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and

PROCEEDINGS OF THE GEMMOLOGICAL ASSOCIATION OF GREAT BRITAIN

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GEMMOLOGICAL ASSOCIATION OF GREAT BRITAIN

(Originally founded in 1908 *as the Education Committee of the National Association of Goldsmiths; reconstituted in* 1931 *as the Gemmological Association)*

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ON JEWELLERY FIT FOR A QUEEN

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THE acquisition of a major gem or a piece of significant jewellery is always a source of excitement to those who curate major gem collections. Imagine then the great excitement when the Smithsonian Gem Collection recently acquired not one but many truly significant pieces of Royal jewellery. Both the amount of new material and the quality were overwhelming. Five new exhibits were designed and installed, swiftly becoming a major attraction in the Hall of Gems. Some of these exciting recent acquisitions, and others, are herein described.

THE MARIE ANTOINETTE EARRINGS

Among the last gifts of Louis XVI to Marie Antoinette was the pair of diamond earrings shown in Figure 1. These gems are approximately 36 carats each and, although not quite a matched set, one being more tapered than the other, they are fine, brilliant, colourless, and of very high quality. These elegant pendeloques have large culets and were obviously cut to effectuate maximum yield. Each 36 carat diamond is suspended from a smaller trapeze-cut stone of approximately two carats. Inasmuch as the African diamond fields were not yet discovered, these diamonds are likely of Indian origin. The gems were originally set in silver and are now set in platinum with small accessory diamonds. The original settings

Fig. 1. The Diamond Earrings of Marie Antoinette (NMNH Gem #5018) (Photograph by Lee Boltin, Smithsonion Institution).

are preserved as objects of historical interest. These earrings were treasured by Marie Antoinette and were found on her person after the arrest of the Royal Family at Varennes while they were fleeing the Revolution in 1791. The earrings then passed through the Youssoupoff Family, were purchased by Cartier Ltd, and were eventually donated to the Smithsonian by Eleanor Close Barzin, of Paris. They presently reside in the Hall of Gems where they are a major attraction.

The Russian Nuptial Crown

This beautiful crown, shown in Figure 2, was designed and constructed about 1840 from a diamond belt that belonged to Catherine the Great. It was created for, and first worn at, the wedding of Marie Alexandrovna and Alexander II; then it was worn at the subsequent wedding of Marie Feodorovna and Alexander III, and also at that of Alexandra Feodorovna and

FIG. 2. The Russian Nuptial Crown of Marie Alexandrovna (Photograph by Lee Boltin, Smithsonian Institution).

Nicholas II. The crown has a spectacular total of 1,535 diamonds weighing a composite 283 carats. Upon the apex of the crown is a cross with 5 large antique cushion-cut solitaire diamonds of high quality. The crown is small, about $4\frac{1}{2}$ inches in diameter at the base and approximately $5\frac{1}{2}$ inches tall. The large diamonds in the cross (about 15 carats total) are mounted with girdle circlets so that the gems are also seen from the rear. Not obvious are three rose-cut diamonds of about 2 carats each, which are on the top of the tiara at the base of the cross. The pleasant lavender colour of the fabric is in good balance and heightens the aesthetic appeal of the whole

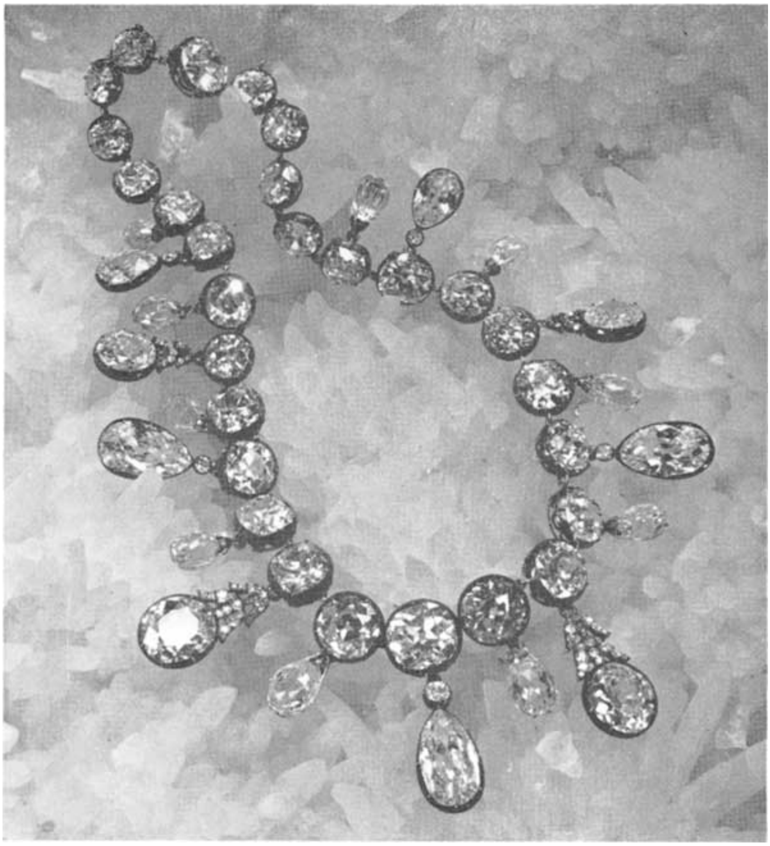

FIG. 3. The Napoleon Necklace (NMNH Gem #5019) on a background of quartz crystals. (Photograph by Lee Boltin, Smithsonian Institution).

piece. The crown was sold at Christie's in London in 1927 for £6,100! It was eventually purchased by the late Marjorie Merriweather Post who bequeathed it to the Smithsonian.

THE NAPOLEON NECKLACE

Joyous at the birth of a son, Napoleon I bestowed many fine gifts on his wife, the Empress Marie Louise. To mark the birth of their son, the King of Rome, Napoleon gave Marie Louise a beautiful necklace of colourless diamonds set in silver and gold (Fig. 3). Most prominent are the thirty-two cushion-cut diamonds, twenty-eight of which form the framework of the necklace, and five

FIG. 4. The Turquoise and Diamond Tiara of Empress Marie Louise (NMNH Gem #5021). (Photograph by Lee Boltin, Smithsonian Institution).

FIG. 5. The Bismarck Sapphire (NMNH Gem #4753) (Photograph by Lee Boltin, Smithsonian Institution).

elegant pendeloques, the largest of which is almost an inch in length. These thirty-seven magnificent stones are mounted with girdle circlets of silver. Ten briolettes are symmetrically spaced and hung in silver-wire baskets. The total assemblage of 167 Indian diamonds weighs 275 carats. The necklace, which was loaned to France for the Napoleon Bicentennial Exhibition in 1969, was originally created, at a cost of 376,274 francs, by Nitot et Fils, jewellers who made most of Napoleon's jewellery. After the death of Marie Louise, the necklace passed to the Hapsburgs of Austria and was sold in 1948 by Prince Francis Joseph of Liechtenstein. The necklace was later acquired by Mrs Post who generously donated it to the Smithsonian.

Marie Louise Diadem

This beautiful headpiece, shown in Figure 4, was another gift from Napoleon to Marie Louise in 1811 when their son was born. This high-symmetry diadem is comprised of about 950 Indian diamonds with a total weight of 700 carats, setting off 79 cabochons of high quality Persian turquoise weighing 540 carats. There is some difference in colour-grade among the turquoises, but the workmanship is excellent. As beautiful as the tiara is in its present state, it nonetheless must have been even more enthralling in 1811, as the original tiara was replete with emeralds which have since been replaced by the turquoise. Accompanying papers indicate only that the original emeralds were replaced by turquoise "a few years ago". The liberal use of brilliant diamonds is in good taste and adds to the very high symmetry of the piece. The diadem is set off by a base row of well-matched diamonds, and large diamonds are also used to accent the visual impact of the turquoise. It was willed by Marie Louise to the Archduke Leopold of Austria, became the property of the Imperial Family of Austria, and was later acquired by Mrs Post, who donated it to the Smithsonian.

The Bismarck Sapphire

This exquisite sapphire from the gem gravels of Sri Lanka (Ceylon), shown in Figure 5, has an exceedingly fine deep royal blue colour. There is no noticeable unsightly colour-zoning, and the colour is well distributed throughout the gem. The refractive indices, measured in sodium light, are $\varepsilon = 1{\cdot}759$, $\omega = 1{\cdot}767$, with a birefringence of 0·008. The gem is cut as a squarish oval and measures 27 × 21·7 mm by 15·5 mm in depth.

FIG. 6. Bracelet of 31 Burmese rubies and African Diamonds (NMNH Gem #5020) (Photograph by Lee Boltin, Smithsonian Institution).

The gem is set in a diamond and platinum mounting and surrounded by eight smaller sapphires. The setting is designed in such a way that the sapphire can be worn as a pendant, or the necklace can be removed and the gem worn as a separate brooch. The sapphire is ensconced in a platinum framework encrusted with tiny diamonds and is nicely set off by rows of baguette diamonds, in sets of five on the long edge of the gem and sets of three on the short edge.

The attendant necklace is comprised of 70 baguette and 142 half brilliant-cut diamonds, arranged in alternating rows of two brilliants and one baguette, and set in platinum.

This magnificent gem, the second largest faceted sapphire in the Hall of Gems, was donated by Countess Mona Bismarck.

The above-described items constitute but a part of the recent additions to the Hall of Gems. Other notable pieces include:

1. A magnificent contemporary ruby and diamond bracelet (Fig. 6) comprised of thirty-one well matched Burmese rubies and 86 marquise and brilliant African diamonds, set in platinum.

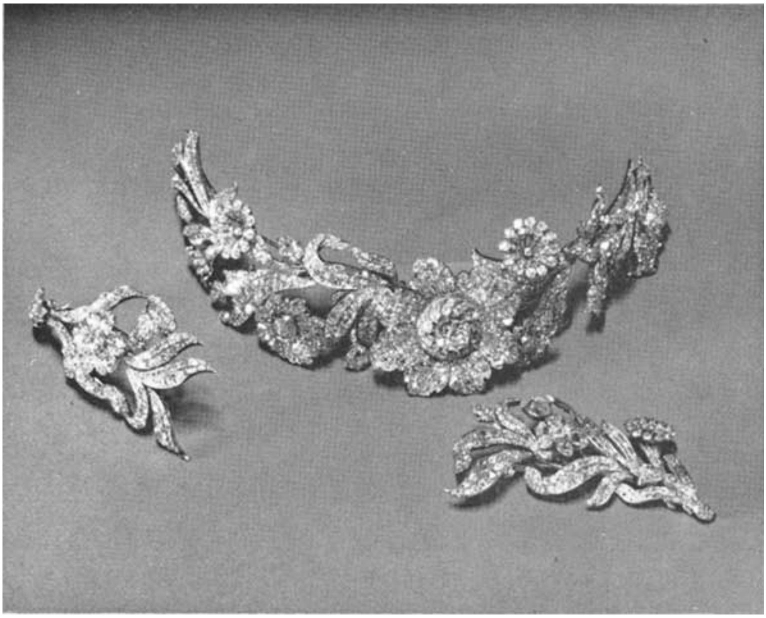

FIG. 7. Floral Diadem with Matching Brooches (NMNH Gem #5026) (Photograph by Lee Boltin, Smithsonion Institution).

