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and

PROCEEDINGS OF THE GEMMOLOGICAL ASSOCIATION OF GREAT BRITAIN

GEMMOLOGICAL ASSOCIATION
OF GREAT BRITAIN
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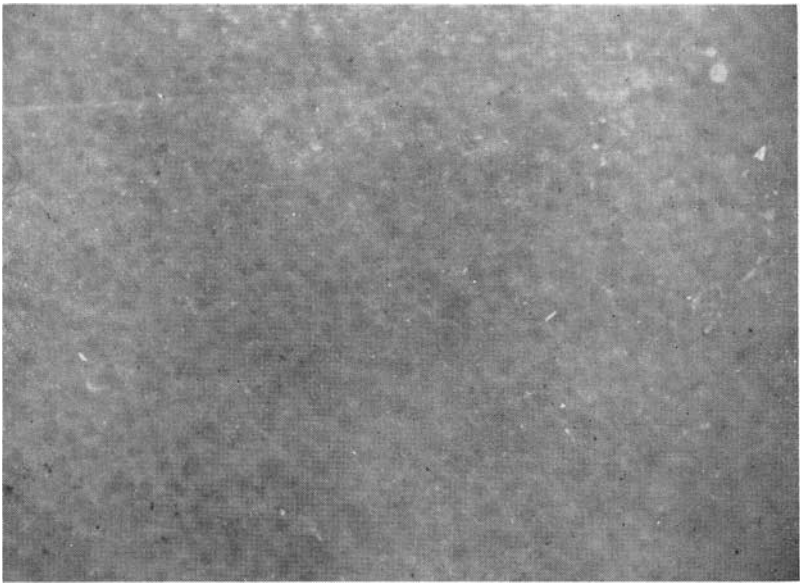
More notes on GILSON SYNTHETIC TURQUOISE

By ROBERT WEBSTER, F.G.A.

THE January 1972 issue of the *Journal of Gemmology* carried an article "Notes from the Laboratory", one part of which was the report on the examination of a specimen of synthetic turquoise produced by the firm of Gilson of France. The following is the report on the examination of another such stone (and subsequently 12 others) and expands the earlier report made by B. W. Anderson.

The stone examined by the writer had been donated by the Gemmological Association for investigation. The stone, an oval cabochon-cut stone, was a pale blue in colour and nearer in hue to the American turquoise than the colour of the better quality turquoise from Iran and other eastern sources. The stone weighed 1·275 carats.

In view of the small size of the stone a density determination was first made by using a heavy liquid method. The stone was found to sink in a liquid in which a rock crystal sphere just floated. A subsequent hydrostatic weighing gave a result of 2·72, a value



Dark blue angular particles in a Gilson synthetic turquoise

in keeping with the effect in the heavy liquid. The back of the stone was then roughly polished, after which a fairly good refractometer reading of 1·604 was obtained. There was some possible trace of the 4320Å line in the absorption spectrum.

A microchemical test proved the presence of the phosphate radical but copper was not convincingly detected by a flame test. The strong yellow colour imparted to a spot of hydrochloric acid did not occur with the Gilson synthetic turquoise as it does with the so-called "Viennese turquoise" and the German "Neolith".

Anderson, in the report of the stone he examined, mentioned that microscopic examination "showed a small-scale speckling of white, not unlike the natural turquoise in appearance." When the stone in the possession of the writer was similarly examined, using a 32 mm (1½ inch) objective and an 8 × ocular, a somewhat similar picture was seen as described by Anderson, but to the author this did not appear to be convincingly the same as the effect seen in natural turquoise. This notion was tested by using a higher magnification, the 32 mm objective being changed to one of 16 mm (2/3rds inch). The change of magnification showed the structure to be made up of small dark blue angular particles, and generally with a semblance of parallel arrangement. These blue particles were buried in a whitish groundmass.

That this pattern was not similar to that seen in natural turquoise was more or less confirmed by the examination of some 70 specimens of turquoise, including a number from known localities and a few of doubtful parentage. In no case was the type of structure seen in the Gilson synthetic turquoise apparent in any of these natural stones. A few turquoises did show blue patches on a whitish background but the patches were not angular and had rounded outlines rather like "clouds".

In view of the apparent discrepancy between the observations of Anderson and the writer, and to guard against either of these two stones being a "maverick", a further parcel of 12 specimens was borrowed from the Gemmological Association. These stones are probably from the same parcel as that from which the stone in the writer's possession came.

The result of the examination of these 12 extra stones was that they all had the typical structure of small angular blue particles in a whitish groundmass, as already described.

The 12 extra stones were then tested for density, first by the heavy liquid method when all the stones were found to sink in the quartz liquid. A bulk hydrostatic weighing of the 12 stones, which weighed 11·545 carats, gave a result of 2·74.

The refractive indices, taken by the distant-vision method on the six larger cabochons, showed an index of about 1·60. The absorption spectrum showed what may be a very weak 4320Å line in the blue-violet, but this observation seems to have little value.

Examination under both long- and short-wave ultra-violet light showed the Gilson stones to have a fairly dull bluish-mauve glow. Again this observation had no particular merit from the viewpoint of identification, as observations on natural turquoise under ultra-violet light showed the glows to be variable, ranging from a dull deep mauve to a bright blue, in fact an effect somewhat similar to that shown by diamonds. During this examination it was noticed that the stone which had been used for the hydrochloric acid test did not glow where the acid had been. This effect did not seem to occur when real turquoises were so tested. Five turquoises from various localities were examined under long-wave ultra-violet light after a sport of acid had been placed on their surface and then dried off with blotting paper. This "off-beat" test with acid is not recommended, as it was found that the acid tended to seep into the stone and, further, tended to lighten the colour. It is inadvisable to do this with any turquoise.

From the observations of 13 stones from one batch it would be rash to draw a conclusion that the structure, and even the acid test with ultra-violet light, would give the answer to the problem of the identification of this new synthetic stone. It is hoped that other workers will carry out further investigation when other specimens become available.

THE GIRDLE OF THE BRILLIANT-CUT DIAMOND

Historical Survey

Notes from the Gübelin Laboratory, Lucerne.

THE first polished diamonds, of Indian origin, revealed the traces of man's ideas in earliest times. The exceptional hardness of the substance made its cutting a long and difficult task, and, since technological progress had not yet evolved to expert cleaving or sawing, the work on the rough diamonds was limited in scope.

The sense of admiration for such extraordinary material was so great that it became superstitiously regarded as a gift of the gods with the belief that cutting lessened the magical force inherent in the stone. Thus the cutter endeavoured to spare as much as he could of the valuable substance and this is reflected up to the present day in the way people in Asia consider precious stones.

The diamond fields of India are exhausted (except those of Panna, with estimated reserves of some three million carats) and precious stones are still being cut in India as sparingly as possible in order to retain the maximum weight.

In the West, centuries of empirical experience have led to the brilliant-cut, the climax of the endeavour to obtain the utmost in brilliancy. The term brilliancy covers three different phenomena: the surface lustre, the interior brilliancy caused by reflection and the fire caused by dispersion. It was only at the beginning of the 20th century that a mathematical statement on optical cutting proportions and angles based on the laws of the propagation of light in crystals was elaborated by Tolkowsky, Rösch and others. On the whole these mathematical formulae agreed quite well with the empirical results obtained by the cutter and led to a still greater yield of light. This was achieved by modifying cutting angles to agree with the optical properties of diamond with regard to total reflection and dispersion of light. Contrary to the old cuts, modern round cuts do not aim at reducing loss of weight to a minimum but at yielding an optimal optical effect.

The brilliant-cut has its own characteristic effect on incidental light. Under practical conditions, as it is the case for diamonds set in jewellery, one may consider that light enters a brilliant-cut diamond under a great number of different angles, to be practically considered as building a hemisphere on the upper part of the girdle of the diamond. If we put the sum of all light rays entering the brilliant-cut diamond at 100%, then the amount of light reflected by an ideally proportioned brilliant-cut lies at between 32-33%, according to the authorities in print.

Slight deviations of cutting proportions affect the brilliance of diamonds and in turn give each one its own characteristic aspect; thus the expert can appreciate the cutting quality of a brilliant-cut diamond by observing the facet reflection patterns without the assistance of complicated instruments or calculations. The first part of the present century has seen a remarkable improvement in both the precision and the symmetry attained in putting the facets on the stone and it is amazing that cutters can reach such a high degree of perfection in manual work with just the aid of a pocket lens.

The flat surfaces of the brilliant-cut comply with the laws of crystal structure: the only non-plane surface of the brilliant-cut, the girdle, is determined by man, and this determines the size of the stone, together with the final measurements and proportions derived from it.

From the time when stones were still bruted by hand, and even after 1891, when the girdling machine was introduced, right up to the beginning of the second World War, bruting used to be carried out carefully and cautiously. It was only after the war that there appeared on the market brilliant-cut diamonds (usually less than one carat in size) that had been girdled too fast with the result that the girdles were frayed—in fact damaged by small cleavage fissures or cracks.

Considerations on the valuation of diamonds

Three factors have contributed to the increasing demand for gem diamonds:

1. The stability of uninterrupted and continuous price increases
2. The growth of world output
3. Publicity to promote sales

More and more consumers are showing interest in diamonds in a wide range of qualities and prices.

Together with growing interest, several systems of classification and description have been devised for gem diamonds. The RAL 560 system is a series of definitions that has been used for quite some time by some European trade associations. In the United States the Gemological Institute of America and the American Gem Society have drawn up their own systems, while in Switzerland the Swiss Gemmological Society has set up rules for members. The present trend calls for exact definition of qualities for use by retail jewellers: this has given rise to several new systems of standards.

