extremely valuable studies of gemstone inclusions, Dr. Gübelin has decided that in certain cases inclusions are so typical that errors in identification are practically excluded. He is more and more under the impression that the modern gemologist may sooner or later abandon the more orthodox method of beginning an examination of gemstones by tests for specific gravity, refraction and dichroism in favor of an approach through study of their inclusions.
—Ed.

All growing matter—and this includes crystals—bears certain typical signs or traces of its origin and formation. As regards crystals, these marks can be observed either on the surface or in the interior. Gemologists are particularly interested in the internal phenomena of the growth of precious stones—the so-called inclusions.

The inclusions in natural gemstones are not merely the surest manifestation of genuineness; their great variety imparts also a very informative indication of the many different minerals with which a precious stone was associated during its formation. Inclusions of foreign minerals form the "internal paragenesis" of a stone; and this can involve a far more decisive factor in its identification by the gemologist than the former "external paragenesis."

The ultimate purpose of the identification of an unknown gem is the determination of its belonging to a certain mineral species. It is often easier to decide whether or not a stone is genuine, than to ascertain to what mineral family and variety the unknown stone belongs. This is, however, a simple matter when the necessary apparatus are at one's disposal and the ascertainment can be based on the physical, chemical and optical characteristics, the testing of which is, as a rule, speedy and easy enough.

There is not a gemologist of experience who has not at one time or another been obliged to determine the nature of a stone submitted for his diagnosis without the valuable aid of reliable instruments. And the necessity often arises of examining and sorting a whole paper containing hundreds of tiny stones of .05 to .50 carats. Moreover, in this case matters are usually complicated not only by the fact of the stones not being easily identifiable, but also by

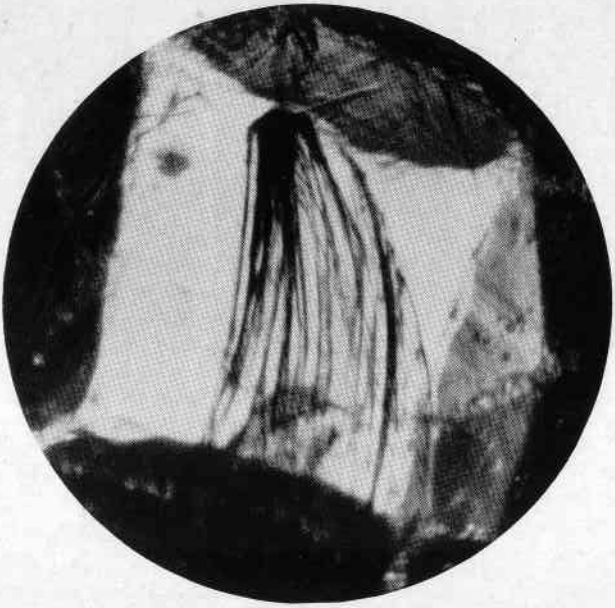


Photo by Dr. Gübelin

Figure 1
Byssolite as inclusions in demantoid. 50x.

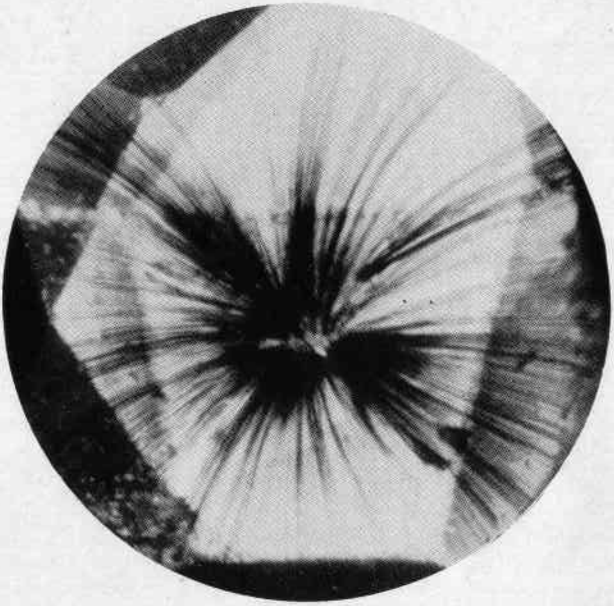


Photo by Dr. Gübelin

Figure 2
Byssolite fibres radiating from a common center in a demantoid. 50x.