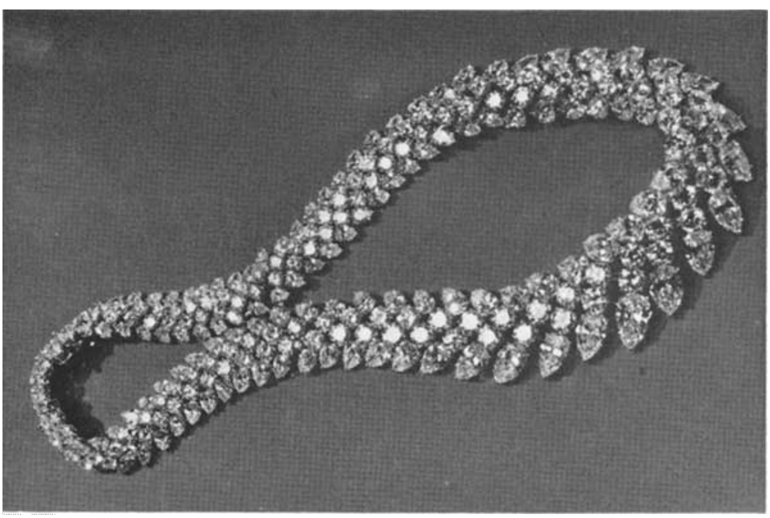

FIG. 8. Contemporary diamond necklace designed by Harry Winston, Inc. (NMNH Gem #5022) (Photograph by Lee Boltin, Smithsonian Institution).

Small emerald-cut diamonds separate the central rubies, while brilliant and marquise-cut diamonds serve to fill out the balance of the bracelet.

2. A lovely floral diadem, mounted on gold-wire spring-work. It is encrusted with diamonds, and some of the floral leaves may be removed and worn separately. Shown in Figure 7, this head-piece was in the hands of the Saxon Royal Family until the end of the 18th century and was eventually donated to the Smithsonian Gem Collection by Mrs Eleanor Close Barzin, of Paris.
3. The contemporary diamond necklace shown in Figure 8 is comprised of 128 pendeloques weighing 66·85 carats and 134 brilliants weighing 42·67 carats. Designed by Harry Winston, Inc., it effectively combines two central rows of brilliant-cut stones with two outer rows of pendeloques, giving the resultant necklace an inherent brilliance while making it appear more lavish than it really is. Estimations on the carat-weight of this necklace are invariably higher than the 110 carat real total.

This assemblage of new and old jewellery has provided a stimulating addition to the Hall of Gems where the National Gem Collection is on exhibit.

The author is indebted to Mr Lee Boltin for the excellent photography and to Paul E. Desautels for assistance with the historical background. Special thanks are due John S. White, Jr, for a critical reading of the manuscript.

REFERENCES

Dix Siècles de Joaillerie Française (1962), Musée du Louvre, p. 87, #95. (Marie Louise diadem)

Twining, Lord (1960), *A history of the Crown Jewels of Europe*, p. 550. (The Russian Nuptial Crown)

EMERALDS AND BERYLS

By A. E. FARN, F.G.A.

AN article by Ian C. C. Campbell, F.G.A., in the October issue of the *Journal of Gemmology** needs an answer. I do not normally rush into print, but feel compelled to deal with the question mooted by Mr Campbell. He asks where is the dividing line between emerald and green beryl? This is not an original question: it has been adequately dealt with before by other authorities. Certainly green beryl, whose colour is due to chromium, is correctly termed "emerald". Green beryl that does not owe its colour to chromium is not emerald.

In his article, first read to the Gemmological Association of Rhodesia in 1971, Mr Campbell made considerable use of an article by A. M. Taylor, Ph.D., F.G.A., on Synthetic Vanadium Emerald† (in itself a contradiction, since his opening lines state that this new synthetic has no chromium). In a number of analyses of emerald he (Taylor) states vanadium was present, but so too was chromium. No one doubts the presence of vanadium, which is usually swamped by chromium, but it is the ubiquitous chromium which keeps turning up. Campbell quotes Taylor's definition of emerald as "a bright green variety of beryl" adding on his (Campbell's) own account "no matter what the cause of the colour is—as long as it is the acceptable(?) hue of green. (The question-mark in brackets is mine)." By his question-mark Mr Campbell admits that "acceptable hue" is ambiguous, to say the least.

The use of the Chelsea colour-filter is no longer of great diagnostic power: it is well known among practising gemmologists that many natural emeralds remain green when so viewed but have in fact a good clear sharp chromium spectrum. I should like to point out here that the use of the spectroscope is in itself an art, when one considers that inadvertently some people have an optical deficiency in resolving lines in the red end of the spectrum. Although my eyes are not so good as once they were, I find that by expertise and judicious use of the spectroscope (handling, focusing and hosing) I can see lines which have escaped my younger colleagues until skill has been placed at their disposal—*then* they are seen.

J. Gemm.*, 1974, **XIV 4, 177–180.—Ed.

†*J. Gemm.*, 1967, **X**, 7 211–217.—Ed.

I digress however, since I am in print for the sole purpose of stating that emeralds *must* have chromium in their content such that with skill, expertise and knowledge, it can be detected by use of a hand-spectroscope—preferably a Beck prism model. The beauty of the spectroscope is that it is indeed a non-destructive test and saves what Mr Campbell touched upon, the destruction of a stone to find traces of chromium! !

Because this spectroscope test is so positive and sensitive it is unique in fixing the determination of emerald, whether it be a poor thing or a superb example of emerald at its best. The merits of the stone, be they commercial or not, are decided by appearance. The example of a poor emerald being mounted and *thought* to be merely green beryl only affords one the obvious knowledge that the stone had no great merit and no gemmologist had tested it (we hope!).

One cannot but feel sorry for the poor hapless people in Rhodesia being "unwittingly legally at fault for dealing with uncut emeralds while genuinely thinking the stones are ordinary beryl". (Mr Campbell's words, not mine). Dr Taylor does not have a valid point when he advocates that "emerald should apply to a bright green variety of beryl". The trade does *not* accept this suggestion and in this country is zealous, if not anxious, to have its emeralds tested to know that they confirm to "trade regulations and usages", as published and displayed by all members of the London Chamber of Commerce and Industry's Precious Stone Trade Section. These state:—"According to the custom of the trade the word Emerald not preceded by a qualification is applied exclusively to natural grass-green beryl with colour due to chromium". The writer respectfully refers all readers to "Chromium as a criterion for Emerald", by B. W. Anderson, *Journal of Gemmology*, Vol. X, No. 2, April, 1966.

TOURMALINES: MULTIPLE INDICES ON THE REFRACTOMETER: A FURTHER NOTE

By C. A. SCHIFFMANN, F.G.A., G.G.

REFERENCE is made to an article submitted for publication by the author in spring, 1972, and printed in the *Journal of Gemmology*, Vol. 13, No. 4, October 1972. The contents offered a detailed description of the appearance of certain cut tourmalines showing satellite shadows of the basic refractive indices on the refractometer, together with a microscopic examination of superficial features present in some of these tourmalines. With the intention of contributing an interesting exchange of experience the author gave a short summary of this subject as an "avant-première" in his talk before the members of the 14th Gemmological Conference at Vitznau, in September 1972. In the following discussions, Professor H. Bank mentioned having observed a similar phenomenon of indices with several shadows in fired tourmalines, and submitted the hypothesis that the reason might be a kind of dissociation.

In private communications following the publication of the article an Australian correspondent, J. R. Jones, wrote to the author mentioning that he had occasionally observed a similar appearance of shadows on the refractometer with certain tourmalines. Mr Jones suggested the hypothesis that agents used during the cutting process might cause a temporary alteration of the surface structure but that this might after a time disappear.

In the 1972 article the author suggested that heat-treatment of the tourmalines would play a role in this phenomenon, but it was not yet clear whether heat alone, or heat as developed in the course of the cutting process through grinding and friction on the polishing lap, would be responsible. According to M. D. S. Lewis and Mrs. G. Parry a modification of the surface of crystals, through the heat of the cutting process resulting in the existence of a Beilby layer, was not conspicuous when testing the indices on a refractometer—the layer being too shallow. "The fully amorphous layer where it exists is far too thin for effect on refractive index".(3) This concurs with the observations reported where the tourmalines did not show the reaction of a superficially amorphous substance, but the indices of a crystalline one, exposing the usual birefringence of tourmaline at their point of maximum separation.

The next step foreseen was to check whether the phenomenon was superficial or present throughout the stones. However, prior to the drastic step of recutting the specimens, in order to avoid uncontrolled modifications, it was preferred to verify the permanence of the phenomenon on the most typical of the tourmalines previously examined, exhibiting 4-fold indices, the data of which are as follows:

Tourmaline of S.W. Africa, cut, with "record" 8-shadow effect on the refractometer

Colour of the stone	dark green				
Weight of the stone	over 13 carats				
Specific gravity	3·11 (hydrostatic method)				
Indices		basic shadow	satellite shadows		
	o	1·645	1·647	1·652	1·660
	e	1·623 +	1·624	1·625	1·629

This specimen was placed at one side at room temperature for about two years and checked from time to time—lastly in 1974. The same satellite indices were obtained on different facets, under the same testing conditions as previously. Consequently, the phenomenon is considered as being permanent at room temperature without further treatment.

The next step was now attempted through carefully recutting to assess whether this appearance would be only superficial (as the shallow fissures observed previously on some specimens and described in 1972 suggested) or whether the modification existed throughout. To verify this, the same tourmaline was slightly recut in 1974, paying particular attention in

(*a*) taking great care to avoid any excessive heating of the stone by settling it especially gently onto the lap, and

(*b*) grinding away only a thin layer of substance, about 0·1 to 0·2 mm in thickness. The result, after partial recutting, is shown in Figures 1 and 2.

On the larger resulting facet of the pavilion side (Fig. 1) the indices measured on the refractometer consisted of two single shadows without satellite lines, as is usual for normal tourmaline, situated at

situated at	o	1·645
	e	1·623 +

whereas on the other unmodified facets the multiple indices were always present with the same intervals, without any modification due to the time lapse, as the latest check has proved.

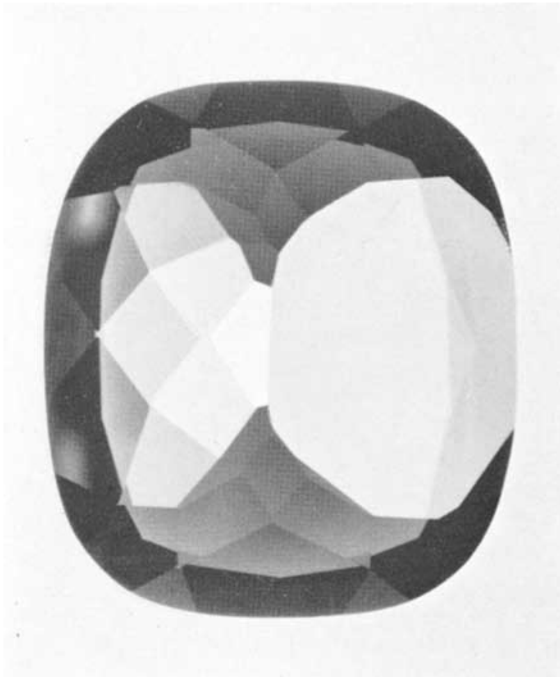

FIG. 1.