Differences of opinion amongst people in the trade have arisen concerning the systems of diamond valuation: some claim that by supplying an exact quality description of a given stone, one reduces selling to a technical matter and makes it more difficult by removing the diamond nimbus. As a matter of fact diamonds are now, before all, (apart from the symbolical meaning awarded by publicity or from the poetic notion given them by romantic buyers) a capital investment the value of which rises with the quality.

In modern business transactions it is usual to classify goods exactly according to the demands of clients who want to be able to judge the quality of any product they wish to buy. In purchasing a diamond, clients are all too often obliged to believe a jeweller on his word because they ignore the objective criteria to judge cut, colour and purity. Jewellers, as well as their clients, are inclined to put too much emphasis on the last two subjects at the expense of the art of cutting. This is unfortunate as it is through the art of cutting that man can substantially affect the beauty of a diamond, which is not the case for the other two factors. Most of the time the amounts of money involved in diamond transactions, together with the often considerable differences in prices, due to differences in colour and purity, make one understand why buyers are extremely cautious, endeavouring to inform themselves and to compare merchandise by going to a number of retail jewellers before making their final decision.

In analysing the motives of buyers one finds that they do not like buying blindly. Psychologically, they appreciate having their judgement confirmed by a document in which the properties of the article they have bought are described. This desire for security is making itself increasingly evident. By using a system of valuation we may try to meet this need. It is sometimes suggested that by applying a precise system of grading we create a handicap to sales, as this is sure to hamper the search for stones of finest quality. As a matter of fact it is just the contrary: the aim of a system of description is to facilitate sales of piqué or off-colour diamonds by

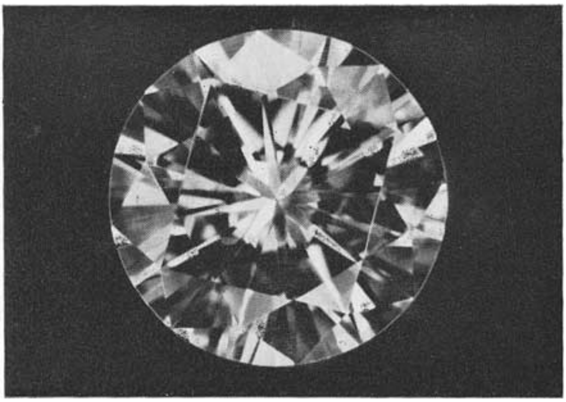


FIG. 1. 0·54 carat diamond, with classically bruted girdle, flawless.

putting down one's cards before the client. Considered in this way, systems of grading actually promote sales. Present trends have led to a growing demand for absolutely flawless diamonds, which over the years have become increasingly scarce. It is evident that extreme care must be devoted to them in cutting. Of the four factors (the four c's) that conventionally determine the value of diamonds, three can only in a limited way be affected by the intervention of man, namely: carat weight, colour and clarity.

It is very easy to affect the shape, in order to obtain maximum beauty from the raw material and therefore it is justified to devote much attention to this factor, the cut.

If we consider how easy it is to influence the cutting and bearing in mind how scarce flawless stones are nowadays, it is difficult to understand how a number of diamonds (usually less than one carat in size) are marketed with bearded girdles, features which are in fact cleavage fissures. In extreme cases the girdle looks like a white circle which affects the brilliancy of the stone. This is caused by inexcusable negligence in the cutting of the originally flawless material. Fig. 1 shows a 0·54 carat brilliant-cut diamond with a carefully bruted girdle (10 ×). Fig. 2 shows another diamond with the characteristics of a flawed girdle looking like a white circle (10 ×).

Fig. 3 is another example of a flawed girdle on a 1·05 carat brilliant-cut diamond, viewed obliquely. Further enlarging (40 ×) shows that the flaws are indeed individual fissures penetrating into the stone (fig. 4).

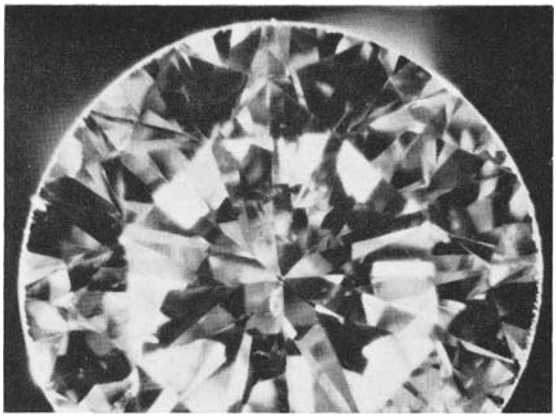


Fig. 2. Diamond with bearded girdle, that looks like a white circle caused by bruting too rapidly (10 ×).

Fig. 3. 1·05 carat diamond with a flawed girdle, seen from a side (10 ×).

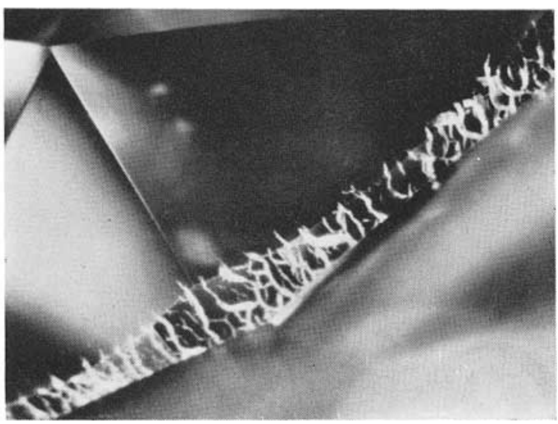


Fig. 4. The same stone as in fig. 3. The enlargement to 40 × proves that the flaws are actually fissures that penetrate into the stone.

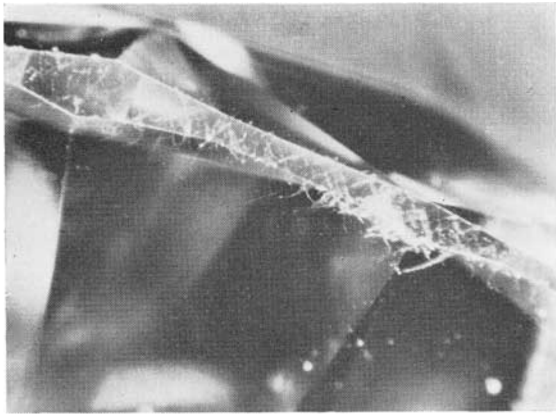


FIG. 5. 1·21 carat diamond. Pronounced fissures under the girdle facets: the stone can no longer be graded as flawless (25 ×).

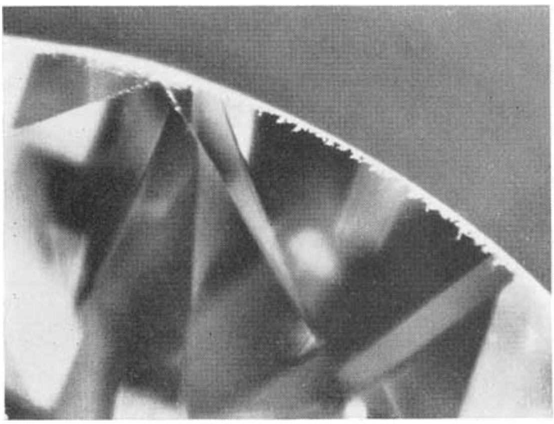


FIG. 6. 1·42 carat diamond. Flawed girdle with white rim (25 ×).

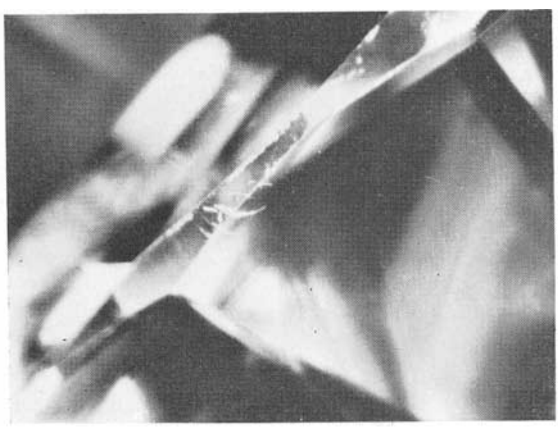


FIG. 7. 1·69 carat diamond. Flawed girdle: separate fissures seen. (25 ×).

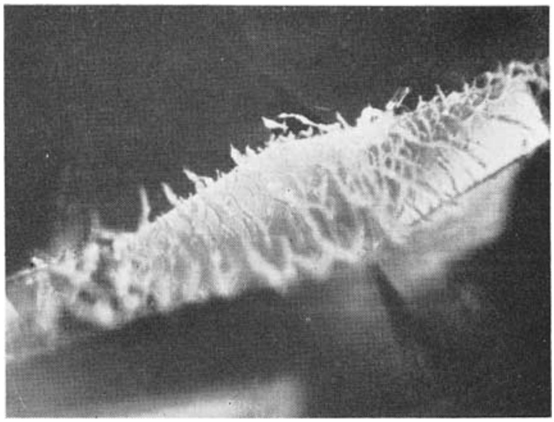


FIG. 8. 1-carat diamond. Flawed girdle (63 ×).