their appearance and color admitting of several alternatives. What a job it always used to be to test each of the innumerable stones separately for specific gravity (by the hydrostatic or suspension method), refraction (by the direct or the Becke method), birefringence, dichroism, absorption, etc.

Here, too, Nature has kindly provided the gemologist with reliable means of deciding the question. For she has placed within such externally similar stones these inclusions—the very internal paragenesis—which differentiate them in no doubtful manner.

Inclusions Characteristic of Garnets

The garnet group in particular, owing to its complicated and varied chemical composition, presents such a gamut of colors and tints that a great many garnets resemble other gemstones. Hence the innumerable known cases of erroneous identification.

The beautiful, sparkling, green demantoid was often in the past taken for olivine or emerald. If, however, those making such errors had been able to recognize the different inclusions in these absolutely different minerals, they would certainly never have made such blunders. The demantoid contains absolutely typical and ever-recurring inclusions, which can be observed in 95% of all such gems.

These consist of minute brown or colorless byssolite crystals (byssolite is the hair-like habit of asbestos) either arranged in curved bundles and bushes as in Figure 1, or radiating from a common centre as shown in Figure 2, though they are very often found in disordered, irregular tangles, like a child's tousled hair, well depicted in Figure 3. The centre of the ray-like byssolite threads which permeate the stone is oftentimes formed by a dark-brown, apparently highly limonitized mineral, the nature of which has so far evaded attempts at identification.

The most interesting feature of these inclusions is the fact that the fine filaments are not in any way kinked or pressed together inside the demantoid; indeed, they have the appearance of being so free and uninfluenced by the surrounding crystal substance as to give the impression rather of unhindered development in air. These fine silky fibres are often large enough to be visible to the naked eye and can in every case be seen with the help of a jeweler's magnifying lens. They can, in consequence, be taken as a reliable identifying feature even when it is impossible to use a microscope for the examination.

Every gemologist is acquainted with the curiously granular appearance of hessonite garnets. Dr. Herbert Smith, the author of "*Gemstones*," says, ". . . just as if they were composed of tiny grains, imperfectly fused together." (See Figure 4.) This is already a distinguishing characteristic, though it is, as a rule, insufficiently evident to be relied on with the unaided eye.

A thorough inspection with a magnifying glass or instrument shows that here, too, the inclusions play an interesting and essential part. Hessonite can be distinguished from gems of similar appearance, such as brown jacinth zircon (whose name it usurped for a long time), brown tourmaline, brown citrine and, of course, from brown paste imitations, by the irregular distribution through-

Photo by Dr. Gübelin

Figure 3
Byssolite threads as inclusions in demantoid. 50x.

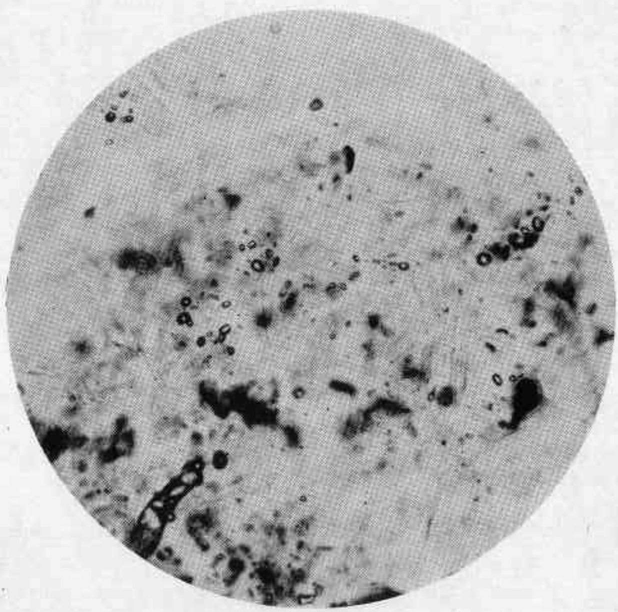


Photo by Dr. Gübelin

Figure 4
Granular diopside inclusions and oily streaks in hessonite. 20x.