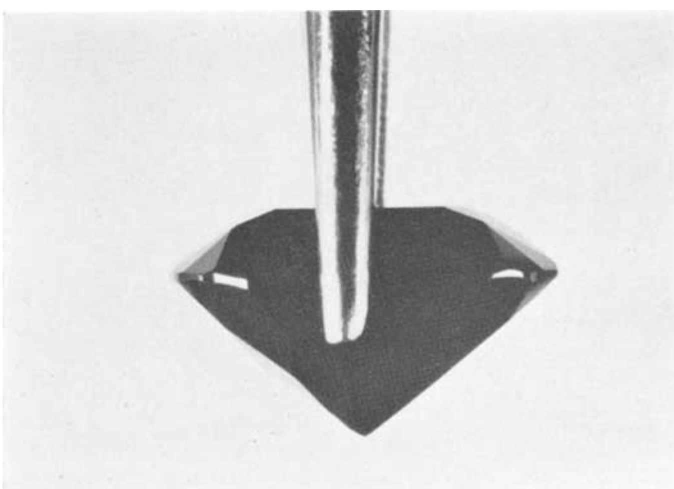

FIG. 2.

The following factors influencing the phenomenon were ascertained:

(*a*) it is limited to a shallow, superficial layer;

(*b*) cutting without development of excessive heat is not the cause;

(*c*) lubricating and grinding agents used had no action of re-establishing it.

The next sample worth noting is a "record" cut tourmaline weighing over 25 carats, showing a 4-fold effect of the refractive indices on the refractometer; this is the largest showing this effect met with up to date. The shape is rectangular with cut corners, the colour green: compared with the colour samples of the DIN 6164 system, the lighter zones correspond approximately to the master colour 21·5 : 4 : 2, the prevalent wavelength being situated between the master colour 21 at 502·4 nm and the master colour 22 at 529·5 nm. Further details of this sample are as follows:

Dichroic colours	:	o dark green
		e lighter green
Specific gravity	:	3·08

Aspect of the indices as observed on a spinel prism refractometer (Anderson-Payne model by Rayner)

	Basic shadow as observed on 9 of the larger facets	Satellite shadows as observed on 14 of the larger facets		
o	1·642	1·643	1·645	1·648
e	1·622	1·6225	1·623	1·625

True Birefringence 0·020.

The prominent feature was that amongst the 25 larger facets, 14 gave the 4-fold readings, i.e. two basic indices with a true birefringence of 0·020 each accompanied by three satellites, whereas

FIG. 1. Base view of a dark green, cut tourmaline, weighing over 13 carats, showing 4-fold indices on the table and on the smaller facets when tested on the refractometer. Slight recutting of some of the pavilion side facets resulted in one large facet (right side of figure) on the centre edge of which only two single, basic indices were observed.
Original length of the sample: 16 mm.
Combined lighting—transmitted light to show the transparency of the specimen, reflected light to demonstrate the shape of the facets. (*Photograph C. A. Schiffmann*)

FIG. 2. Side view of above tourmaline—to show how little material was cut away on the right side of the pavilion: at the formerly prominent spot only approximately 0·1 to 0·2 mm thickness. On the left side of the pavilion the facets were left in their original condition. Original size of the sample: width 14·1 mm, height 8·4 mm. (*Photograph C. A. Schiffmann*)

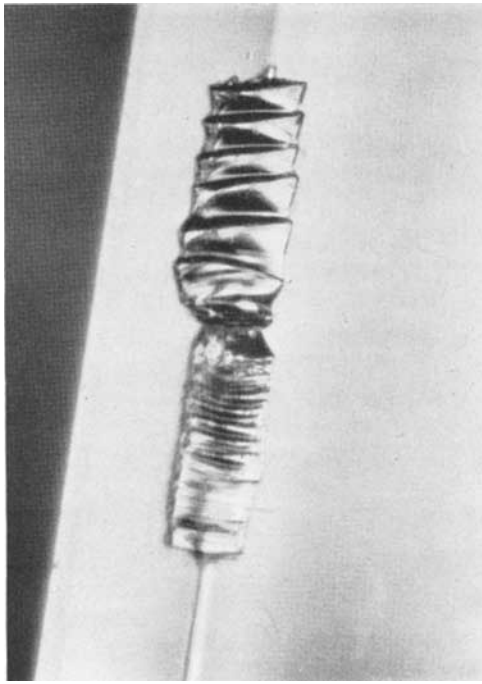

Fig. 3. Microphotograph of dark green, cut tourmaline, showing 4-fold indices, weighing over 25 carats—the largest met with to date. At the girdle on the common edge of two long side facets (orientated parallel to the direction of the optic axis) fracture surface was not caused by a knock but presumably through thermal shock. The roughly similarly orientated, cyclic arranged grooves at the surface give testimony of relieving internal strain. Original length of the fracture: approx. 1 mm.
(*Photograph C. A. Schiffmann*)

the nine of the remaining larger facets showed only the two single readings, usually situated at the same values as the basic indices above; the corner facets were too small to yield valid readings.

Through examination between crossed polarizers, tourmalines often exhibit strain resulting in irregular extinction in a direction parallel to the optic axis; another effect of strain is a good example, showing a small splintered place spotted on a common edge of two long facets. Under convenient magnification, the fractured place is seen to have quite a remarkable surface configuration worth showing as in Figure 3; the cyclic arrangement of the nearly parallel grooves confirms the repeated zones of internal strain.

There are several reasons why the presumable releasing factor induced was a thermal shock when heating the tourmaline—the localization on a facet edge, the shape, the recessed aspect which is not the one of a fracture through damage caused by a mechanical knock. The fact that the multiple indices are absent in a certain number of facets proves that these have been recut after heating; consequently damaged places at the surface must have been more significant necessitating repolishing with the exception of a small spot.

It should be stressed that among all the tourmalines tested, a few were of a dark green colour still usable for jewellery, whereas the majority of them fortunately showed a very pleasant, saturated green colour which, together with good cutting proportions, made fine bright gems of them.

The absolute largest of all these green cut tourmalines showing the phenomenon (in this case a doubling of the two basic indices, i.e. two basic indices with each one a satellite line, as observed on the table and on the back facets sides) is a splendid gem of 156·04 carats, rectangularly shaped. The colour is a bright, saturated green (dominant wavelength 552·7nm) which compares with colour sample 23 : 4 : 6 of the DIN 6164 Colour Card for the brighter spots, whereas the darker ones have no equivalent on the DIN Card in its present version, and are presumably located at 23 : 6 : 8. This gem is undoubtedly a collector's item with a particular scientific interest. It is part of a private collection.

Up to now, only green tourmalines have been met with showing the multiple indices on the refractometer, but as green tourmalines are more numerous on the market than tourmalines of other colours, there is of course less chance of meeting this feature in the less frequent red, pink, yellow, brown, blue tourmalines.

In a further stage of study, it is foreseen to determine under which conditions the phenomenon is taking place.

In a recent short note, illustrated by a reproduction of the Figures 1, 3 and 4 of the 1972 article presented by the author, Professor Bank describes experiments made independently from those of this study, in an attempt to solve the problem.(4)

LITERATURE

1. Mitchell, R. Keith *Refraction anomalies in tourmalines.* J. Gemm., 1967, **X,** 6, 194.

2. Schiffmann, C. A. *Tourmalines, rare multiple indices on the refractometer.* J. Gemm., 1972, **XIII,** 4, 125-132.

3. Lewis, M. D. S. *The structure of gemstones, Part V.* Gemmologist. 1948, **XVII,** 203, 149.

4. Bank, H. and Berdesinski, W. *Über Phänomene bei der Refraktometerablesung gewisser Turmaline.* Z. Dt. Gemmol. Ges., 1975, **24,** 1, 20-22.

TOPCON DIAMOND PROPORTION HAND SCOPE

By ERIC BRUTON, F.G.A.

THE Japanese, justifiably noted for their optical systems, have introduced a "diamond proportion hand scope" of Topcon make that is different from the three other systems available. The object of any such instrument is to gauge the quality of cut of a diamond by comparing it with a drawing or image of an ideal cut. The accuracy of cutting, or make of the stone, is becoming increasingly important as prices rise and has in any case been a factor in the value of stones of otherwise high quality on the American market in particular for some years.

For this reason, the Gemological Institute of America introduced their "ProportionScope" early in 1967, based on the optical comparator used in industry for quality control, in the hobbing and milling of gear wheels for example. The principle is to project an enlarged and accurate shadow of the part, in this case the diamond, on to a screen with the ideal proportions and the tolerances drawn on it. The magnification of the diamond is adjustable to make the shadow fit the drawing as nearly as possible. The ProportionScope is easy to use, has a wide range but is not easily portable, needs a plug-point and is expensive in the U.K.

Subsequently, for those owning the binocular diamond-grading microscope known as the "Gemolite", with a zoom lens, the GIA introduced a simpler and, to my mind after using both, better alternative called the "diamond proportion reticule". It is an eyepiece containing the same diagram of ideal cut which replaces one of the microscope eyepieces. With it comes a special holder for the diamond which enables it to be placed in the field of vision and to be turned and rotated. It also makes the culet visible. The silhouette of the diamond seen through the eyepiece is made to fit the diagram as nearly as possible by moving the magnetic stone holder and increasing or decreasing the size by the zoom lens.

The third system referred to is a simple one devised by U. J. Pettersson, F.G.A., in which the stone is held in a special holder and its shadow projected by an orthodox projector on to an enlarged drawing of an ideal cut. I have not tried it, but wonder how many modern projectors would have a slide slit width sufficient to admit more than quite small diamonds.

The Japanese instrument looks at first glimpse like a hand-spectroscope with a gadget on one end to hold the stone. Its principal advantage is certainly its portability, because using the GIA eyepiece with their microscope still needs a power-point and the Gemolite is not an easily portable instrument. The Topcon hand scope can be used anywhere as long as there is reasonable light. The stone is clipped between a screwed piece which presses against the table and a spring-loaded one with a tubular end into which the culet fits. It is held centrally, and by means of the screwed part the image of the stone can be centralized vertically in the eyepiece diagram. A screw in the body of the instrument centralizes it horizontally. It is varied in size to fit the diagram by a central knurled band which operates a zoom system. In addition there is another attachment to hold a single stone diamond ring so that the diamond can be examined in the setting.

The instrument works well and is a pleasure to use. Judging the proportions of a stone in relation to pavilion and crown angles, table diameter ratio to total diameter, girdle width, and so on is quick and easy. The only point on which I would criticize it is that the diagram is more complicated than in the GIA's instruments. Without going into detail, it gives actual proportions in percentages and actual angles in degrees and minutes showing the ideals and certain limits, together with scales for table width and girdle thickness. The GIA diagram on the other hand provides scales for all the parameters (except angles, as the angles relate directly to other proportions): this makes the diagram simpler and easier to read.