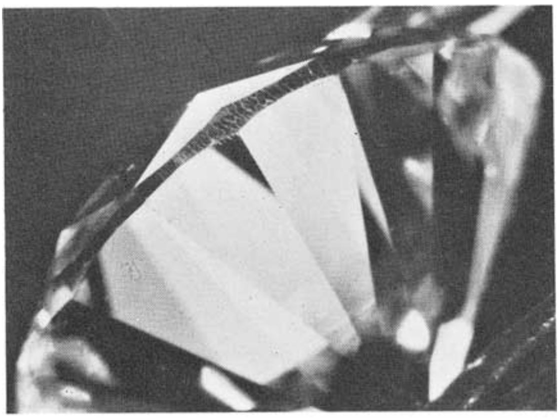


FIG. 9. 1-carat diamond. Bruted girdle with flaws (10 ×).

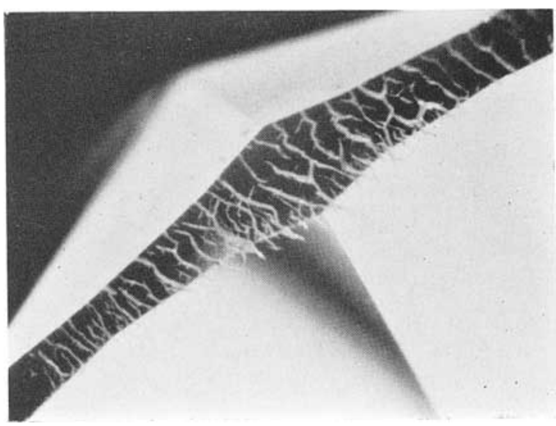


FIG. 10. 1-carat diamond. The same girdle with flaws (40 ×).

In which clarity grade shall we classify such a stone?

Let us remember the definition of a flawless gem diamond, according to international agreement and found in several modern grading systems.

A diamond is considered flawless when found free from inclusions, through expert examination under 10-fold magnification. A flawed girdle with a number of fissures that are clearly visible through a 10 × lens causes the stone—when we want to apply the rules—to be graded as VVS or VS, in spite of the absence of natural inclusions. If only a little more care had been taken in girdling, the stone could have been graded as flawless. It is a mistake to assume that fast girdling is advantageous; the fact that it is lowers the value of a precious stone. Furthermore it is also false to assume that the time-consuming task of faceting the girdle will hide the damage caused by careless bruting. It is a fact that the fissures may still remain visible under the facets. Fig. 5 demonstrates this: strongly pronounced fissures are visible through the girdle facets on a 1·21 carat brilliant-cut diamond.

Figs. 6 to 8 show fissures in other diamonds (25 × to 63 ×). Figs. 9 and 10 show a bruted girdle with fissures.

The pictures prove that even finest quality diamonds of more than one carat have not been spared from this unfortunate treatment despite the rarity of stones devoid from natural inclusions.

It is regrettable to encounter the rare case of a professional activity where the raw material is artifically flawed, although this ought to have been avoided at all costs: the finished product—a flawless diamond, would have been much more valuable.

If only the harm that this practice caused was understood and eliminated hundreds of European retail jewellers (who have attended courses on diamond valuation by modern grading systems) would have the chance to grade more diamonds as flawless stones.

This article aims at drawing the attention of diamond cutters to a retail jewellers' problem, a problem they could easily solve themselves by giving more consideration to exceptional raw material. They would thus contribute to the common interests of everyone in the trade by promoting and facilitating sales.

N.B.—The figures accompanying this article are pictures unretouched, showing the common aspect of fissures under different enlargements.

This article first appeared in *Diamant*, No. 147, Feb. 1972.

EMERALDS REPUTED TO BE OF ZAMBIAN ORIGIN

By I. C. C. CAMPBELL, F.G.A.

RECENTLY I had the opportunity of examining a variety of emerald which is reputed to originate in Zambia. The suppliers who cut these stones would give no details other than that they had originated from claims in the Kitwe district; hence, unfortunately the exact location cannot be given. Kitwe itself is only approximately 20 miles from the Congo border. It is understood that claims may be commercially viable and the cut emeralds are apparently mainly destined for the Continent. Information has been received that one origin of emerald is Miku, Zambia. This name cannot be found by the writer, in even detailed maps of Zambia—it is possible that it is either a new name or, as is often the case lately, an old place that has been re-named. In an exchange of correspondence, Robert Webster is of the opinion that "Miku" could be a mis-representation (spelling?) of a similarly spelt name.

I did not in fact examine a large but poor quality emerald from Zambia in January, 1971. This was referred to in the Minutes of the Third Meeting of the Gemmological Association of Rhodesia in the same month which, at the time, dealt with inclusions in emeralds from different sources. The inclusions in this stone and the test stones referred to in this study appear to be similar, so it is possible that emeralds—at least a limited number—have been coming from the same source for a minimum period of 19 months to date.

It is thought that these additional data on emeralds will be of some use, as some rather interesting aspects have arisen in so far as the inclusions are concerned in this batch of 20 faceted stones.

It would appear that a similar—probably the same—type of emerald is also finding its way to the Republic of South Africa. Stones from that country were also examined and found to fit in perfectly with the results of the Zambian test stones. Although some properties were similar to the Northern Transvaal ones, it is obvious that the stones seen were not from that origin, although some quarters would have one believe otherwise.

The schedule below refers to the properties of the 20 test stones:—

Physical and Optical Properties				
Specimen No.	*Weight Metric Carats*	*Specific Gravity*	*Refractive Index (optic sign: Negative)*	*Birefringence*
1	1·080	2·752	1·583–1·590	0·007
2	0·282	2·751	1·581–1·588	0·007
3	0·262	2·747	Vague	
4	0·281	2·751	Vague	
5	0·248	2·755	Vague–1·590	
6	0·354	2·750	Vague–1·590	
7	0·291	2·751	{ 1·590 Table 90° to C-axis }	
8	0·354	2·750	1·583–1·590	0·007
9	0·270	See Text	Vague–1·590	
10	0·312	2·751	1·583–1·590	0·007
11	0·285	2·747	1·581–1·588	0·007
12	0·310	2·751	1·583–1·590	0·007
13	0·308	See Text	1·583–1·590	0·007
14	0·286	2·752	{ 1·590 Table 90° to C-axis }	
15	0·211	2·753	Vague	
16	0·257	See text	Vague	
17	0·259	2·751	Vague	
18	0·267	See text	Vague	
19	0·262	2·752	Vague–1·590	
20	0·281	2·748	Vague–1·590	
Average:	0·283 Excluding No. 1	2·747 to 2·755 Av.: 2·75	5 stones: 1·583–1·590 2 stones: 1·581–1·588	0·007

Test stone No. 1 is excluded in the average weight as it is considerably larger than the other 19.

As can be seen from the above listed weights, the average size is relatively small, hence not of optimum size which is required for a study of this nature. The exception is specimen No. 1, which gave a reasonably good refractive index reading on a standard Rayner refractometer. The other six full R.I. readings are considered clear enough to accept. With reference to another five stones, the index of refraction for the ordinary ray (1·590) was relatively distinct. Specimens Nos. 7 and 14 appear to have been cut with their table facets orientated at right angles to the main crystallographic axis (C-axis) of each stone. The two did not show extinction when each stone was orientated under the polariscope either in the normal position with the table facet orientated parallel to the polaroids or in the reversed position—extinction was only evident when each stone was viewed through the sides. The refractometer gave a single, fairly sharp refractive index reading of 1·590 for both of them. The balance of the stones gave extremely vague shadow edges and thus obviously not good enough for reliable readings, although in at least half the cases it was evident that the shadow edge fell between 1·58 and 1·59. Finally, the two different sets of readings leads one to speculate whether or not the relative stones were from two different sources, although the other tests gave uniform results for the entire group. It is interesting to note that B. W. Anderson (*Gem Testing*, 8th edition) gives the R.I. for Zambian emeralds as 1·581-1·588.

The specific gravity was initially hydrostatically determined with the use of alcohol and a Mettler electric metric balance of accuracy to within 0·002 of a carat. The tests were repeated three times, each time on different occasions, and the S.G. of the liquid was assessed with a Westphal balance at the time of each series of tests. Thereafter, a heavy liquid was mixed to suspend an indicator of S.G. 2.75 and the stones re-tested on a comparative basis. This final procedure proved that the computed values for specimens Nos. 9, 13, 16 and 18 were incorrect. Nevertheless, it was ascertained that the S.G. values of three of them fell between 2·747 and 2·749, while the other one actually suspended in the liquid, thus fixing it at 2·750. The remaining 16 stones behaved in the liquid as one would expect them to in relation to their computed values. It should be noted that of the three values assessed for each stone, the more favourable one was accepted in accordance with the stone's behaviour in the liquid. It is also interested to note that B. W. Anderson (*Gem Testing*, 8th edition) gives the S.G. for Zambian emerald as 2·75. R. Webster (in a letter to the author) gives the value of one stone, also from Zambia, as 2·753.

In view of the foregoing details, the following results for Zambian emerald are given:

Refractive index	:	1·581-1·588 to 1·583-1·590
Birefringence	:	0·007
Specific gravity	:	2·74 to 2·76 (Av: 2·75)

Fluorescence:

Under S.W.U.V. and L.W.U.V. rays: Inert

Under the Chelsea Filter: All the stones fluoresced a reddish hue, some fairly strongly, while others showed a barely perceptible reddish-pink in the smaller stones. None of the stones showed the particularly bright glows normally associated with the majority of synthetic emeralds to date.

Absorption Spectrum:

A Rayner prism spectroscope was used in conjunction with the microscope and direct substage lighting. Not all the test stones were examined, but of those that were the spectrum is due to chrome: Three strong absorption lines in the deep red, one pair of which is a doublet—the line at about 6830Å being the strongest. Absorption of the deep violet was also seen. No other lines or bands were evident. As this instrument is not calibrated, a precise Angstrom reading cannot be given.