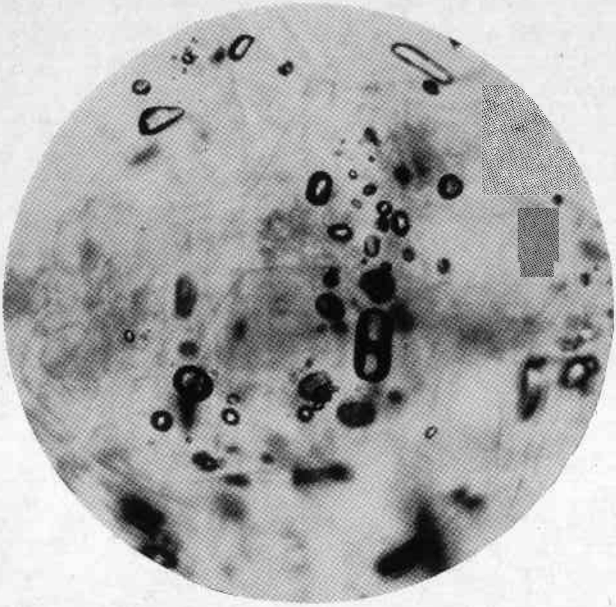


Photo by Dr. Gübelin

Figure 5
Diopside crystals as inclusions and oily streaks in hessonite. 50x.

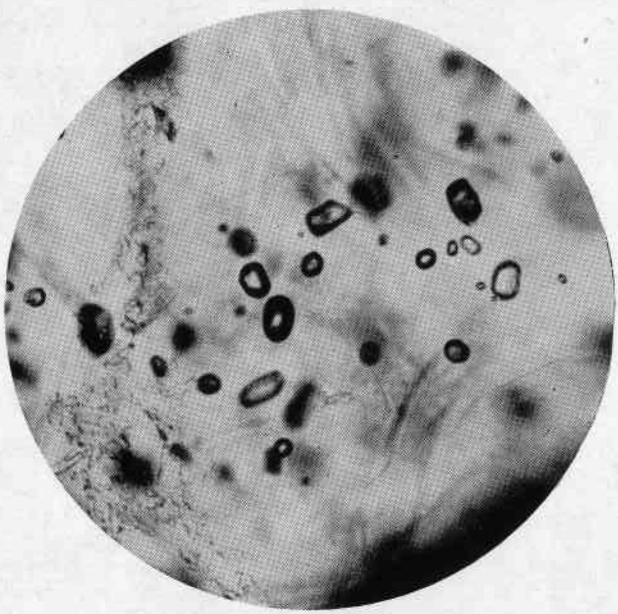


Photo by Dr. Gübelin

Figure 6
Included diopside crystals and oily streaks in hessonite. 50x.

out the whole stone of an infinity of often clearly idiomorphous diopside crystals (Figures 5 and 6).

Hessonite is accompanied in its growth by this mineral, i.e. they have also the same external paragenesis. It is, moreover, traversed by peculiar streaks which give it an appearance of interior oiliness as in Figure 7. This has definitely to be borne in mind because it furnishes a particular characteristic of recognition also contributing to the hessonite's granular aspect.