A more serious omission in the Japanese instrument is a circle on which to gauge the roundness of the stone. To provide one would also need a modified stone holder, of course. Roundness (and centralization of the culet) is an important factor in gauging the quality of make. It is also a factor in another use to which proportion instruments can be put—estimating the weight of stones that are to be recut. For old-mine cuts with cushion-shaped outlines and for earlier European cuts with high crowns and deep pavilions, a Leveridge or Moe gauge can be used to estimate the weight when recut to ideal proportions. If the stone is out of round, or asymmetrical because of an off-centre culet, is too deep in the pavilion, or broken, a proportion instrument can be used to estimate the new weight.

There is one major difference between the two scale diagrams, however. The Japanese one is based on the ideal cut according to the SCAN.D.N. standard, which are the general proportions considered ideal in Europe. The GIA scale diagram is based on the revised Tolkowsky proportions considered ideal in the U.S.A. The main difference is in the size of the table, 53 per cent of the girdle diameter in the modified Tolkowsky ideal cut and 57·5 per cent in the SCAN.D.N. figures. The table height is also slightly less in SCAN.D.N., 14·6 per cent of the total depth (not including girdle) compared with 16·2 per cent as favoured in the U.S.A.

The range of the ProportionScope is 0·18 to 8·00 carats (two screens are provided), and of the diamond proportion reticule from 0·10 to 5·50 ct with the Mark V *de luxe* Gemolite, but only from 0·25 to 1·80 with the non *de luxe* model. The Topcon diamond proportion hand scope has a range from 0·25 ct to 2 ct.

Cost in the U.K. approx. £150.

A JEWEL STONE OR A SCIENTIFIC TOY?

By ROBERT WEBSTER, F.G.A.

THE writer has been privileged to examine an unusual necklet and pendant which has been presented to the Gemmological Association. This piece of jewellery, made of gilt metal, is set with an oval cabochon stone having unusual properties, for when warmed, even by just the heat of the hand, the stone is seen to change colour. The stone, which comes from Japan, owes its colour-change properties to "liquid crystals" sealed into the base.

Examination of this cabochon stone, approximately 17 mm by 12 mm and mounted in a closed-back rolled-over setting, showed the colour at ambient temperature to be blue-grey, which on slight warming first turned to a speckled reddish-yellow, then to a bright green and finally to a bright blue.

The cabochon itself is apparently colourless, and by the "distant-vision" method the refractive index was found to be about 1·57. The hardness is less than 7 as the stone could be scratched by rock crystal. Under the short-wave ultra-violet lamp the cabochon glowed a uniform bluish light, and under the long-wave ultra-violet lamp a somewhat similar glow was seen, but this was not uniform and seemed to come more from the edges, from which it could be inferred that the glow emanated from the base. Mounted on its side on the stage of a petrological microscope, so that light could be transmitted through the stone, and with the "polars" in the "crossed" position, the stone was found to be isotropic. A fair presumption, despite no definite bubbles being seen, is that the stone is glass.

On examining the stone through the microscope, using top lighting, the base was seen to show a mosaic of colours, which were more or less predominantly the colour of the stone at a given temperature. What was more interesting was the quite strong dichroism which could be seen when a hand-dichroscope was used, the "twin-colours" being light and dark shades of the hue of the stone at the given temperature. This is considered to be an optical effect from the encapsulated liquid crystals. No diagnostic absorption spectrum could be seen, although, maybe, there was an absorption of the blue-violet which moved to shorter wave-length as the stone turned to a blue colour.

An experiment to determine the temperatures at which the liquid crystals turned to different colours was carried out by placing the pendant, metal surface downwards, on the flat surface of the asbestos housing of a sodium lamp. This supplied a slow-heating warm plate. Placed in juxtaposition with the metal of the pendant was set the bulb of a mercury thermometer which was graduated in fifths of a degree Celsius. The following results were established:—

17·3°C	Ambient temperature colour of the stone blue grey.
22·3°C	Stone started to turn to a reddish-yellow.
23·0°C	Stone completely reddish-yellow.
23·5°C	Stone started to turn green.
23·8°C	Stone became a bright green.
24·4°C	Stone had a blue-green colour.
25·0°C	Stone turned to a bright blue.

This colour remained till about 28·5°C when the stone appeared to start to turn to its original blue-grey colour. At this stage the lamp was switched off—in fact when the temperature was at 30·0°C. On cooling, the stone changed colour in reverse order and at similar temperatures.

Liquid crystals do not appear to have entered the field of gemmology until now, although they have been used in digital displays in watches. What are liquid crystals? The short statement by Julius Grant(1) that "they are a liquid which have the optical properties of a crystal" gives a start to the answer. The report of a lecture given to The British Horological Institute at the Royal Society of Arts by Richard Elliott(2) puts it another way as the lecturer states "The action of a liquid crystal is rather complex. Briefly, it can be described as a re-alignment of molecules when a voltage is applied causing the crystal to become cloudy and light-reflective". Later the writer was credibly informed that there is a mirror or reflective surface placed below the crystal and the normal incident light is reflected and "lights-up" the cloudy crystals. This may well be due to a "Tyndall effect". It is clear from this that the liquid crystals used in watches operate by electrical or magnetic stimulation. This jewel stone operates by temperature, so it was necessary to "dig further".

A scientific encyclopaedia was then consulted(3) and further information was obtained from this reference. This told much more and stated that liquid crystals are viscous with viscosities extending from that of a light glue to a glassy solid and that they have very definite evidence of structure. There is a three-fold classification of liquid crystals, depending upon the arrangement of the molecules. These are *smectic* crystals, *nematic* crystals, and lastly the *cholesteric* liquid crystals which exhibit the phenomenon of *circular dichroism:* that is, they break a beam of ordinary light into two components, one with the electric vector rotating clockwise and the other rotating counter-clockwise. The first is usually transmitted and the second reflected. This is a property which gives these liquid crystals an iridescent light when illuminated with white light. Some liquid crystals of cholesteric type behave as liquid crystals and produce colour change only in a certain temperature range. It seems that the liquid crystals in this jewel stone are of this category.

REFERENCES

1. Grant (J). *Hackh's Chemical Dictionary,* 1969, McGraw-Hill, London. p.185.
2. *Horological Journal,* November 1972, **115**, 4, 10.
3. *Van Nostrand's Scientific Encyclopedia,* 4th Edition, 1968, New Jersey, pp. 1024-1025.

NOTES ON INCLUSIONS IN TANZANITE AND TOURMALINATED QUARTZ

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Helvite in Quartz

Tourmalinated (schorl) quartz from Governador Valadares, Minas Gerais, Brazil, is frequently encountered as cabochon-cut or faceted gems. Gems of clear, colourless, quartz with the black needles of tourmaline are quite striking. Interspersed through this material are exceedingly thin filaments of an unknown mineral (perhaps tourmaline). Perched on these filaments are euhedral light yellowish-green tetrahedra (Fig. 1). These tetrahedra are usually isolated and quite obvious under a magnification of 10 × and

Fig. 1. Tetrahedra of helvite impaled on unknown filamentary crystal in Brazilian tourmalinated quartz. (60 ×).

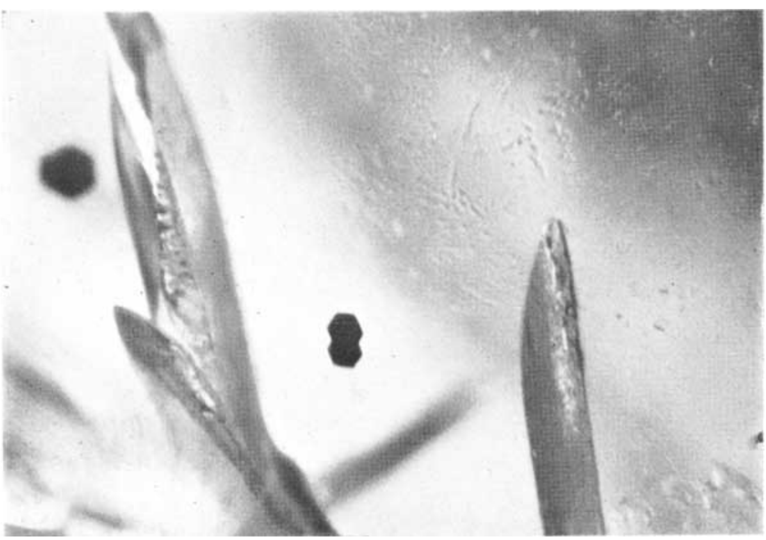

Fig. 2. Graphite inclusions in tanzanite. (40 ×).

they are about 1 mm in maximum dimension. Optical examination of these green tetrahedra indicated that they are isotropic, with a refractive index of $\sim nD = 1{\cdot}73$. Examination by x-ray diffraction indicated that these crystals were in the helvite group. Microprobe analysis of this helvite group mineral indicates that Mn > Fe > Zn and thus the yellowish-green included crystals are helvite, $Mn_4Be_3(SiO_4)_3S$. This analysis is presented as Table 1.

Graphite in Tanzanite

Blue gem zoisite (tanzanite) was discovered in Tanzania in 1967 and was described by Hurlbut (1969). Inclusions of black hexagonal crystals in this material were noted by Eppler (1969) and by Liddicoat (1967). The identity of these black crystals was not determined by either Eppler or Liddicoat. The hexagonal euhedrons occur both as discrete crystals and in parallel growth (Fig. 2). X-ray diffraction indicates that they are graphite. In one of the specimens in the Smithsonian collections, there appears to be an epitaxial relationship with {0001} of graphite parallel to {010} of tanzanite. Since there also is abundant randomly oriented graphite in some specimens, this possible epitaxy is not at all certain and confirmation must await repeated observations.

Most tanzanite is cut with the table of the stone parallel to {010} to avoid the less pleasing red-violet colour of the X-vibration direction. Gems cut with this orientation will have the strongest and most pleasing blue colour. If the above noted possible epitaxial relationship is substantiated by repeated observations, this presents a dilemma for the lapidary in the cutting of a stone with these graphite inclusions. In order to produce a stone with the strongest blue colour, he will be compelled to cut the gem in such a manner that the graphite crystals will be most obvious. By cutting the gem with the table parallel to {100}, the lapidary can orient the graphite so that it is seen edge-on when looking through the table of the stone, but he will be cutting a gem in which the less pleasing red-violet colour of the X-vibration direction will be observed. This also will hold true for heat-treated tanzanite, although the effect is less troublesome as the X-vibration direction colour is changed to violet-red after heat-treatment. It is indeed fortunate that the graphite inclusions are not too common. For a detailed discussion of the effects of heat-treatment of tanzanite, the reader is referred to Dr C. S. Hurlbut's paper.

TABLE 1

ANALYSIS OF HELVITE FROM BRAZIL

MnO	47·67%
FeO	1·46
ZnO	0·24
CaO	0·60
BeO*	13·51
Al_2O_3	0·71
SiO_2	31·90
S	5·17
TOTAL	101·26
LESS O = S	2·58
	98·68

*BeO content estimated from calculation from pure end-member components.