Colour and Some Other Aspects:

It is not easy to give an opinion on colour, particularly when it comes to comparing different hues of what is basically one colour. In the opinion of the writer the colour of the Zambian stones compares favourably with the Rhodesian Sandawana (Belingwe) type of green.

The sizes seen to date give one the impression that the average size compares with that of the average Sandawana stones, although very likely the larger and possibly better quality stones are finding select markets. They are, however, being used in jewellery to good advantage—the effect being quite striking.

The price, at the time of writing, appears to be below that of other comparable emeralds in Rhodesia, probably because it is a new variety in the country—hence not yet as acceptable as the well known Sandawana stones. There is no reason to doubt that prices will increase once the public overcome any unfounded doubts which may exist due to not having seen them before, and provided the supply continues at a reasonable and (if necessary) suitably controlled rate. It is the personal opinion of the writer that the better quality Zambian emeralds (those free of heavy inclusions) compare favourably with normally accepted good quality Sandawana ones.

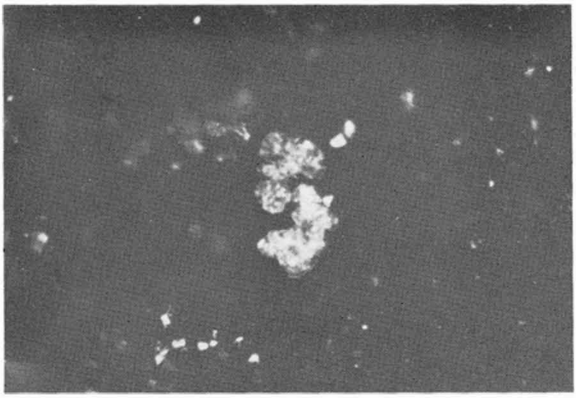
Inclusions:

The inclusions, tabled hereunder, were examined under a Wild Heerbrugg M.4 binocular microscope using, as required, substage or overhead lighting depending upon whether internal features were to be examined or inclusions shown at the facet surfaces.

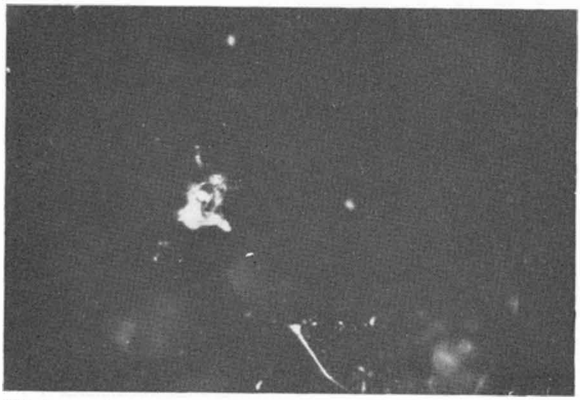
The description "mica", used loosely in the following text, refers to the *appearance* of the mineral, as it is equally possible that it could be another mineral which is similar in appearance. Another aspect, as far as these stones are concerned, was the noticeable lack of actual flaws (cracks etc.), although the stones were comparatively heavily included.

Description of Inclusions

Specimen No.	Magnification	Lighting arrangement: Overhead	Lighting arrangement: Substage	P/Micro Ref. No.	Description of inclusions
1	40 ×	√		1/A	"Bread-crumb" type inclusion.
	60 ×	√		1/B	"Bread-crumb" type inclusion at surface where cut by a facet. The two dark irregular shaped spots are in fact openings to a common hollow centre.
	40 ×		√	1/C	"Fragmentation" of bread-crumb type inclusions—pseudo-forms evident. Also pale, almost invisible, flakes of a mineral strongly reminiscent of mica platelets of ultra-thin cross-section (barely visible).
3	40 ×		√	3/D	Coarse "treacly" appearance in places due to comparatively coarse platelets of closely packed "mica"-type flakes. They vary from what appears to be almost colourless to a pale brown tint. Apparently of random orientation. Biotite is also present and is black in colour. See photomicrographs Nos. 14/H and 20/J in relation to better examples of a "treacly" internal appearance.
6	60 ×		√	6/E	"Crochet" type pattern of biotite. Also loose flecks and spots of biotite (all black). Paler flecks are "mica"-type flakes which show as pale brown tints in substage lighting. Fragmented "bread-crumb" type inclusions similar to those seen in specimen No. 1 and others.
12	60 ×	√		12/F	Referring to the two irregular shaped profiles in the centre of the photomicrograph: both are at the table facet surface: (i) L.H.S. (showing less reflection)—pit left after removal of flake of "mica"-type substance with the use of a probe. (ii) R.H.S. (looking somewhat like cotton-wool in this photograph)—is the bright effect seen (in fact it looked irridescent under the overhead lighting) of the same type of "mica"-type substance as in (i) aforementioned, but still *in situ*. It was, however, first disturbed and prodded with a probe. The effect seen was similar to a separate minute plate of mica also examined after the same treatment. This was done for comparative purposes. Both these flakes (the removed one being examined independently) were also examined under 120 × and it is thought that they are mica.
13	40 ×	Combined		13/G	(i) Cloudy (or milky) due to dense, extremely minute pin-point type inclusions. (ii) General view of heavily included matter—mainly of what appear to be pseudo-forms of "bread-crumb" type of inclusions similar to those shown in photomicrograph 1/C; as well as ultra-thin "mica"-type flakes, in random orientations.



SPECIMEN 1/A.



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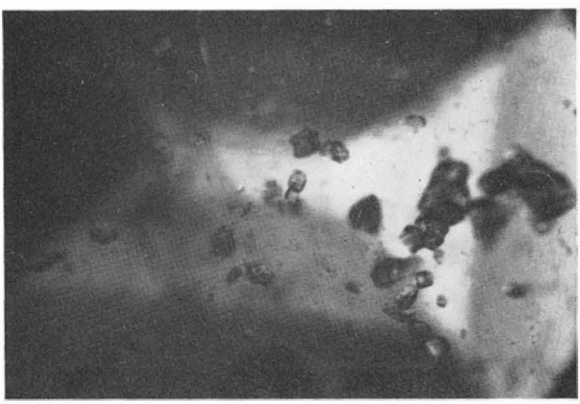

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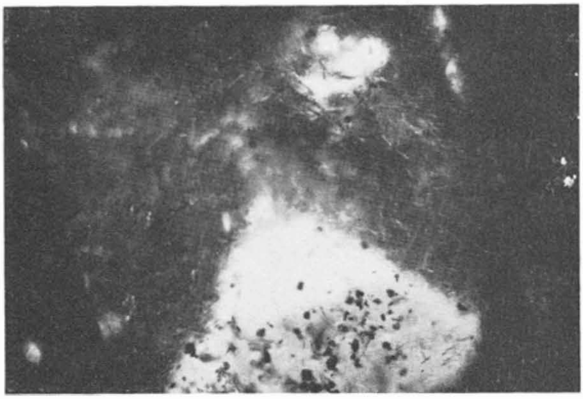
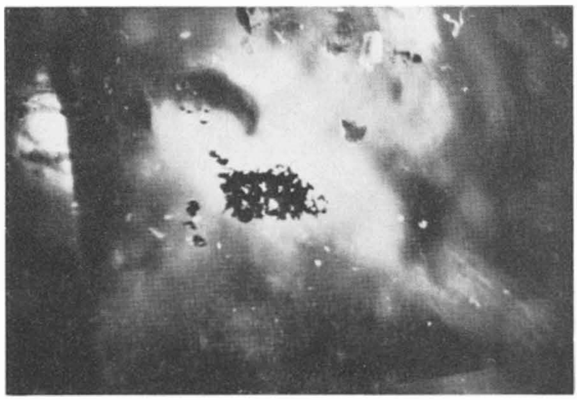
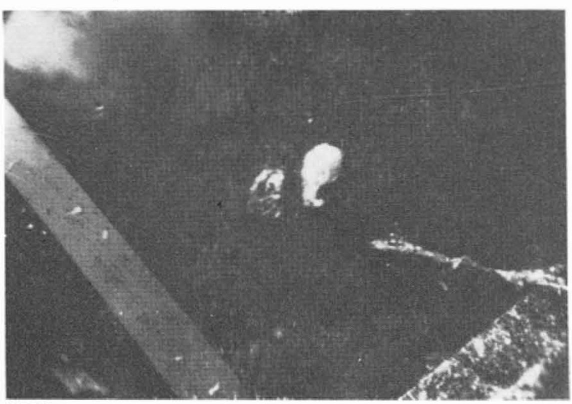


SPECIMEN 3/D.



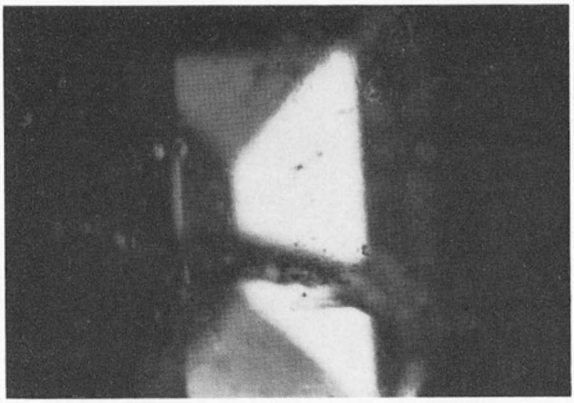
SPECIMEN 6/E.



SPECIMEN 12/F.