(To be Continued)

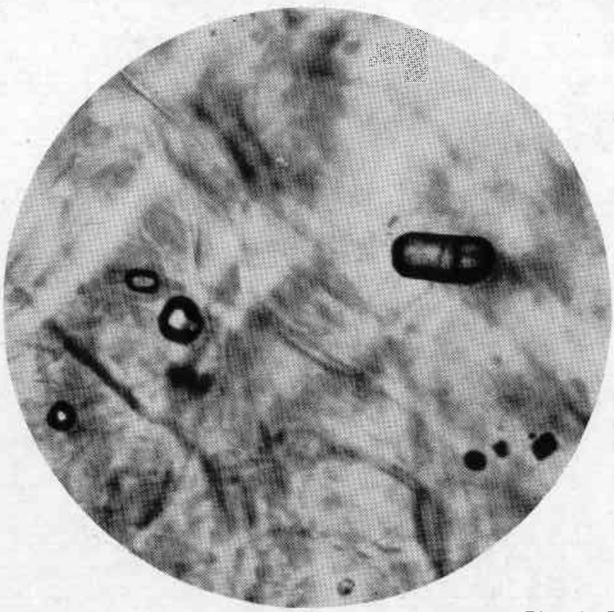


Photo by Dr. Gübelin

Figure 7
Diopside crystals as inclusions and oily streaks in hessonite. 50x.

Absorption Spectra of Pyrope Garnet and Red Spinel

by

B. W. ANDERSON, B.Sc., F.G.A.

The absorption spectrum of ruby, already described, is so clear-cut and distinctive that a mere glance through the spectroscope serves to identify it. Unfortunately the same cannot be said of two other red gemstones, pyrope and spinel, which are the subject of the present article. These, too, owe their finest colour to the presence of chromic oxide, but the narrow bands in the deep red so typical of chromium spectra are often either absent or difficult to observe, and occur at almost the same wavelength, so that it is wiser to confine one's attention to the broad absorption region towards the middle of the spectrum. In pyrope this has its centre near 5720A, in the yellow-green, while with spinel the very similar band is centred in the green at about 5400A.

This difference of 300 Angstroms is quite sufficient to make distinction between the two certain if one has any kind of wavelength scale or other measuring device attached to one's spectroscope. At the beginning of this series of articles, however, I maintained that the more expensive and elaborate instruments embodying such scales etc., were seldom necessary and hardly worth the extra cost. This question of discriminating between the spectra of spinel and pyrope happens to be one of the few instances where some means of gauging one's whereabouts in the spectrum rather precisely is advisable. Fortunately, there are several ways in which one can do this without much trouble or extra apparatus. One or the other of the methods suggested below should be possible to any reader who is sufficiently interested to take the small amount of trouble involved.

(a) *By direct comparison with known specimens of pyrope and red spinel.*

Pyrope pebbles from Kimberley are very suitable, and red spinel octahedra from Burma or Ceylon. Both can be obtained from any mineral dealer, such as Wards' Natural Science Establishment, Inc. It is preferable to get several pieces and then to choose one of each of convenient size and depth of colour. The "unknown" specimen can be placed on a blank microscope slide between the pyrope and the spinel and the spectrum compared with first one and then the other by pushing the slide along under the objective of the microscope. I am assuming that the technique suggested earlier is being followed, in which the specimen on the microscope stage has a concentrated beam of light directed through it by means of a broad angle substage condenser, and that the microscope tube, fitted with a low-power objective, is so focussed as to give an even field of illumination to the slit of the spectroscope held in place of the eyepiece.

(b) *By using a "wavelength filter."*

Solutions of certain soluble salts having a clear-cut series of absorption bands can be introduced into the path of the light beam and the dark bands due to the solution then form a yardstick for gauging the approximate position of absorption bands seen in minerals. Of these potassium permanganate is the most readily obtainable, and works very well in the present connection. Introduce a very weak solution of the permanganate into a shallow glass cell or dish. Adjust the strength so that, when placed on the microscope stage and light passed through, the 5 main dark bands due to the permanganate are clearly perceptible but not merged into one solid absorption block. The approximate wavelength measurements for the centres of these bands are 5680, 5440, 5250, 5040, 4870 Angstroms.