TABLE 2

OPTICAL PROPERTIES OF ZOISITE

(Reprinted from the *American Mineralogist* with Dr Hurlbut's permission.)

Indices (Na light — ± 0·0001)	Orientation and Pleochroism	
α = 1·6925	$X = b$ red-violet	Opt (+)
β = 1·6943	$Y = c$ deep blue	2V = 53°
γ = 1·7015	$Z = a$ yellow-green	$r > v$

REFERENCES

Anderson, B. W. (1968). *Triple bill, three items of interest to gemmologists.* J. Gemm., **11,** 1, 1–3.

Eppler, W. F. (1969), *Einschlüsse im blauen zoisite.* Z. Dt. Gemmol. Ges., **18,** 2, 56-60.

Hurlbut, C. S. (1969). *Gem zoisite from Tanzania.* Am. Miner., **54,** 702-709.

Liddicoat, R. T. (1967). *Developments and highlights at the Gem Trade Lab in Los Angeles.* Gems Gemol., **12,** 8, 247.

Liddicoat, R. T. and Crowningshield, G. R. (1968), *More about zoisite.* Lap. Journ., **22,** 736-740.

Meen, V. B. (1968). *Zoisite, a newly found gem from Tanzania.* Lap. Journ., **22,** 636-637.

EMERALD FROM NORTH CAROLINA

By M. J. O'DONOGHUE, M.A., F.G.A.

THE Big Crabtree emerald mine is situated near the Great Smoky National Park in Mitchell County, near to the town of Asheville. It is operated commercially and had reached a depth of 210 feet in 1968. I am greatly indebted to Mr William Collins, operator and part owner of the mine, for sending me two crystals, of good hexagonal form and of a fine colour, and a piece of quartz with feldspar, bearing tourmaline and emerald crystals. I am most grateful to Professor William J. Furbish, of Duke University, Durham, North Carolina, for introducing me to Mr Collins.

The mine contains quartz, feldspar (albite), tourmaline of a dark colour, and mica schist. The emeralds are found in a pegmatite and are growing deeper in colour as the mine goes deeper. Most of the emerald is so intimately associated with the feldspar that the two are recovered and slabbed and polished together, being sold under the name of "emerald matrix". Mr Collins was kind enough to send me a slab of this material.

The two crystals in my possession show a medium red under the Chelsea filter and display a chromium absorption spectrum. It was not possible to obtain a clear refractive index reading since there were no faces sufficiently flat, but a rough "bright line" reading indicated approximately 1·58.

Professor Furbish, who refers to the location as "Little Switzerland" in an article in *Gems and Gemology*, Summer 1972,* showed that inclusions of quartz crystals were found in emeralds recovered from all depths of the mine, though they occurred in few individual crystals. The quartz crystals did not appear to follow any crystallographic orientation. Mica crystals could be seen in the quartz inclusions, though I was unable to distinguish either mineral in my specimens. G. F. Kunz, in "History of the gems found in North Carolina", published in 1907, states that the emerald crystals varied in length from minute up to one inch, and were $\frac{1}{8}''$ to $1\frac{1}{4}''$ in diameter. My two crystals are $\frac{1}{4}''$ long by $\frac{1}{4}''$ wide.

The other major emerald location in North Carolina is the Rist Mine, near the town of Hiddenite. At this mine work takes place in surface levels, which are bulldozed to facilitate access.

**Gems Gemol.*, XIV, 2, 34-37. — Ed.

There is no tunnelling as at the Big Crabtree mine. In 1969 the largest crystal of emerald found in North America was unearthed; it measured $3\frac{1}{16}''$ long by $2\frac{1}{8}''$ wide. Many of the emeralds from this area are a good chrome-green on the outside but have colourless cores. The surrounding material is a micaceous red sandy clay in which the emeralds occur in pockets. Muscovite mica flakes and quartz crystals appear to be an indication of the possible whereabouts of emerald.

William Earl Hidden, after whom the green chrome-coloured spodumene was named, was sent to this area by Edison to look for platinum. This was not found, although hiddenite was. In 1881 he started the Emerald and Hiddenite Mining Company; operation of the mine was sporadic and ceased in 1927. To-day the property is owned and worked by American Gems, Inc., who allow visitors to dig for emerald.

Gemmological Abstracts

ANDERSON (B. W.). *Short cuts to certainty.* Australian Gemmologist, 1974, 12, 3, 71–74.

First printed in *Z. Dt. Gemmol. Ges.*, and abstracted in *J. Gemm.*, 1974, XIV, 4, 181. R.W.

BALL (R. A.). *Liesegang rings.* Australian Gemmologist, 1974, 12, 3, 89–91. 1 illus.

A discussion on the formation of Liesegang rings and the theories for them that have been propounded. There is a good list of references. R.W.

BANK (H.). *Gelblich-grünlicher durchsichtiger Prehnit aus Australien.* (Yellow-green transparent prehnite from Australia.) Z. Dt. Gemmol. Ges., 1975, 24, 4-7.

Prehnite has long been known as usable as a gemstone. It has now been found in a transparent or nearly transparent state; the refractive indices of these stones can easily be read and their R.I.s and their relationship with their chemical composition are presented in diagram form. The prehnite under discussion came from Australia. Bibliography. E.S.

BANK (H.). *Durchsichtiger schleifwürdiger roter Cuprit von der Onganja Mine.* (Transparent cuttable red cuprite from the Onganja mine.) Z. Dt. Gemmol. Ges., 1975, 24, 8-9.

The author discusses this cubic crystal from a new find in S.W. Africa. Chemically the stone is Cu_2O, D = 6·0 ± 0·2, the hardness is 3½–4 and the R.I. 2·848. Bibliography. E.S.

BANK (H.). *Grüner durchsichtiger schleifwürdiger Phosphophyllit von Cerro Rico de Posito/Bolivien.* (Green transparent cuttable phosphophyllite from Cerro Rico de Posito in Bolivia.) Z. Dt. Gemmol. Ges., 1975, 24, 10-12.

This phosphophyllite was found in the silver and tin mines in Bolivia. It has a hardness of 3-4, density 3·081-3·0825, crystallization is monoclinic-prismatic, R.I. = 1·599-1·621, D.R. = 0·022. The colour is light green. E.S.

BANK (H.). *Grüne chrom- und vanadiumhaltige Granate (Grossulare) aus Kenya: Tsavolith—Moeglichkeit einer neuen Benennung?* (Green grossularites containing chromium and vanadium from Kenya: Tsavolite—possibility of a new name?) Z. Dt. Gemmol. Ges., 1975, 24, 13-15.

There have been various finds in Kenya of green grossularites which occur in various colour intensities. The trade has suggested a new name for these stones, i.e. Tsavolite, as the Tsavo Park is near the occurrences and lithos = stone. E.S.

BANK (H.) and BERDESINSKI (W.). *Über Phänomene bei der Refraktometerablesung gewisser Turmaline.* (Phenomena when taking the refractometer reading of certain tourmalines.) Z. Gemmol. Ges., 1975, 24, 20-22.

The authors will continue to research into the cause of the phenomena shown when reading R.I. of tourmalines first described by R. K. Mitchell in 1967 and later noted by various other gemmologists. After some experiments in which stones showing these phenomena were halved and one half repolished, the authors conclude that these deviations from the norm could be classed as surface phenomena caused by overheating during the heating process. E.S.

BOLTON (H. C.). *Synthetic diamonds.* Australian Gemmologist, 1974, 12, 3, 81–83.

The report of a lecture given at the Federal Conference of the Gemmological Association of Australia. The article contains much useful data and there is a good list of references. R.W.

BRIDGES (C. R.). *Green grossularite garnets ("Tsavorites") in East Africa.* Gems & Gemology, 1974, XIV, 10, 290–295. 1 illus. 2 maps.

A very good geologically oriented survey of the green grossularite garnet found in Kenya. This stone has been called "Tsavorite" by Tiffany & Co. Much is told of the possible formation of the mineral and the elements which may be the cause of the colour. A seemingly unnecessary comparison with emerald is made. R.W.

BROOKES (N.). *Jade.* The Guilder (Johannesburg), 1975, 1, 4, 1–5. 3 illus.

A short and concise article which is factually correct. R.W.

BUECHE (ARTHUR M.). *Diamond Synthesis—A Continuing Exploration.* Proceedings of the Royal Institution of Great Britain, 1974, 47, 287-302.

This is an account of Dr Bueche's Discourse given at the Royal Institution on 2nd May, 1974, during the course of which he not only demonstrated the burning of a diamond by heating it to about 800°C and dropping it into liquid oxygen but also actually made some diamonds by the General Electric process—"the first time we have ever made a public demonstration of this type". Success was first achieved by General Electric using a metal catalyst, and now by using different metal catalysts a variety of shapes, sizes and types can be produced to meet customers' requirements. At pressures nearing 3 million p.s.i. and simultaneous temperatures of nearly 5000°C graphite can now be directly converted to diamond without a catalyst, but using catalysts at lower temperatures and pressures remains most cost-effective. "Hexagonal diamond" has been created, which in nature has been found only in meteorites ("Lonsdaleite"): and semiconducting diamonds can be made, as well as diamonds of gem quality. Still in the future, it is suggested that, under sufficient pressure, diamond, like silicon and germanium, should have a metallic form. J.R.H.C.

CASSEDANNE (Jacques P. and Jeannine O.). *Le gîte d'améthyste de Cabeludos.* (The home of Cabeludos amethyst). Bulletin de l'Association Française de Gemmologie, 1975, 42, 22-24.

An account of the occurrence of amethyst in the state of Bahia, Brazil. The crystals are found as hexagonal prisms with pyramids and are more deeply coloured towards the termination. S.G. given as 2·67, R.I. as 1·553, 1·544, D.R. 0·009, H. 7. M.O'D.

CROWNINGSHIELD (R.). *Developments and Highlights at the GIA's Lab in New York.* Gems & Gemology, 1974, XIV, 10, 298–305; 11, 327–336. 40 illus.

There is the report of another taaffeite, said to be the largest on record, but no present weight is given (although it is stated to have weighed more than 9 carats before recutting), and there are further reports on a cat's-eye kornerupine weighing 7·57 carats and of a grey-green cat's-eye zircon. A bright green and some yellow sapphires brought back from the Orient were found to be synthetic. Quartz crystals suitably cut and painted green found inserted into matrix rock form a new fake to puzzle the mineral buyer. Proposed to be marketed under the name "captured emerald" is a new composite stone which consists of a hollow-backed rock crystal in the hollow of which are embedded pieces of beryl or emerald in a green cement (plastic). A pendant of fluorite of some age, but well protected by the setting, is mentioned. A black and white vase which was found to be nephrite and a carved dagger in stained jadeite are two other items recorded. A number of fake lapis lazuli pieces are mentioned and these include dyed howlite and plastic bonded lapis-lazuli types. Other items reported are surface-stained and plastic-coated turquoise, an imitation opal on matrix, inclusions in an emerald which probably came from the Lake Manyara source in Tanzania, the inclusions being emeralds of a deeper colour. Reference is made to modifications to the brilliant-cut and inclusions in diamond. A star-sapphire damaged by a loose diamond shoulder stone and damage to a diamond by burning are reported. The name "blue morganite" is mentioned as being used for treated "Maxixe type" beryl. There are reports on the rubies from Tsavo National Park, Kenya, and some notes on the Uncle Sam diamond and on a visit to the Maine tourmaline mine. R.W.