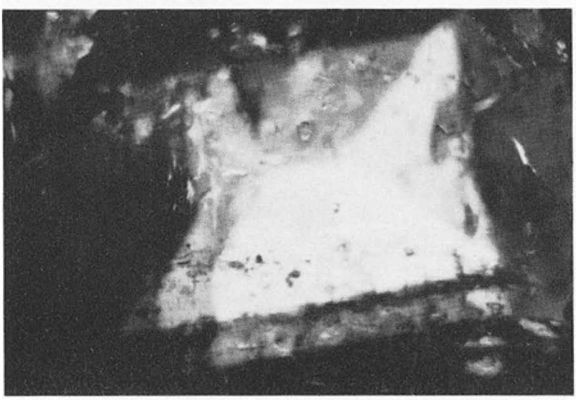
Specimen No.	*Magnification*	*Lighting arrangement*		*P/Micro Ref. No.*	*Description of inclusions*
		Overhead	*Substage*		
14	60 ×		√	14/H	(i) "Treacly" appearance due to excessive number of ultra-thin "mica"-type flakes in random orientation. (ii) A feather (unfortunately, not quite in focus).
20	40 ×		√	20/I	General appearance of inclusions and fairly typical of what was seen in most stones: (i) Black specks of biotite. (ii) Other inclusions which *appear* to be 2-phase—in reality those examined from different angles showed close contact between biotite specks and "mica"-type platelets or flakes (i.e. they are not 2-phase). (iii) An overall view of the type of irregular profiled and rounded "mica"-type flakes—some comparatively large in size.
	40 ×		√	20/J	Focus was just below the surface of the table: (i) Black, irregular shaped inclusions of biotite. (ii) Overall, slightly "treacly" effect or "disturbed" appearance due to concentrations of almost invisible ultra-thin "mica"-type flakes in random orientation. (iii) Larger flecks of "mica"-type flakes, a few of which (and in particular, one) appear to be thicker than the average.

SPECIMEN 13/G.



SPECIMEN 14/H.

SPECIMEN 20/1.



SPECIMEN 20/J.

In Correlation of the Foregoing Findings:

Five types of inclusions are evident in these emeralds:

(1) Black biotite in the form of irregular shaped specks, dots and larger expanded shapes (e.g. the crochet type pattern in one stone).

(2) "Bread-crumb" type inclusions trailing off to what appear to be pseudo-forms—probably hollow in the larger sized ones. These are reminiscent of those seen in some emerald-coloured paste as shown by Webster in *Gems: Their Sources, Descriptions and Identification*, 1962 edition, page 334, figure 173. The resemblance is remarkable.

(3) Mica, or a mineral similar in appearance to mica, was present in all stones to a lesser or greater degree. The size of the flakes varied considerably, their profiles being mainly irregular but rounded as opposed to a geometric outline. The colour in these flakes appeared as a very pale tint of brown to a slightly darker shade. Others appeared colourless (or the colour was masked by that of the host stone) and were of a twisted appearance. The latter inclusions gave some stones an internal "treacly" look. (The term "treacly" can be likened to the temporary effect seen when water is added to a colour tinted spirit, such as alcohol).

(4) Extremely fine pin-point inclusions in some stones giving a cloudy or slightly milky appearance.

(5) Feathers in some stones.

As noted in the schedule of inclusions, in one stone there is a contact between the "mica"-type flakes and a speck of biotite which gives the overall effect of two-phase inclusions—until the host stone is re-orientated, and in some cases the magnification increased, when the true effect is observed.

Conclusion:

A quick appraisal, with the use of a loupe only, of stones of an emerald colour, should be treated with caution as there is no reason to uppose that other "bread-crumb" type inclusions will not appear again in natural emeralds from this source. However, these stones do fluoresce under the Chelsea filter.

The "mica"-type flakes are strikingly similar to those in the Habachthal stones, (*Journal of Gemmology*, Vol. XI, No. 5, January 1969 Page 168, Fig. 6). Nevertheless the Habachthal stones also contain many long slender needles of tremolite. The Northern

Transvaal emeralds also have included mica and biotite, but these stones appear to have a different body-colour and rarely fluoresce.

The specific gravity of known natural emeralds falls within the range of 2·69 to 2·75. The Zambian stones fall within this range and in fact have the same average value for the Northern Transvaal and Rhodesian (Sandawana or Belingwe) stones.

The refractive index range of the species is given by Webster as 1·56-1·57 to 1·58-1·59. The Zambian stones fall within the higher range as do emeralds from Russia, Northern Transvaal, Rhodesia, India and Habachthal—the birefringence of 0·007 being the same for all of them.

In respect of the Zambian stones, the R.I. of 1·583-1·590 coincides with the Indian values, but the inclusions and specific gravity is different in each case. Similarly, the R.I. of 1·581-1.588 coincides with the Russian values, but again the specific gravity and inclusions are markedly different. Admittedly, on inclusions alone the Zambian stones are remarkably similar to the Northern Transvaal stones, but as can be seen, the identification can be made when the other properties are also considered.

REFERENCES

Webster, Robert. *Gems: Their Sources, Description and Identification.* 1962, Vol. 1, 74-88, 334; Vol. 2, 710, 728.

Anderson, B. W. *Gem Testing*, 8th edition.

Gübelin, E. *On the Nature of Mineral Inclusions in Gemstones.* The Journal of Gemmology, Vol. XI No. 5, 168, 169, 170, January 1969. *Emeralds from Sandawana.* The Journal of Gemmology, Vol. VI, No. 8, 340-354, October 1958.

ROMAN IMITATION DIAMONDS

By JACK M. OGDEN, F.G.A.

THE use of diamond in Roman times is well attested but was by no means common.[1] It is thought to have been introduced from the East sometime about 4th Century B.C., possibly as a result of Alexander the Great's conquests in the East. It is found set in rings and other jewellery in the Late Roman Period and the writer knows of no instances of its use prior to the third Century A.D.

The Romans were unable to cut diamonds due to their great hardness and all attested Roman diamonds are mounted in the naturally occuring form—octahedral crystals.[2] The impossibility of cutting, no doubt, encouraged the name "Adamas" meaning "invincible", the word from which our 'diamond' comes.[3] It would seem, however, that although the Romans were unable to alter the shape of natural diamonds they had no hesitation in copying the shape in other materials, a 2000-year old case of 'if you can't beat it, join it'!

A Roman ring found in Syria and now in the hands of the writer is set with a clear, colourless octahedral stone which, although whiter than the usual murky Roman stones, could, at first glance, be taken for a diamond. In fact the stone is quartz cut into an octahedral form. This ring is by no means unique and several other examples are known by the writer.[4] The explanation must surely be that the Roman jewellers were consciously imitating diamonds.

Glass imitations of gem-stones are common in classical times and, indeed, are known from the earliest periods in Egypt and Western Asia. Normally these imitations are purely colour copies and were cut in the usual shapes of the period. The copying of a crystal shape, as with the octahedral quartz, is obviously due to the impossibility of cutting diamonds and, thus, the octahedral quartz copied the only known shape of diamond. Other copying of crystal forms is possibly to be found in Roman times, a bracelet, also in the hands of the writer, is composed of ~~red~~ glass beads of Romano-Egyptian origin of cornerless cube shape, a shape known from as early as 500 B.C. (Glass beads from Crimea). It is tempting to equate these with small garnet crystals. A ring in the British Museum is set with a green chalcedony cut to form a hexagonal prism, surely an imitation of an emerald.[5] This chalcedony, often called 'plasma' in books on Ancient Jewellery, has whitish blotches and gives a good imitation of poor quality emeralds.

NOTES

1. Examples are found in many museums and private collections. The British Museum has several for example—"Catalogue of the Jewellery Greek, Etruscan and Roman in the Department of Antiquity", British Museum 1911 No. 2954—a Gold seal and "Catalogue of the Finger Rings Greek, Etruscan and Roman in the Department of Antiquity", British Museum No. 779, 785, 787-90.
2. The faceted diamonds occasionally found in Roman Jewellery would seem always to be later additions, for example No. 779 in the British Museum Catalogue of Finger Rings mentioned in note 1 above.
3. For a full history of the word "diamond" see "The origins of 'Diamond'," by S. B. Nikon Cooper in Journal of Gemmology, 1972, Vol. 13, No. 2, p. 51.
4. Two are in the British Museum, see Catalogue of Rings mentioned in note 1 above. No. 800, 846 (?)
5. British Museum Catalogue of Finger Rings (see note 1 above) No. 835.

Gemmological Abstracts

BANCROFT (P.). *The Mineral Museum.* Lapid. Journ., 1972, 26, 4, p. 594.

An account of various celebrated mineral cabinets, illustrated in colour, with details of particularly interesting holdings. Some of the duties and difficulties of the museum curator are explained and a plea is made for greater imagination to be shown in the display of specimens. M.O.D.

BANERJEE (A.). *Ein Beitrag zum Thema Türkis. A note on turquoise.* Z. Dt. Gemmol. Ges. 1972, 21, pp. 86-102. Various illustration diagrams and bibliography.

Because of the increasing rarity of turquoise, various other minerals are used in its stead, and poor quality turquoise is treated and improved. Chemically related minerals are: faustite, coeruleolaktite, chalcosiderite, rashleighite and wavellite. Genuine turquoise can easily be distinguished by its remission line. The absorption lines show a remission maximum at $\lambda = 430$ nm and minimum at $\lambda = 432$. The genuine and improved, as well as imitation, turquoises were also examined by infra-red spectroscopy and the diagrams are reproduced. This examination was particularly useful in identifying treated stones. Turquoise changes colour permanently when heated, i.e. blue material becomes blue-green when heated to 250°C, which then turns green when heated to 400°C. The colour of the material also changed from blue to green when radiated. E.S.