If now, a red spinel and a pyrope garnet are immersed in the cell, and the cell moved so that light from first one and then the other is observed through the spectroscope, the difference in the respective positions of the broad absorption band is strikingly apparent. With red spinel it falls almost exactly within the framework, so to say, provided by the permanganate bands 5680-5040, while with pyrope there is a marked "side-step" towards the red as the stone is slid under the objective. Didymium glass (used in Crooks anti-glare lenses), or a solution of didymium nitrate will serve a similar purpose. The strongest didymium group of fine bands is centred near 5800A and is thus nearly coincident with the centre of the pyrope band. The spinel band is by comparison displaced considerably nearer the blue.

(c) *By comparison with emission spectrum lines.*

If a carbon arc is available as a light-source, the sodium doublet at 5893A will be clearly visible against the background of continuous spectrum colours provided by the incandescent carbons. The relation of this bright doublet to the absorption band will be notably different in the two cases. The absorption band of pyrope swallows the sodium line up while with spinel it remains clear of the band. This type of comparison can be extended indefinitely; metallic salts such as those of lithium, barium, strontium, calcium, provide a range of bright lines, the wavelength of which is accurately given in tables, and by choosing suitable emission lines the precise position of any well-defined absorption band can be established.

(To be Continued)

New Diamond Deposits in Russia

An AP release of May 22 reported announcement by the Russians of the discovery of nineteen new diamond deposits in the Ural mountains.

Use of the Polariscope

by

EDWARD WIGGLESWORTH, Ph.D., C.G.

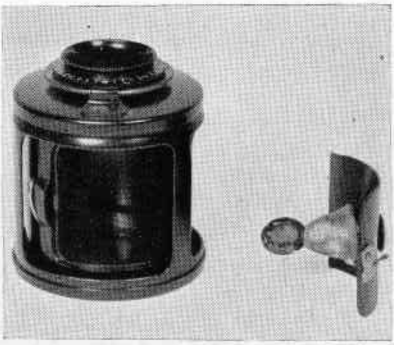
Late President of the Gemological Institute of America, and until his death, Director of G.I.A.'s Eastern Laboratory

A polariscope may be defined as any optical instrument consisting basically of two polarizers with a means of rotating a specimen between them. A gemological polariscope is one designed especially for use with gems. The Shipley polariscope is the most efficient—if not the only—specially designed gemological polariscope.

This Polariscope is principally designed to separate singly and doubly refractive stones, especially colorless stones and others that show little or no pleochroism. It may, however, also be used to observe dichroism and in some cases, optic figures. The instrument consists essentially of two pieces of polaroid separated by a cylinder which can be rotated independently of the polaroid discs, and in which may be placed the stone to be tested. The polarizers are ordinarily placed in the "crossed" position, that is, so that very little, if any, light is allowed to pass. This adjustment is easily made by rotating the top polaroid which is mounted in a movable sleeve in the upper part of the instrument.

In the cylinder is a removable door with a knurled head, on the interior of which is mounted some beeswax to hold the stone for examination. This allows turning the stone in various positions. For illumination, either good direct daylight may be used, or better, the instrument may be placed directly over a substage lamp. When examining a stone, the instrument should be at least a foot from one's eye and the specimen inside should be looked *at* and *not through.*

Further, the stone should be rotated to three different positions to avoid the possibility of looking along an optic axis, which, of course, would prevent seeing any double refraction and might lead to thinking the stone singly refractive. If the stone is doubly refractive, it will allow light to pass through it in spite of the crossed polaroids, but as it is rotated through 360 degrees, it will become dark four times, or every 90 degrees. If the stone is singly refractive, it will stay dark through the complete rotation.



The Shipley Hand Polariscope, Showing the Door Removed.