CURTIS (George E.). *Venezuela's valley of diamonds.* Lapidary Journal, 1975, 28, 11, 1708-1718.

Diamonds obtained from the Rio Guaniamo amounted to almost 700,000 carats in 1973, the location being near the Guaniamo river, reference 7° 50′ north, 65° 80′ west. M.O'D.

DEGENHARD (W. E.). *The measurement of the brilliance of diamond.* Also EULITZ (W. R.). *The optical brilliancy of two different brilliants—a comparative investigation.* Gems & Gemology, 1974, XIV, 9, 259–269 and 273–282. 11 illus. 5 tables.

These two articles are respectively a complaint and a rebuttal, giving two different interpretations of the brilliance of a brilliant-cut diamond with 106 or (supplemented by 38 additional girdle facets) 144 facets compared with the normal brilliant cut of 58 facets, Degenhard claiming that it shows more, and Eulitz that it shows less, brilliance. In Figure 1 of the Degenhard article there seems to be a lack of clarity and understanding of the optics of light rays. R.W.

DUNN (P. J.). *Inclusions of albite and phenakite in gem topaz from the Tarryall Mountains, Colorado.* Gems & Gemology, 1974, XIV, 11, 337–339. 2 illus.

The deposit of blue topaz crystals at this locality was first worked about 1909 and consists of well-formed crystals in the loose debris formed from the weathering of pegmatites. The refractive indices are about 1·61–1·62, but the birefringence is said to be only 0·008, which is rather low for the fluorine-rich type of topaz. The density is 3·56. The crystals darken to a murky brown after a ten-hour x-radiation using CuKα radiation, but this gradually fades after several days exposure to sunlight. Two types of inclusion were found—by using x-ray powder photographic method and by electron microprobe—and were broad platy crystals of albite either as single platelets or twinned multiple crystals and clear colourless phenakite crystals. R.W.

EPPLER (W. F.). *Nochmals: Synthetischer Opal.* (Again: synthetic opal.) Z. Dt. Gemmol. Ges., 1975, 24, 23-25.

In December 1974 the author described in the *Z. Dt. Gemmol. Ges.* the black synthetic opal produced by the firm Gilson in France*. This firm also manufactures white opal with specific gravity and R.I. as in the natural stones. The easiest way to differentiate between the natural and synthetic white opal is again by microscopic examination. The synthetic product shows a cobble-like structure made up of fairly regular blocks. These synthetic stones are made from sodium silicate (water glass) or a silicon ester which is then slowly dehydrated. The tiny particles are similar to the cristobalite balls in natural opal and have a diameter of 0·0002 mm. The synthetic product has a hardness of 4½ as opposed to 5½-6½ for the natural stone. The commercial value is £10-£300 p. ct. E.S.

GELLIE (G. J.). *Industrial diamonds.* Australian Gemmologist, 1974, 12, 3, 84–89.

A general survey of the types of diamond and a very good exposition of the various uses to which diamonds have been put in industry and science. R.W.

GRAINDORGE (J. M.). *A gemmological study of emerald from Poona, Western Australia.* Australian Gemmologist, 1974, 12, 3, 75–80. 10 illus.

A very good survey of the emeralds first found during 1914 in the Poona district of Western Australia. The geology of the emerald formation and the properties of the emeralds found at this locality are given. It is said that three-phase inclusions are found in Poona emeralds. A useful article. R.W.

HUDSON (D. R.). "*Pilbara jade*". Australian Gemmologist, 1974, 12, 4, 127–133. 3 illus.

"Pilbara jade", or "Marble Bar Jade", is found to be a serpentine mineral. The article deals with the different types of serpentine and tells of other green minerals in the Pilbara region. R.W.

LEITHNER (H.). *Seltene Lasuritkristalle aus Afghanistan—Ein Beitrag zum Farbproblem Lapis-lazuli.* (Rare lazurite crystals from Afghanistan—a contribution to the colour problem of lapis-lazuli.) Z. Gemmol. Ges., 1975, 24, 26-36.

Survey of history and characteristics of lapis-lazuli, found mainly in Hindu-Kush and specifically in Badakhshan: also gives details of rare rhombic dodecahedral crystals of lazurite, roughly 5 cm diameter, found in white marble from

*Abstracted in J. Gemm., 1975, XIV, 6 295.—Ed.

Afghanistan. The author discusses chemical composition, crystal structure and habit, colour and how it is produced, R.I. density, and fluorescence and especially details of occurrence of the Badakhshan finds. E.S.

Liddicoat (R. T.). *Developments and Highlights at the GIA's Lab in Los Angeles.* Gems & Gemology, 1974, XIV, 10, 309–316; 11, 340–351. 44 illus.

A very full report on the examination of Gilson synthetic opals is given, which includes the effects seen by transmitted light and by ultra-violet transparency. A new synthetic white star-sapphire and cameos in hessonite garnet and in quartz are mentioned. A colour-change natural spinel, a ruby with unusual inclusions, sodalite, and black spinel are items discussed. Various inclusions seen in diamond as well as a diamond which had cleaved in two are referred to, and damage to a red garnet-topped doublet is described. Concentric growth lines in a synthetic star-sapphire, and unusual inclusions in glass and in hessonite garnet, as well as unevenly dyed jade, are mentioned. A tortoiseshell snuff-bottle, which showed the layering where the material had been pressed together, is another item referred to. R.W.

Lindsten (Don E.). *The emerald.* Lapidary Journal, 1975, 28, 11, 1694-1700.

A general account of the emerald with particular reference to the manufacture of synthetic stones. M.O'D.

Males (P. A.). "*Mexican onyx and other marbles*". Australian Gemmologist, 1974, 12, 3, 92–94. (Reprinted from Australian Lapidary Magazine).

A general article on "onyx marbles" with much consideration of the nomenclature with overtones on Consumer Protection. R.W.

Nassau (K.). *Natural, treated, synthetic and imitation gems.* Gems & Gemology, 1974, XIV, 11, 322–326. 5 illus.

This article puts into perspective the various groups implied by the title but with the main emphasis on treatment. The terms synthetic and imitation are discussed. There is a good list of references. An article which must be read. R.W.

Oughton (J. H.). *Treated stones.* Australian Gemmologist, 1974, 12, 4, 111–118.

A general survey of the stones said to have had their colour changed or enhanced by irradiation or by sub-atomic bombardment, methods which have reached considerable importance in the last decade. The stones mainly considered are topaz and beryl. There are some notes on the treatment of amethyst, spodumene and sapphire. The type of wording to be used on certificates for these stones and the legal aspects of nomenclature are discussed. R.W.

Petrov (I.) and Berdesinski (W.). *Untersuchungen künstlich farbveraenderter blauer Topase.* (Examinations of blue topazes with induced colour-change.) Z. Dt. Gemmol. Ges., 1975, 24, 16-19.

This report is only preliminary. The authors report on the blue topazes which have recently been sold in Europe and which could not be distinguished from the natural blue topazes. The method of differentiating between the natural and synthetic colour is a thermo-luminescence one. Bibliography. E.S.

POIROT (J.-P.). *Les principaux substituts de lapis-lazuli.* (The principal substitutes for lapis-lazuli). Bulletin de l'Association Française de Gemmologie, 1975, 42, 25-26.

Sodalite, lazulite, dumortierite, azurite, glass, synthetic spinel, stained jasper and other imitations are described. M.O'D.

POST (George). *Blue magic: turquoise Indian jewellery.* Lapidary Journal, 1975, 28, 11, 1670-1676.

An account, illustrated in colour, of the history of the use of turquoise as an ornamental stone with illustrations of Indian jewellery from the Navajo tribe of the U.S.A. M.O'D.

ROSE (W. A.). *Treating matrix opal.* Gems & Gemology, 1974, XIV, 10, 306–308. 2 illus.

Precious opal embedded in a kaolinite clay matrix does not show the play of colour effectively owing to the white reflections from the clay which dilute the play of colour. When the clay is dyed black the play of colour is much enhanced. The stones need to be cut before treatment, which consists of soaking the stone for about two weeks in a sugar solution of which various types are used; the stones are then placed in a glass container and covered with sulphuric acid and left for twenty-four hours or more, after which they are well washed in a strong solution of sodium bicarbonate: the stones are then lightly polished. R.W.

SCALA (C. M.). *A survey of some research work on impurities in gems.* Australian Gemmologist, 1974, 12, 4, 119–124. 6 illus.

This erudite article describes the estimation of impurities in gemstones by the use of Mossbauer spectra (which concern the resonant absorption of gamma rays in crystals containing impurities which can be produced by radioactive decay), and further investigation was made by using Electron Paramagnetic Resonance (E. P. R., sometimes referred to as "electron spin"). R.W.

SCHMETZER (K.), TRAUB (I.) and MEDENBACH (O.). *Demantoid aus Korea.* (Demantoid from Korea.) Z. Dt. Gemmol. Ges., 1975, 24, 1-3.

A green garnet coloured by Cr^3 from a new occurrence is described. For the crystals of gem quality $a_o = 12{\cdot}0597$Å, $n_D = 1{\cdot}8889$, $D = 3{\cdot}82$-$3{\cdot}83$. A micro-probe analysis gave a composition of 36·6% SiO_2, 30·3% Fe_2O_3, 33·9% CaO and traces of Al_2O_3, Cr_2O_3, MgO and MnO. E.S.

STEINERT (H.). *Das Volksfest der Strahler—Mineralbörse der Schweiz in Brig.* (The fête of the rockhounds—a mineral bourse in Brig in Switzerland. Z. Dt. Gemmol. Ges., 1975, 24, 37-39.

The author reports on an annual event taking place in Brig in Switzerland. The rockhounds of all ages meet, eat and exchange views and specimens. E.S.

STEYN (E.). *Unakite.* The Guilder (Johannesburg), 1975, 1, 4, 12.

A short but interesting article on the rock called unakite. While no mention is made of the origin of the name unakite and its occurrence in the Unaka Mountains in North Carolina, this article does give a new locality for this ornamental rock—the Limpopo valley bordering South Africa and Rhodesia and mainly in the Beit Bridge area near Messina. Some notes are given on the polishing of the material. R.W.

SWITZER (G. S.). *Composition of green garnet from Tanzania and Kenya.* Gems & Gemology, 1974, XIV, 10, 296–297.

Using a microprobe analyser the author has produced an analysis of four green grossular garnets from Kenya and Tanzania. The compositions are tabled and it is stated that the correct mineralogical nomenclature for the green gem-quality garnet from Kenya is *vanadian grossular.* R.W.