BANK (H.). *Hell und dunkelgrüner durchsichtiger Andalusit aus Espirito Santo, Brazil.* Light and dark green transparent andalusite from Espirito Santo, Brazil, Z. Dt. Gemmol. Ges., 1972, 21, 2, pp. 124-125.

Andalusite in cuttable quantity has been found in Ceylon and in Brazil in Minas Gerais. The stones found in the state of Espirito Santo are described and properties given. E.S.

BERNARD (A.). *Le saphir de Houei-Sai.* Bull. Assoc. Francaise de Gemmologie, Sept. 1972, 32, p. 10.

Houei-Sai in the Upper Mekong area produces sapphire from a basalt in association with orange spinel and some zircon. From 5,000 to 7,000 carats per month are sent to Bangkok for cutting.

M.O'D.

DENNEN (W. H.) and PUCKETT (A. M.). *On the chemistry and colour of amethyst.* Canadian Mineralogist, 1972, 11, 2, pp. 448-456.

The colour of amethyst results from the substitution of small quantities of ferric iron for silicon followed by ionizing irradiation. The over-all content of trace elements is not greatly different from that of colourless quartz, but stoichiometric calculations indicate that some or all of the iron present must be Fe^{3+} in tetrahedral coordination. Comparison of colourless and coloured portions of the same crystals shows the iron content to increase both with respect to aluminium and in absolute amount from colourless to amethystine portions. Growth temperatures are calculated to be 70°–285°C with a median of 250°C. R.A.H.

GALIA (W.). *Diagnostische Merkmake synthetischer Smaragde von Linde.* Diagnostic marks of synthetic emeralds by Linde. Z. Dt. Gemmol. Ges., 1972, 21, 2, pp. 112-117.

It had been assumed that Linde synthetic emeralds had an RI less than 1·57, but the author shows that many have an RI higher than 1·57. Under ultra-violet light there is red fluorescence comparable to that of Chatham synthetic emeralds; they also behave similarly under the Chelsea filter (red). The average weight was 2·67 cts. ±0·01. Many stones show coloured layers under the microscope; there are also inclusions which seem to indicate hydrothermal healing cracks. E.S.

GÜBELIN (E.). *Neueste Feststellungen am synthetischen Schmuckdiamanten der GE Co.* Latest observations on the synthetic gem diamond of the GE Co. of America. Z. Dt. Gemmol. Ges., 21, 1972, 2, pp. 103-111.

The jewellery trade was most interested in the possibilities of the GE Co. of America's ability to produce a synthetic diamond in carat-size. It was said that this diamond would lose half its weight when brilliant-cut. The GE therefore asked the diamond cutters, Lazare Kaplan & Sons in New York, to cut the synthetics in brilliant-cut style and to compare the polishing properties and variations in hardness between the natural and synthetic stones. Cleaving and sawing of the synthetic stones was so easy that the cleaver and sawyer had the feeling of working either with a softer diamond or having a better tool. The stones were then polished parallel to the cube face and this proved to be very easy. However, when the direction was changed and the wheel went against the grain there was strong resistance. Of the six stones polished, five were brilliant-cut and one was faceted in an oval shape. The brilliant-cut stones lost two-thirds of their original weight, but it seems that one would lose less weight when polishing them as carré or emerald-cut stones. The finished stones were beautifully polished and three photographed examples weighed between 0·30 and 0·40 cts, one being colourless, one canary-yellow and one light blue. Under magnification of 15 × the formerly observed dust clouds could be seen, in the case of the blue diamond forming a cross. It was not possible to see these clouds under a magnification of 10 ×, and it is therefore suggested that in future diamonds under 1 carat should be examined with a 10 × or 30 × lens. The coloured stones were definitely of the fancy-colour variety, while the colourless stones were classified as 'crystal', i.e. there was a slight yellow tinge which showed them to belong to the Cape variety. No stones showed any absorption lines and they did not fluoresce in long-wave UV light. However in short-wave UV light (2537Å) the colourless and blue GE stones fluoresced and phosphoresced strongly (which natural ones do not do). The synthetic stones are as transparent to x-rays as the natural ones. Of all the natural diamonds only the blue Type IIb transmits electricity; it is a semi-conductor. The colourless synthetic GE diamonds are also semi-conductors, while the yellow synthetic diamonds do not transmit electricity and thus behave in the same way as the natural yellow stones. The author has added a very useful table, comparing the properties of the natural to the GE synthetic stones, which are divided into three groups, i.e. colourless, yellow and blue.

E.S.

LINDBERG (J. D.). *Changing the colors of transparent gemstones.* Lapid. Journ., 1972, 26, 4, p. 604.

Experiments carried out by the author, mainly on varieties of quartz, and accompanied by coloured photographs of the various stages of colour change, are detailed together with a theoretical account of the phenomena. The term colour-centre is explained. M.O'D.

MACKENZIE (K. J. D.) and GREEN (J. M.). *The cause of colouration in Derbyshire Blue John banded fluorite and other blue banded fluorites.* Min. Mag., 1971, 38, 296, pp. 459-70.

Techniques including mass spectrometry were employed to try to discover the cause of colouration in banded blue fluorites from Derbyshire. Optical spectroscopy and paramagnetic resonance measurements failed to distinguish this type from other blue banded fluorites. Optical spectra and behaviour under bleaching techniques are consistent with colouration by colloidal calcium. M.O'D.

SCHIFFMAN (C. A.). *Observations on synthetic red spinel grown by the Verneuil method.* Lapid. Journ., 1972, 26, 6, p. 926.

The author has examined both boules and cut stones with an account of the morphology of the boule surface, which was covered by a criss-cross pattern of ridges following the crystal system and enclosing smaller triangular formations. Constants for the cut stones fell within the usual synthetic spinel range. Growth lines were curved but not concentric, meeting at an angle. M.O'D.

SCHOONOVER (M.). *Gem Treasures of Australia.* Lapid. Journ., 1972, 26, 4, p. 628.

A general account of the gem localities of Australia with a background of a continental journey. Detailed descriptions of the fields are given, in particular those bearing opal and sapphire. M.O'D.

STRUBEL (G.). *Hydrothermal Kristallwachstumsprozesse.* Processes of hydrothermal growth of crystals. Z. Dt. Gemmol. Ges., 1972, 21, 2, pp. 58-84. 19 illustrations; extensive bibliography.

Most minerals which are used for gem purposes are produced from hydrothermal solution or at least in the presence of some water. This article deals with various aspects of hydrothermal solutions, their chemical composition and occurrences. Even small quantities of water influence the speed of reaction of crystallising substances positively and the presence of water can lower the necessary temperature and stability of minerals by several 100°C. Quartz-glass, i.e. the mineral lechatelierite, does not alter even in geological periods if conditions are absolutely waterless. Experiments in an autoclave show three-phase systems at room temperature becoming two-phase systems at experimental temperatures. Other experiments show the stable mica mineral muscovite, which only decomposes at over 1,000°C when heated in a dry atmosphere, showing signs of change between 150-740°C. Various forms of hydrothermally-formed crystals are illustrated and discussed. E.S.

VANCE (E. R.) and ANDERSON (B. W.). *Study of metamict Ceylon zircons.* Min. Mag., 1972, 38, 297, pp. 605-613.

Metamict Ceylon zircons were examined by x-ray, SG, RI and optical absorption techniques. The anomalous absorption spectrum in low zircon is associated with small particles of ZrO_2 in a radiation-damaged lattice in both heated and unheated stones. M.O'D.

VANCE (E. R.) and ANDERSON (B. W.). *Differences among low Ceylon zircons.* Min. Mag., 1972, 38, 298, pp. 721-724.

Low Ceylon zircons showing an absorption band at 5200Å appear to have been more damaged by radiation than other Ceylon stones. Experiments with fission-fragment irradiation showed that low Ceylon zircons showing the anomalous absorption spectrum had been subjected to heat late in their geological history. M.O'D.

WIRSCHING (U.), BANERJEE (A.), PENSE (J.). *Rauchquartzfärbung durch Bestrahlung.* Colouring smoky quartz by radiation. Z. Dt. Gemmol. Ges., 1972, 21, 2, pp. 118-123.

There are two experimental ways of colouring smoky quartz, by electrolysis and by radiation. This article deals with the latter. Not all natural rock-crystals can be coloured this way and not all synthetic stones react to it, especially those that are pure. Untreated smoky quartz is usually less coloured than smoky quartz or rock-crystal which has been radiated. In untreated smoky quartzes no definite relationship was found between absorption content of trace elements. Rock-crystals with strongly coloured growth sectors showed opposite conditions of colour intensity after gamma radiation. In both natural and radiated smoky quartzes the absorption spectra were similar, as well as their temperature stability luminescence and weakening of colour by ultra-violet rays. E.S.

BOOK REVIEWS

BENNETT (E. M.). *Turquoise and the Indian.* Revised edition. Swallow Press, Chicago, 1970. pp. 152. Coloured illustrations. $5·00.

A first-class account of the occurrence and use of turquoise in the South-Western United States, this book is the result of lengthy research and, more specifically, of a course in ethnology which contributed a detailed knowledge of the craftsmanship of the Indian tribes. The book introduces turquoise as a mineral and continues with a description of early occurrence reports, and of individual mines. Chapters 5-8 are devoted to the fashioning of the stone and its use in traditional Indian jewellery, which is well and simply shown in colour. Concluding chapters are on folklore and archaeology. There is a comprehensive 8-page bibliography and each chapter is followed by relevant footnotes. M.O'D.