Care must be exercised in interpreting what is observed and some experience is necessary. First, there is apt to be confusion due to what may conveniently be called "facet effects," resulting from light being reflected and refracted from various facets. In a singly refractive stone, this may often be mistaken for double refraction; and again, a doubly refractive stone may, particularly with the pavilion down, shunt enough light away from the facets so the stone appears singly refractive.

More mistakes are made by beginners on this instrument than on any other, so much so that in the laboratory we caution them that if the results are at variance with what the other instruments indicate, they should recheck results very carefully.

Second, we must watch for *anomalous double refraction.* If a singly refractive stone or imitation is under strain, it is very apt to show a patchy extinction while being revolved. Unless on the lookout for this, it may easily be mistaken for true double refraction. Usually in anomalous double refraction, the *whole stone does not extinguish at once,* but a *dark wave crosses the facets* of the stone. If such is suspected, a good way to verify it is to revolve the stone to a position where the greatest amount of light passes through the stone, then while still looking at the stone, revolve the top polaroid away from the crossed position. If more light then passes through the stone, that is, if it becomes brighter, it is safe to assume that the stone is singly refractive. The fact that a stone shows anomalous double refraction is important, as it shows that a strain exists; therefore care should be used in handling the stone, especially during heating and mounting.

To observe pleochroism with this Polariscope, the polaroid discs are revolved until they are parallel instead of crossed, that is, both discs polarize the light in the same direction and the maximum amount of light is allowed to pass. A pleochroic stone then placed in the cylinder and revolved will show a change in color. If dichroic, it will show only two colors alternately, regardless of its position, but if trichroic, a third color can be seen if the stone's position is changed. Of course, only two colors are seen in one position. As the stone is revolved in another position one of these colors may be different. When this can be observed, we have a clue to the crystal system of the gem. If the colors are different enough so that there is no difficulty in recognizing the change as the stone is revolved, all well and good, but usually the difference is small and therefore can be more easily seen with the dichroscope which shows the two colors side by side at the same time.

Interference figures may sometimes be obtained with this instrument. For this purpose, it is necessary to use a loupe with the polariscope. The polarizers are crossed and the loupe is set in contact with the upper one. A good light must come through and the position of the stone must be adjusted until the line of vision is parallel to an optic axis; then a figure may sometimes be seen. This is often time-consuming, if not extremely difficult, but if everything is just right, it is possible to see either a uniaxial or biaxial figure which may help to identify the stone. For this purpose the instrument should be at least eighteen inches from the eye.

Of course, a petrographic microscope will do everything the Polariscope will do and better.

BOOK REVIEW

***The Art of Gem Cutting,* Third Edition, by Dr. H. C. Dake and Richard M. Pearl, C.G. Published by *The Mineralogist,* Portland; $1.50. Obtainable through the G.I.A.'s Book Department.**

This book has much of the same material which was used by Mr. Young in the second edition of *The Art of Gem Cutting,* but some subjects have been enlarged upon, improved methods given and new methods presented. One familiar with the second edition will find a rearrangement of the subject matter in many instances in this new third edition. Mr. Pearl, who has succeeded Mr. Young as co-author in this edition, was a jeweler before entering the service, and was one of our earliest students to receive the title of Certified Gemologist.

The first pages of this book are given over to those who enjoy gem cutting as a hobby, and to an interesting and enlightening history of the art of gem cutting. One cannot fail to be impressed with the progress of this time-honored trade as outlined in the introduction.

The authors of the third edition of *The Art of Gem Cutting* have conveniently divided the book into four parts. Briefly, the subjects covered in each part are:

Part I, Cabochon Cutting, is designed to bring to the lapidarist the materials necessary and the type of equipment best suited for different steps in cabochon cutting. The amateur will find instructions concisely accumulated, simply stated, and practical. The saws used for different materials are described, as are different types of grinding wheels with proper grits for each; sanding methods are dealt with; and polishing, the last of the four principal steps in cabochon cutting, is well covered. There are a number of illustrations of equipment; detailed information in connection with their use has gone so far as to advise the user the R.P.M. for maximum results with the various items described.