WILSON (A. T.), HENDY (C. H.) and TAYLOR (A. M.). *Peridot on Ross Island—Antarctica.* Australian Gemmologist, 1974, 12, 4, 124–125. 1 map.

Peridot crystals of gem quality have been found in the Cape Bird area of Ross Island. The facet-grade material is yellowish-green in colour and in sizes one to three grammes, from which stones fairly free from inclusions and up to a carat in size can be faceted. The inclusions seen in these peridots are brown mica platelets and minute melt inclusions of a glassy nature. The refractive indices were found to be $\alpha = 1{\cdot}653$, $\gamma = 1{\cdot}689$, the double refraction being 0·036, and the density was found to be 3·34 to 3·35. R.W.

YAKOVLEVA (M. Yo). *Variegated garnet-bearing jasper of the southern Urals.* Dokl. Acad. Sci., U.S.S.R., Earth Sci. Sect., 1970, 191, 134-137, 3 figs. Trans. from Dokl. Akad. Nauk S.S.S.R., 1970, 191, 1134-1137.

Variegated jasper containing dispersed garnet occurs as lenses 0·2 to 3 m thick and 5 to 40 m long in Lower Devonian greenstone. Hematite is the pigment in red jasper, magnetite in black jasper, and both hematite and magnetite in violet jasper. The garnet, mainly andradite, occurs as minute globular granules 1 to 5 μm dispersed in jasper. X-ray peaks are given for garnet; chemical and mineralogical analyses for 3 types of jasper. R.B.H.

Le salon des minéraux. (The hall of minerals). Bulletin de l'Association Française de Gemmologie, 1975, 42, 2-16.

An account with coloured illustrations of some of the finest pieces in the recently re-arranged galleries of the Muséum National d'Histoire Naturelle, Paris.
M.O'D.

BOOK REVIEWS

COOPER (Diana) and BATTERSHILL (Norman). *Victorian sentimental jewellery.* David and Charles, Newton Abbot, 1972. pp. 127. Illustrated in black-and-white. £2·95.

The two parts of this book deal with mourning jewellery and with love brooches respectively. A number of jet pieces are illustrated. The meaning of the various devices found on love brooches is listed and there is a short bibliography. M.O'D.

FAKTOR (M. M.) and GARRETT (I.). *Growth of crystals from the vapour.* Chapman and Hall, London, 1974. pp. x, 300. £7·00.

Chemical vapour transport is one of the cheapest and most versatile methods of growing crystals and is widely used in the production of material for the electronics industry. The basic science, thermodynamics of crystal growth, elementary crystallography and chemistry are treated before the actual growth processes are described. There is a useful bibliography. M.O'D.

GOODMAN (C. H. L.). *Crystal growth theory and techniques.* Vol. I. Plenum Press, New York, 1974. pp. ix, 300. £10.

Four topics of crystal growth are treated by different contributors—mechanism in vapour epitaxy of semiconductors: principles of the vapour growth of single crystals: travelling solvent techniques: refractory metal crystal growth techniques. There is a subject index and a materials index. References are given at the end of each chapter. M.O'D.

KUSHNER (Ervan F.). *A guide to mineral collecting at Franklin and Sterling Hill, New Jersey.* Ervan F. Kushner Books, Paterson, New Jersey, U.S.A., 1974. pp. 91. Illustrated in black-and-white. $4·50.

An excellent guide to this fascinating area, this book is particularly valuable for its up-to-date notes on the luminescence of the minerals of the district, which contradict some earlier reports. Also of value are the maps and historical notes. M.O'D.

MACDONALD (Barbara). *Gemstones as amulets, talismans and healing stones.* M.O.S. Publishing Co., Ringoes, New Jersey, U.S.A., 1974. pp. ii, 11. Price on application.

A short guide listing 14 gemstones, 3 symbols and 6 colours with the magical, healing or occult powers attributed to them. M.O'D.

MARTYNOVA (M. V.). *Precious stones in Russian jewelry art in XIIth–XVIIIth centuries.* Iskusstvo, Moscow, 1973. pp. 51. Illustrated in black-and-white and in colour. £4·90.

A general introduction precedes the very fine coloured reproductions of Russian jewellery. Each piece is described in Russian and English, giving size, details of the metal and stones used, provenance and present location. M.O'D.

MAXWELL-HYSLOP (K. R.). *Western Asiatic jewellery c.*3000–612 B.C. Methuen, London, 1974. (University paperbacks 525). pp. lxvi, 286. Illustrated in black-and-white and in colour. £4·90.

This book covers the period from the Early Dynasties in Mesopotamia to the capture of Nineveh in 612 B.C. Line drawings and photographs are of high quality. There is a bibliography. M.O'D.

MYATT (Bill). *The Paul Hamlyn dictionary of Australian gemstones.* Paul Hamlyn, Dee Why West, N.S.W., Australia, 1974. pp. 191. Illustrated in black-and-white and in colour. Price on application.

An abridged edition of the same editor's *Australian and New Zealand Gemstones*, published in 1972, this book includes such unlikely gems as selwynite and zeolite, which is a mineral class. There are some mis-spellings, such as Burchester for Buchester, in the bibliography, which does not include B. W. Anderson's *Gem Testing;* some of the colour plates are out of focus and the typography is indifferent. M.O'D.

PAMPLIN (Brian). *Crystal Growth.* Pergamon Press, Oxford, 1975. pp. xiv, 672. £21.

A compilation of current papers dealing with all aspects of crystal growth, including comprehensive bibliographies and tables. All techniques are described in considerable detail. An invaluable contribution to a study whose literature is still scarce and largely theoretical. M.O'D.

SATALOFF (Joseph) and RICHARDS (Alison). *The pleasure of jewelry and gemstones.* Octopus Press, London, 1975. pp. 96. Illustrated in colour. £2·50.

A popular introduction to jewellery, this well-illustrated book contains a section on gems, illustrations for which are taken from the photographs prepared by the Geological Museum. The matter seems unexceptionable. M.O'D.

SIMPSON (Brian). *Minerals and rocks.* Octopus Books, London, 1974. pp. 128. Illustrated in black-and-white and in colour. £2·95.

A general popular guide to minerals and rocks with a special chapter on gemstones. This appears unexceptionable, though the statement that the blue variety of topaz is the most valuable seems open to question. M.O'D.

WAINWRIGHT (John). *Discovering lapidary work.* 2nd edn. Mills and Boon Ltd, London, 1973. pp. 216. Illustrated in black-and-white and in colour. £3·60.

This book is intended for use in schools and much of it is devoted to step-by-step explanations of the tumbling and faceting processes. An early chapter introducing simple gemmological theory and testing contains some loose writing, including the statement that sinhalite is a common gemstone. The bibliography is unhelpfully compiled by title and no publication dates are given. Nothing raises the book above the common run. M.O'D.

WEBSTER (R.) *Gems.* Third edition. Newnes-Butterworths, London, 1975. pp. xviii, 931. Illustrated in black-and-white and in colour. £15·50.

The third edition of such an accepted work as *Gems* provides a convenient point from which to review the enterprise as a whole and to consider the shape that might be taken by future editions. The book has reached the largest size possible for a single-volume and the weight of paper on a binding not apparently mounted on tapes arouses misgivings for the condition in a year or two of books subjected to heavy use.

The most notable feature of the book to anyone who uses it frequently is the difficulty of locating some of the information which is nevertheless known to be included. Large sections which might have been expected to occur in the gem-testing part of the book lurk among the individual gem materials; an example is the lengthy note on asterism in the chapter on corundum. In this note reference is made to Alice Tait's work, but this is not mentioned in the bibliography. Again, the reader may seek the topic 'alteration of colour'; it will not be found in the index under colour but under colour change—quite a different conception. Here again some details are given with the stones and the rest lumped together in the testing section—in this case the painting of emerald. All this should have been tidied up by the publishers' editor in previous editions. Presuming that later editions will once more appear in more than one volume or even in sections that can be separately purchased, it should not be too difficult to bring appropriate sections together.

The details of the occurrence of some of the gems are very uneven; there is no account of the paragenesis of demantoid garnet, although a theory regarding that of hydrogrossular is given; this information is also absent from the sections on less well-known gemstones but could well be included.

The section on the testing of stones is excellent as readers will know by now. Here again there could be more on inclusions, although this would naturally increase the size of the book; there could be more on the use of x-rays—much more, since the work of the American Society for Testing Materials and its powder diffraction files should certainly be included. However, if so much more information goes into later editions, either the book will become unusable by reason of size or other parts may have to be sacrificed. I suggest that neither of these two courses need be followed. Much of the book is written in an essay form which could, often with advantage, be altered to a simpler style. This would incidentally cut out some phrases which become tedious with repetition. It would also be easier for readers to find what they want and for the editors to ensure that all material on one topic is placed together.

A new edition must have an adequate bibliography—this one is too small, gives insufficient detail, includes works of no merit and excludes periodical articles. (The writer must set his teeth and include them in a work of this magnitude!) The index is also inadequate and needs professional handling. The illustrations are almost all good, but those of jewellery should be left out of later editions or else replaced; the details of the stones are too small and the general appearance of the models dated (these are not and never can have been examples of top-class fashion photography). The illustrations of gem stones are much better, but perhaps a less wooden arrangement could be adopted for later editions, as in Gübelin's Edelsteine. The few misprints (Eicholz for Eickhorst is a bad one since it occurs in the preface to this edition) and the one out-of-focus photograph (the coloured plate of diamonds, plate IV) can easily be corrected.

The foregoing remarks are offered as suggestions on the ways in which a superb book may be made unrivalled. They involve a great deal of work, but

Mr Webster's innumerable excellencies fortunately include an infinite capacity for taking pains—said to be an attribute of that indefinable quality, genius.

M.O'D.

WILKINSON (Alix). *Ancient Egyptian jewellery.* Methuen, London, 1975. (University Paperbacks, 524). pp. lxi, 266. Illustrated in black-and-white and in colour. £4·90.

A reprint of a book first published in 1971, this is a comprehensive and lucid account of jewellery from predynastic times to 525 B.C. Many examples are illustrated by line drawings and the finest pieces by photographs. There is a museum index and a bibliography. M.O'D.

Gemstone fossicking in New South Wales. Published by the Department of Tourism of New South Wales, 1974. Freely distributed.

A well-illustrated pamphlet introducing the gemstones of the State and including particulars of mining and prospecting laws. M.O'D.

Turquoise annual. Vol. 1. Published by Longart Corporation, Reno, Nevada, U.S.A. $2·95.

A well-written and illustrated first number, this publication contains articles on the identification and marketing of turquoise, on its use in American Indian jewellery and on treatment and substitutes; one of these of unstated composition is called "Turquite". There are articles on variscite and on United States locations.

M.O'D.

Gem World.

This periodical is the official journal of the Jewellers' Association of Jaipur, India. It appears monthly and the annual subscription is Rs 50.00. The issue examined, Vol. II, No. 3, 1975, contains articles on diamond simulants, in which an immersion technique is incorrectly described, and details of trade visits from West Germany. Considerable space is devoted to the Indian diamond trade.

M.O'D.