BOLESZNY (I.). *Manufacture of artificial gemstones.* Research Service Bibliographies no. 119 of series 4. Compiled under the auspices of the State Library of South Australia, Adelaide, 1969. pp. 38. Price on application.

This is a list of periodical articles and books covering the period 1927-1969. The author abstracts from Applied Science and Technology Index, Chemical Abstracts, Engineering Index, Internationale Bibliographie der Zeitschriftenliteratur aus allen Gebieten des Wissens, Industrial Arts Index and Mineralogical

Abstracts. Only the last quoted would normally be used by the gemmologist and on this score alone it is difficult to praise the author too highly. M.O'D.

CAMPBELL (W. M.). *Minerals and Gems of Maoriland.* Fourth edition. Unity Press, Auckland, New Zealand, 1970. Illus. in black-and-white. pp. 80. Price on application to the publishers.

Designed for use in the field, this otherwise good little book loses some of its value by not illustrating its specimens in colour. The main part of the book lists the stones likely to be found in New Zealand (for which Maoriland, for the purposes of the book, is a synonym). The maps are small but quite clear. A concluding section gives hints which are interesting though in no particular order. M.O'D.

CHIKAYAMA (A.). *Gem identification by the inclusions.* Gemmological Association of All-Japan, 1968. Illus. in black-and-white. In Japanese. pp. 102. 3,000 yen.

A concise description, by the Director of the Gemmological Association of All-Japan, of the commoner gemstone inclusions. Although the text is in Japanese, the chapter headings are in English and it is therefore possible to determine which illustrations relate to particular stones. The reproduction of the inclusions is quite good although giving the impression that the original photographs were of higher quality. The section on emerald, divided into natural and synthetic, is useful. There is a short bibliography in English. M.O'D.

CONROY (N.). *Making shell flowers.* Oak Tree Press (Ward Lock) 48 pp. Black-and-white and coloured illus. £1·05.

Simple instructions for making jewellery and other ornamental items from shells. S.P.

DE MICHELE (V.). *The World of Minerals.* Orbis Publishing, London, 1972. Illustrated in colour. pp. 128. £1·95.

Another of the superbly illustrated books emanating from the Istituto Geografico De Agostinin, Novara, Italy. This book is on a larger scale than the same author's Crystals, symmetry in the mineral kingdom, and contains a foreword by Dr. George Claringbull.

The minerals are shown in Dana order and there are good drawings of the crystals in diagram form accompanying the magnificent colour plates. One might quarrel with the description of the typical benitoite crystal as prismatic where rhombohedral might be preferable, and there are a few unimportant misprints. M.O'D.

DESAUTELS (P. E.). *Gems in the Smithsonian.* Smithsonian Institution, Washington, DC, USA, 1972, pp. 62. Illustrated in colour. (U.K. £1).

First issued in 1965 in a smaller format, this small book gives a brief glimpse of the riches of the National Gem Collection, part of the Division of Mineralogy of the Smithsonian Museum. This collection is notable for the great size of many of its specimens and for the admirable display techniques employed. The coloured illustrations are of good quality and are well chosen to fit the accompanying text, so that the reader is not forced to find his material on more than one page. Emerald, for some reason, is not shown. M O'D.

DRAGSTED (A.). *De aedle stene og deres mystik.* Privately printed, Copenhagen, 1967, pp. 239. 78·00kr. A re-issue of a book first printed in 1933.

The first section of this interesting book contains an alphabetical listing of gemstones with accounts of their mystical properties as quoted in classical and later literature. Astrological, biblical and occult usages are covered and this part of the book closes at p. 191. The rest of the book is more concerned with gemmological data, albeit of a rudimentary nature. An interesting section deals with prices and the book ends with a short bibliography. The reprinted edition contains a few notes about the author and a new preface. M.O'D.

FLETCHER (E.). *Pebble polishing.* Blandford Press, London, 1972, pp. 104. £1.

This is an adequate guide to tumbling which seeks to take the reader through all the processes from the finding of the pebbles to the final stage of polishing. There is nothing new in the geological section of the book and it may be rather alarming to think of crystals being subjected to this somewhat harsh treatment, but the author certainly describes every part of the work in the closest detail, to such an extent that a child could follow it. The illustrations are good and the style clear though repetitive.

M.O'D.

FROMANGER (H. D.). *Bijoux et pierres précieuses.* Hachette, Paris, 1970, pp. 190. Illus. in black-and-white and colour. 45fr.

A popular guide to famous jewellery, well illustrated and with numerous historical anecdotes. Opening sections deal with the diamond, ruby, sapphire and emerald; other well-known stones are covered briefly. The author's allegation that ruby is found in Sussex (England) needs no comment. Useful illustrations of diamond cutting are included. The rest of the book is devoted to the art of the jewelmaker and is worth reading for the amount of data given which would not easily be found elsewhere. The quality of illustration is high; the value of the bibliography would have been enhanced by the provision of dates for the works included.

M.O'D.

GLEASON (S.). *Ultraviolet Guide to minerals.* Ultra-violet Products, Inc., San Gabriel California, 1972, pp. xii, 244. Some coloured plates.

A handy paper-covered edition of this well-known guide which first appeared in 1960. Early chapters explain the phenomenon of fluorescence, how to employ simple ultra-violet lamps in the field and simple mineral recognition. Tables of fluorescent minerals, arranged under their fluorescent colour, occupy pp. 26-103. A chapter on the fluorescence of gem materials includes a number of specimens with their US localities. The book concludes with the use of ultra-violet techniques in mining, radioactive minerals and prospects for further research. The coloured plates are of fine quality.

M.O'D.

HUTTON (H.). *Practical gemstone craft.* Studio Vista, London, 1972, pp. 103. Illus. in black-and-white and in colour. £2·60.

A very informative and lucid guide to the origin of rocks and minerals, this book endeavours, in the words of the author, to cover the general interests of the lapidary and to create a balance between the geological background of minerals, descriptions of them and techniques for cutting and polishing them. The opening chapter deals with the main types of rock, with fine photographic illustrations, and goes on to describe crystals and their symmetry. Later chapters deal with lapidary equipment and techniques and descriptions of gem materials. There is a clearly-drawn map of British gem locations, a locality list covering Britain and the United States in some detail, a list of suppliers and a bibliography in title rather than author order.

M.O'D.

JERRARD (R. A.). *The Amateur Lapidary.* D. Bradford Barton Ltd., Truro, 1971. pp. 88. Black-and-white illus. £1·25.

A step-by-step account of the simpler lapidary processes, amply and clearly illustrated. After the inevitable chapter on the tumbling of pebbles the reader encounters surface polishing and grinding, the commoner abrasives and a list of some of the gem materials likely to be fashioned without great expense. Many of the stones listed have appended to them some legendary property, an unnecessary inclusion in a practical manual. Later chapters deal with jewellery making, hall-marking and descriptions of the more sophisticated polishing machines. There is a short bibliography and a list of lapidary clubs, without, however, their addresses.

M.O'D.

JOHNSON (P. W.). *A Field Guide to the Gems and Minerals of Mexico.* Gembooks, Mentone, California, USA, 1965. Illus. in black-and-white. pp. 96. $2·00.

This excellent book lists the best gem and mineral localities in Mexico, including photographs of appropriate mineral specimens and a good deal of data on local conditions, customs and other attractions. Most of the individual mines are listed and there is a useful glossary of mining terms in Spanish and English.

M.O'D.

KALOKERINOS (A.). *Australian precious opal.* Thomas Nelson (Australia) Ltd., Melbourne, 1971. pp. 51. Many coloured illus. $4·95 (Australia).

The best book on Australian opal so far to appear. Dr. Kalokerinos examines the major Australian locations in detail, covering their geology, the methods of mining, celebrated stones and mining anecdotes. Coloured plates of high quality display the characteristic features of opal of various kinds. Dr. Kalokerinos is particularly informative on the valuation of opal, possible faults and their classification. The reader is enabled to judge for himself whether or not his specimen is likely to be of value from the data given here.

M.O'D.

KIRKALDY (J. E.). *Minerals and Rocks in Colour.* Blandford Press, London, second edition reprinted 1972. pp. 184. £1·20.

A popular guide to minerals and rocks as found in the field, this book is a translation of the Swedish Stenar i färg, which had a text directed at the Swedish reader. For this edition the text has been completely rewritten with the British reader in mind. 290 coloured illustrations open the book and these are followed by chapters on the types of rock, the nature of minerals, and crystals. The minerals are described in traditional order and there is a short bibliography and a glossary. Authoritatively written, the book is conveniently sized for the pocket.

M.O'D.

Lapidary techniques. Craftool Press, Harbor City, California, 1971, pp. 46. Illus. in colour. $2·00.

A simple guide to the growing hobby of lapidary work, with lists of clubs and of the better-known gem materials found in each of the states of the U.S.A. There are also simple instructions for operating tumblers and faceting machines. The book is attractively illustrated in colour.

M.O'D.

MCCAULEY (C. K.). *Gemstone resources of South Carolina.* Division of Geology, State Development Board, Bulletin no. 30. Columbia, S.C., 1964, pp. vi, 34. Price on application to the Division of Geology.

The principal feature of this short guide is the description, in tabular form and accompanied with maps, of the precise locations of gem materials in the state. There is no regular production of gemstones on a commercial basis, although in 1958/59 sillimanite crystals were collected from Oconee County and sold to tourists and collectors. Earlier sections of the guide contain a table of gem materials with some of their constants and a review of the types of geological formation likely to prove gem-bearing. Some outmoded and inappropriate nomenclature does not spoil a useful and authoritative guide.

M.O'D.