Part II, Facet Cutting, which is a much more difficult and elaborate phase of the lapidary art, is carefully developed from the amateur's viewpoint. The new methods of facet cutting with the modern mechanical facet-cutting devices are advocated over the old method where the dop is held by hand, because it is the authors' point that there is more opportunity for variation in the angles, which are so vitally important, to produce a facet-cut gem of maximum beauty. There are a number of photographs illustrating these modern devices.

Part III, Gemology, the subject covered in this portion of the book, is also presented for the amateur lapidarist rather than as a scientific treatise. The behavior of light

(Continued on Page 239)

DIAMOND GLOSSARY

(Continued from page 216 of last issue)

Orloff Diamond (Cont'd)
inches; length, 1⅜ inches. If it is identical with the Great Mogul it was acquired by Shah Jahan, who had it fashioned as a Hindu cut stone, which is, except for the broad base, entirely covered with facets. With other jewels of the Mogul emperors it passed into the hands of Nadir Shah, and eventually reappeared as the eye of an Indian idol, from which it was stolen and found its way to Amsterdam. There it was purchased by Prince Gregory Orloff, a discarded favorite of Empress Catherine II of Russia, who presented it to her in 1773, after which it remained in Russia as a crown jewel.

Orlov. The Russian spelling of **Orloff (Diamond).**

Orlow. The German spelling of **Orloff (Diamond).**

Orpin-Palmer Diamond. The first of several large South African alluvial diamonds found (1902) on the Vaal River Estate. Valued at £1,000, it was said to be of a dull white color, and weighed 117½ carats (Beet).

Otto Bergstroom Diamond. A South African alluvial diamond discovered in 1907 in the Gong-Gong diggings, by Bergstroom. Found in the deep ground near the potholes it was a perfect octahedron, yellowish in color.

Otto's Kopje. A diamond mine near the De Beers and Kimberley Mines that differs from their more or less circular volcanic pipes as being a wide and irregular volcanic fissure.

out-of-round diamond. A term used to describe any brilliant or other round diamond the outline of the girdle of which is obviously not a symmetrical circle; a diamond the circumference of whose girdle is appreciably nonuniform.

outside diamonds or **outside goods.** A trade term for gem diamonds which are not controlled by the Diamond Corporation and can therefore be purchased from original or other sources than the Diamond Trading Co. They consist, in part, of the production of Brazil, British Guiana, and to some extent South Africa. The latter production consists principally of irregularly shaped alluvial stones.

Ovalumpally. Name of an old diamond mine in the Madras district of India. Same as Woblapally.

overgrowth. Term used to describe a coating of calcium carbonate ($CaCO_3$) that is found on some rough diamonds, and that is extremely thin but often prevents diamonds from adhering to the grease tables (Sutton).

overspread. Another name for a spread stone. See **spread stone.**

oyster line. The name for alluvial diamond deposits which occur in orderly rows. Many of them contain shells of mollusks. These deposits occur along a thirty-mile stretch of the Atlantic Ocean in

Little Namaqualand. See **wave-built terraces.**

Pacha of Egypt Diamond. See **Pasha of Egypt Diamond.**

pagoda. A Hindu unit of money mentioned by Cattelle in 1912 as worth eight shillings English money.

Painted Diamond. A diamond to the girdle or pavilion of which some substance has been applied (usually of transparent violet or violet-blue color) for the purpose of making the diamond appear more whitish or bluish.

pampel cut. Same as **pampille cut.**

pampille cut. A drop-shape closely related to the briolette but with circular (or polygonal) cross-section and usually more elongated. Covered with rows of facets of differing shapes and sizes, which become smaller as they approach the lower point of the stone.