ASSOCIATION NOTICES

DR G. F. CLARINGBULL

In the Birthday Honours published in mid-June the honour of knighthood was conferred on the Association's President, Dr G. F. Claringbull, for services as Director of the British Museum (Natural History).

Mr F. E. LAWSON CLARKE

The Association's Treasurer, Mr F. E. Lawson Clarke, celebrated 50 years in the jewellery trade in December 1974 and in May 1975 he was elected President of the National Association of Goldsmiths. This organization represents retail jewellers in the U.K.

EXAMINERS

At the meeting of the Council held on 5th February, 1975, Mr A. E. Farn, F.G.A., and Mr E. A. Jobbins, B.Sc., F.G.A., were appointed as examiners in gemmology.

ANNUAL GENERAL MEETING

The 45th Annual General Meeting of the Association was held at Saint Dunstan's House, Carey Lane, London E.C.2 on the 28th April, 1975.

The Chairman, Mr Norman Harper, welcomed members and commented:

"I should first of all like to say how pleased we are that Dr G. F. Claringbull is continuing as our President and his interest in the Association is much appreciated.

"It is with regret that we heard of the death of Mr McWilliam who although having to travel a long way was a regular attender at meetings of the Council. He represented the interests of members in Scotland in an admirable way. I would also say how very sorry we were to lose Dr Ernest Rutland in January this year.

"Once again the Branches were very active and arranged a number of interesting meetings and also social events, and I should like to say thank you to the Branch Secretaries who carry out such a useful job. Mr Basil Anderson completed his trilogy of talks about his work at the Gem Testing Laboratory and in November Dr Gübelin was good enough to come specially from Switzerland to present the 1974 Awards.

"Entries in the 1974 examinations were again very high and our thanks are due to the Examiners and the staff for the way the work was carried out. The Association's diploma is still held in very high esteem in places overseas.

"The Association lost its Registrar at the end of 1974 with the result that the staff were placed in a very difficult position, especially with the arrangements for the 1975 examinations. I am pleased to say that through a lot of extra work by the staff everything should be satisfactory for the forthcoming examinations. In this respect our thanks are due to the N.A.G. for allowing staff to spend so much time on this vital G.A. work."

The Chairman then proposed the adoption of the Annual Report and Accounts, which was seconded by Mr Robert Webster and duly carried.

Dr G. F. Claringbull was re-elected President, Mr N. A. Harper re-elected Chairman, Mr D. King re-elected Vice-Chairman and Mr F. E. Lawson Clarke re-elected Treasurer. Messrs E. Bruton, D. Kent and M. O'Donoghue were re-elected and Mrs S. Hiscox and Messrs D. Callaghan and P. Daly were elected to serve on the Council.

The Chairman announced that Messrs Hard Dowdy, Watson Collin & Co., chartered accountants, had signified their willingness to continue as Auditors.

Finally the Chairman expressed the Association's thanks to the Goldsmiths' Company: the Wardens make various rooms at the Hall available for meetings whenever it is convenient and the Association is greatly indebted to them.

MEMBERS' MEETINGS

London

A talk was given at Goldsmiths' Hall on the 19th March, 1975, by Mr A. E. Farn, F.G.A., on "Pearls". The substance of his talk will be given in a future issue of the *Journal*.

Midlands Branch

Members of the Branch attended a Mediaeval Banquet on the 26th February, 1975, at Coombe Abbey, Coventry.

On the 11th June, 1975, Mr E. A. Jobbins, B.Sc., F.G.A., gave a lecture on one of his recent trips abroad, illustrated by slides.

Nottingham Branch

On the 12th May, 1975, Mr J. W. Farrell, Keeper of Textiles at the Castle Museum, Nottingham, gave a talk and exhibited the antique jewellery in his keeping at the Museum.

A buffet dance was held on the 2nd June, 1975, at the Bridgford Hotel, Trent Bridge, Nottingham.

Scottish Branch

Mr H. J. Whitehead gave talks in Glasgow and Edinburgh on the 12th and 19th March, 1975, respectively, entitled "The Sri Lankan Gem Scene". The talks were illustrated by colour slides and specimens.

The Annual General Meeting of the Branch was held on the 23rd April, 1975, at the North British Hotel, Glasgow. Mr H. Whitehead and Mr A. Tait were re-elected Chairman and Secretary respectively, and Mrs C. Kilpatrick and Messrs D. Hill, A. McRae, I. McKenzie, A. Armstrong and M. Turner were elected to serve on the Committee.

GIFTS TO THE ASSOCIATION

The Council of the Association is grateful to the following for their gifts:

Mr James G. Gosling, F.G.A., a number of concretionary formation on laterite core-layers of goethite and concretionary limonite known as "Black Pearls of Guyana" found at Aranka River.

Mr F. W. Maiwurm, Newark, Delaware, U.S.A. for a copy of the book "Man-made Crystals" by Joel E. Arem.

TALKS BY FELLOWS

Mr Pete J. Dunn gave a talk to the Baltimore Mineral Society on the subject of "New Gem Acquisitions at the Smithsonian Institution" on the 21st February, 1975.

BOOKS

"Gems" by Robert Webster. Third edition, revised, now available. Price £15.50. Postage extra. U.K. 54p. Overseas charged at cost. Net weight 5 lb.

LABORATORY—GOLDEN JUBILEE

The Gem Testing Laboratory of the Diamond, Pearl and Precious Stone Trade Section of the London Chamber of Commerce celebrated its Golden Jubilee in March. A luncheon was held at Goldsmiths' Hall, London, to mark the occasion when Messrs Basil W. Anderson, Alec E. Farn, Cecil J. Payne and Robert Webster were present. This team of four ran the laboratory for over a quarter of a century.

COURSES FOR F.G.A.s

Two special courses for Fellows of the Gemmological Association are being organized by *Retail Jeweller* in September.

The course lecturers will be Alan Hodgkinson, F.G.A. and Michael O'Donoghue, M.A., F.G.A., and the number of students will be limited so that individual attention can be given to them.

Objects of the courses are to show experienced gemmologists the many new synthetics and some 'new' gemstones they may not have encountered and to give them practice in identification of these materials.

Dates for the two-day courses are Thursday and Friday, 11th and 12th September and 25th and 26th September. The venue is Elm House, Elm Street, off Gray's Inn Road, London WC1X 0BP (training room, seventh floor). Bookings should be made with Miss Ann Williamson at the address above or phone 01-278 2345, ext. 246/203.

COUNCIL MEETING

At the meeting of the Council held on Monday, 28th April, 1975, the following were elected to membership:

Fellowship

Boruszak, John K., Blackpool. D. 1966

Smalley, David F., Nottingham. D. 1974

Alcock, Ann, Toowoomba, Australia.
Ayres, Thomas D., Farnham.
Baker, Irene M., Brisbane, Australia.
Balakumaran, Sivasubramaniam, Colombo, Sri Lanka.
Barker, Cyril H., Southampton.
Beste, Achim, Hanau/Main, W. Germany.
Boileau, Joyce M., Brisbane, Australia.
Breeze, John A., Francistown, Botswana.
Bressel, Heinz L., Milwaukee, Wis., U.S.A.
Candel, J. L. G., Boskamp, Netherlands.
Chikano, Hirokazu, Kobe, Japan.
Chikano, Takane, Kobe, Japan.
Coles, Christopher J., Childrey, nr Wantage.
De Jong, Ype P., Krimpen Aan Den Ijssel, Netherlands.
De Silva, Pandigamage D. A., Colombo, Sri Lanka.
Dias, Ahauda A. P. R., Angoda, Sri Lanka.
Gamble, Joan A., Brisbane, Australia.
Gautier, A. E., Newton.
Gerhardt, Willem C., Ede, Netherlands.
Gorinsky, Peter D., Idar Oberstein, W. Germany.
Goto, Tetsuya, Okayama-Ken, Japan.
Gujjar, Arthur, Limerick, Eire.
Hallford, Dianna O., Hong Kong.
Hansen, Lynette C., Johannesburg, S. Africa.
Hargreaves, Raymond J., Brisbane, Australia.
Hegi, Michel A., Geneva, Switzerland.
Henrich, Francis J., Lower Hutt, New Zealand.
Ikonen, Hilkka, Colombo, Sri Lanka.
Inukai, Nobuhiro, Okayama-Ken, Japan.
Jager, Edith E., Schoonhoven, Holland.
Jayawardene, Lt. Jayadeva P. A., Nugegoda, Sri Lanka.
Johnston, Rae, Brisbane, Australia.
Kaasschieter, Huig C., Barneveld, Holland.
Kanamitsu, Takako, Okayama-Ken, Japan.
Keeley, Helen C. M., London.
Kothari, Deepak T., London.
Kropman, Caroline A-M., Schoonhoven, Holland.
Kuff, David J., Washington D.C., U.S.A.
Lake, Thomas R., Cuychoga Falls, Ohio, U.S.A.
Langaard, Conrad, Hanau/Main, W. Germany.
Langton, Adrian, London.
Laurence, Carol M., Lourenço Marques, Moçambique.
Legein, Patrick C. J. M., Rotterdam, Holland.
Legg, Veronica, Hong Kong.
Longbottom, Jane, Colchester.
Los, Rembrandt J., Voorhaven, Netherlands.
Mayer, Marianne, Cully, Vaud, Switzerland.
Mayling, Clifford G., Slough.
Mayur, Dave, London
Middleton, Beryl A. M., Winchester.
Mishima, Yoji, Hiroshima-Ken, Japan.
Papanicolaou, Michael D., Athens, Greece.
Pearce, Mary M., Mousehole.
Rush, Jerome B., London.
Rustage, Donald A., Cuddington.
Sanchez, Sabeena T., Reading.
Scells, Gerald V., Collinsville, Australia.

Silva, Senaka W., Katana, Sri Lanka.
Smith, James D., Riverton, Ill., U.S.A.
Soni, Shashikant V., Wembley.
Summers, Adele E., Orpington.
Tanaka, Shigenori, Okayama-Ken, Japan.
Thomas, Ian, Lawnton, Australia.
Toshima, Tetsuo, Fukuoka City, Japan.
Turner, Christopher F., Hertford.
Van Berkel, Sylvia M., Amersfoort, Holland.
Van Den Hoven, Alexander N., Ede, Holland.
Van Ginneke, Vincentius H. M., Woerden, Holland.
Van Hoogenhuizen, Julia H., Schoonhoven, Holland.
Van Rooyen, Irma E., Schoonhoven, Holland.
Verkerk, Ruud, Stolwyk, Holland.
Vest, Kenneth N., Bangkok, Thailand.
Victorsen, Monica A., Brisbane, Australia.
Walter, Letty, Vlist, Holland.
Walter, P. A., Dordrecht, Holland.
Warburton, Alan J., Leigh-on-Sea.
Watson, John L., Bulawayo, Rhodesia.
Westaway, Joyce, Brisbane, Australia.
Willemsen, Francine, Utrecht, Holland.
Wong, George, San Francisco, Cal., U.S.A.
Yamamoto, Kazui, Fukuoka City, Japan.

1974 Examinations

It is regretted that the name of Mrs F. Brooks, of Hong Kong, was omitted from the list of successful candidates in the 1974 Preliminary Examination.

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