Pan (The). A name once used by South African diamond diggers for the **Dutoitspan** (Du Toits Pan) diamond mine.

pane. A little-used name for **star facet.**

Panfontein mine or diggings. See **Koffeyfontein Mines.**

Panna. (1) Previous to the last century an important alluvial diamond locality in northern India, between the Son and Khan Rivers, tributaries of the Jumna River, northwest of the **Manahi** group of mines. Still produces a few stones. (2) The city and diamond market of that name. (3) An old Indian trade term for diamonds with a faint orange tint (Streeter).

panning diamonds. The act of separating diamonds from other minerals by shaking them with water in a pan.

Paolo de Frontin Diamond. A Brazilian diamond, 49.5 m.c. in rough, in which condition it was sold in London in 1936. Its exterior showed a slightly greenish cast.

paper marks. The dulled areas consisting of fine scratches on paper-worn diamonds.

paper-worn diamonds. Diamonds which have been dulled on the surface from being carried loose in a diamond paper with other diamonds.

paragon diamonds. (1) A term which seems to have been first used in the 16th century for the first large diamonds of probably over twelve carats (Hamlin). (2) A term once used by jewelers to mean diamonds "free from specks or foulness." (3) A term now applied to diamonds of over one hundred carats in weight (The New English Dictionary).

parcels. A term used to describe groups or lots of diamonds, especially those which have been sorted.

Parisian diamonds. Name for an imitation diamond (Spencer).

Parteal Mines. Diamond mines near Golconda, in India, some of which were worked as late as 1850. Located on north bank of the Kistna River, east of **Kollur Mines** and at the junction of the Kistna and Munyero Rivers. Said to have had large production from an alluvium of a decomposed diamondiferous stratum (Cattelle).

Partial Mines. See **Parteal Mines.**

parting (in diamonds). The tendency of a crystal to separate along certain planes that are not true cleavage planes, but which have become directions of minimum cohesion through gliding, secondary twinning or some other external cause (Standard).

(To be Continued)

Book Review (Cont'd)

and its relation to gem cutting to bring out such properties as dispersion, brilliance, and the interesting effects of phenomenal gems is briefly touched upon. Some of the optical instruments in connection with gem testing are described, together with sketchy instructions in their use. Such instruments as the refractometer, the dichroscope, polariscope, loupe and microscope are dealt with. Some of the uses of the microscope discussed in connection with gemology are very practical. However, the Becke test is one the student must employ with extreme care and accuracy; the lapidarist might find it helpful with fragments of rough gem minerals. Mr. Pearl, author of this section, has taken a subject very large in scope and crammed it into a very few pages. The tabulations and other statistical information given are very accurate.

Part IV is taken up with *special lapidary technique* such as cameo cutting (with interesting illustrations), making of doublets and cutting of star sapphires.

Virginia V. Hinton,
C.G., F.G.A.

A.G.S. Rulings (Cont'd)

scribed as a diamond (nor jewelry containing such a stone be described as diamond jewelry), without stating either the number of its facets or a clearly descriptive qualification that the stone is a rough or uncut diamond or that it is a rose-cut diamond, diamond chip, or chip diamond.

Advertising Diamonds as "Blue White"

Governs all A.G.S. Members

Recommendation A-6 (1944). Because the term "blue white" has been abused so generally over a long period as to have become meaningless, and because such a small proportion of diamonds actually possess a bluish body color: **It is recommended that the term "blue white" not be used in advertising.**

Note: This includes the use of the term on display cards, price tags, diamond papers, etc. The recommendation will not prohibit the description as "blue" or "bluish" of a diamond possessing any tint of bluish body color or as "bluish fluorescent" or "blue fluorescent" any diamond *the body of which is colorless* and which exhibits bluish fluorescence in daylight.

Describing Diamonds as "Blue White"

Governs all A.G.S. Members

Recommendation A-7 (1944). **It is recommended that a diamond should not be described as being "blue white."**

Note: The term can be used only in defending the jeweler's own merchandise, as for instance, by explaining that the term has become meaningless since different jewelers use it to describe diamonds of different colors, including diamonds tinged with yellow, and therefore the American Gem Society has entirely prohibited its usage.