METZ (R.). *Edle Steine.* Photographs by Arnold Fanck. Belser Verlag, Stuttgart, 1965. pp. 256. DM 14·80. Series Belser-Bücker-Reiche 13.

A smaller and much cheaper edition of the authors' large-format work issued in the same year. The quality of the illustrations is a little marred by the unfortunate habit of the paper to curl but the reproduction is still good. The publishers promise an English edition late in 1972.

M.O'D.

PABIAN (R. K.). *Minerals and Gemstones of Nebraska.* Educational Circular no. 2 of the Conservation and Survey Division, University of Nebraska, Lincoln, Nebraska, USA, pp. 80, 1971. Price on application. Illus. in colour and black-and-white.

A useful and sprightly guide which is relevant to the gem collector outside the State of Nebraska. Many specimens are well illustrated in colour and the drawings of crystals and other specimens in the text are particularly good. Nebraska is rich in agates and these are exhaustively treated. There is a good bibliography and a glossary.

M.O'D.

PEARCE (G. A.). *The story of New Zealand jade, commonly known as Greenstone.* Collins, Auckland, 1971, pp. 109. Coloured illustrations. $3·60.

Chapter headings of a generally fanciful conception disguise to some extent the considerable amount of factual matter, which is well-arranged. This is a very good book and the best introduction I have so far seen to the subject of New Zealand nephrite. The author spends little time on imitations but opens with a good and imaginative account of the formation of the material. Under the heading "Jade casts its spell" there is a lucid account of the adoption of nephrite and its use by primitive peoples. The methods of working the stone are detailed and text-illustrations display the traditional Maori artefacts. Modern methods are also shown and attractive coloured plates depict the recovery of boulders, various forms of nephrite and types of finished article respectively. An account of other materials resembling jade is left for an appendix and there is a bibliography of 20 items.

M.O'D.

ROBERTS (B.). *The Diamond Magnates.* Hamish Hamilton, London, 1972, pp. 335. £3·40.

An account of the lives of the early diamond magnates, such as Cecil Rhodes, Barney and Harry Barnato, the various Joels and others. Some of the controversy and scandal which evolved round the various characters brings to mind that although man's technical ability has advanced remarkably during the present century, his social and moral wisdom has not progressed over the centuries. An interesting commentary about the first diamond tycoons.

S.P.

ROGERS (C.). *A Collector's Guide to Minerals, Rocks and Gemstones in Cornwall and Devon.* D. Bradford Barton, Ltd., Truro, 1968. Hand-drawn text illus. and maps in black-and-white. pp. 48. 40p.

Written with the emphasis on work in the field, this useful and cheap little book would be a welcome companion on a trip to Devon and Cornwall. The author introduces the minerals likely to be found in that area with a word or two on the crystal systems, and then proceeds to list general and specific places where these specimens may be found. The best sections describe the appearance of the minerals and the author sensibly points out that great care should be taken in visiting dangerous places and that many minerals are now very hard to find except by those who can descend the mines.

M.O'D.

ASSOCIATION NOTICES

MEMBERS MEETINGS

Professor Tolansky speaks at Random

Saying that he had been asked by the Secretary to speak at random, Professor S. Tolansky—expert and author of a number of books about diamond—launched himself into a series of anecdotes at a meeting of the Association, at Goldsmiths Hall, London, on 17th October.

He said he did not know much about gems, but a little about diamonds, and this was an accident. It was in 1944 that he developed a technique known as multiple beam interferometry and later wrote a paper on "The Topography of a Face of a Diamond Crystal", when the "atomic energy people" called him in to try and find the isotope of uranium (235)—he was at the time an expert in spectroscopy—and provided, he told the authorities, he was given some uranium he could do the work. Having collected all the instruments together, he had only to receive the 235, when the American army said that they were not releasing any to another country and he would have to go to America. The outcome, said Professor Tolansky, as he was doing the job for nothing, was that he did not go to America. Instead he was given ordinary uranium, which required him to test his instruments to ensure they were good enough for the work, which resulted in him developing a technique to look at the properties and qualities of plane surfaces.

The outcome of all of this was he found surfaces were a lot more interesting than they appeared and he consequently chose to study diamond which, being extremely hard, he thought when it came from the ground it would still retain its virgin growth.

He acquired several interests in respect of diamond, one was the size of diamond and another, the history and folklore of diamond, "I'm afraid I never acquired an interest in the history of the value of diamond", he said. He continued, "I am often asked by my friends about the value of diamond and I quote them Tavernier's rules." Professor Tolansky said that Tavernier, who lived in the 1600's, wrote a book in which he said that a diamond was valued in proportion to the square of the weight, thus if you said that 1 carat was worth £100, 2 carat would be worth two squared—£400, and 3 carat £900, and 4 carat £1,600. It was, he said, an extraordinary thing but when he had occasion to visit De Beers the rule seemingly applied to the general run of stones. Tavernier described how stones were bought and sold in the market places in India. Tavernier, it appeared, would go to the market place and find a dealer and they would both join hands and these would be covered by a black cloth and then selling and buying would take place according to an agreed code—a knuckle would, perhaps, be so much and a finger something else. The value of this system, said Professor Tolansky, was that the next buyer had no idea of what had been agreed or disagreed between the two previous parties. When Tavernier described the output of diamonds he mentioned a figure of 60,000 people, mainly women and children, scratching the surface of the ground for diamonds.

Professor Tolansky went on to say that diamond was valued because of its hardness, it being believed by the owners that the hardness would transfer to them, a very necessary attribute to the warriors that wore them. He thought that in the past many fine diamonds must have been lost in war.

Polishing of diamonds, said Professor Tolansky, was discovered about 1300 AD and the first polished diamonds consisted of just a table. Then someone discovered that one could polish diamond on the dodecahedral plane and produce a lozenge, and polished diamonds belonging to old families are either tables or lozenges.

Tavernier, wrote that Indians had been polishing diamonds from the beginning of the millenium and had kept the process secret. Pliny described how splinters were fastened in pieces of metal and used to bore great boreholes to extract diamonds. Even 2,000 years ago this was standard practice.

Professor Tolansky said he had spent a lot of time investigating the origin of the glazier's diamond, and discovered some writings by a German of 1050 AD which mentioned diamond cutting of glass.

Professor Tolansky then turned to the subject of the etching of diamond and he discovered it was easily done by immersing a diamond in sodium nitrate heated to about 500°. He used the etching of diamond as part of the process in his research into plane surfaces. By stopping the etching at a certain point he was able to see under a microscope, by the surfaces that were left, the actual growth of diamond.

The subject of diamonds on the moon was then broached by the speaker, who said it was back in the early 1960's that he conjectured that there might be diamonds on the moon. He based his theory on the fact that a very large crater in the Arizona desert, reputed to have been caused by a violent explosion many years ago, has diamonds around its edges. Although of microscopic size he had the impression that these diamonds resulted from the impact. The moon, he said, contained many craters and this gave him the feeling that diamonds were to be found. He had very good reason to believe there was carbon there. There were thousands of millions of tons of carbon on the sun, and, he said, "why shouldn't there be the same on the moon?" He also presupposed that the carbon was in a situation where it could act as a heat-sink, which would be an extractor of heat.

Two or three years after he had suggested diamonds on the moon, American scientists made diamonds by a combination of high pressure and high temperature. He predicted diamonds on the moon, and, he said, he still predicted diamonds on the moon around the crater lips.

Professor Tolansky then spoke of the other material he had received from the moon and the type of stones he had discovered when he investigated this. He illustrated his talk with a number of colour slides, which showed moon-material very much enlarged.

Scottish Branch

On the 31st October, 1972, a "Quiz Night" was held at the North British Hotel, Glasgow. As well as the quiz, during which members were asked to identify various gemstones, a demonstration of the new Rayner Dialdex Refractometer was given.

A further meeting was held on the 19th December, 1972, also at the North British Hotel, when Dr. J. Cunningham gave a talk on the "Art of Lapidary", and specimens of his work were shown.

Midlands Branch

A late summer outing was held on the 17th September, 1972. when members of the Branch visited Blenheim Palace, Woodstock, Oxfordshire. Dinner was taken at the Alveston Manor Hotel, Stratford-on-Avon.

Mr. Alec Farn, Director of the London Chamber of Commerce Gem Testing Laboratory, gave a talk entitled "Instruments for Gem Testing" to members of the Branch at the Auctioneers Institute, Birmingham, on the 3rd November, 1972. In addition to mentioniug simple testing methods members can use to test specimens themselves, Mr. Farn spoke about new developments and techniques used in the Laboratory.

MEMBERS MEETINGS 1973

29th January	Talk by Mr. B. W. Anderson, B.Sc., F.G.A., entitled "1925 and All That". Goldsmiths' Hall, London, 7.00 p.m.
17th April	Talk by Julius Petsch, Jrn., Idar-Oberstein on "New gem location discoveries and the present treatment of gemstones". Goldsmiths' Hall, London. 7.00 p.m.
2nd May	Annual General Meeting, Saint Dunstan's House, London.
29th October	Meeting, Goldsmiths' Hall, London, 7.00 p.m.
19th November	Reunion of Members, 6.00 p.m., and Presentation of Awards, 7.00 p.m. Goldsmiths' Hall, London.

Midlands and Scottish Branch Meetings to be announced.

INSTRUMENTS

A member is interested in acquiring *old* gem testing instruments of any sort. Would anyone having items to offer, please contact the Gemmological Association office.

GEM DIAMOND EXAMINATION

Forty-one candidates entered for the Association's 1972 gem diamond examination. The following is a list of successful candidates, arranged alphabetically.

Qualified with distinction

Martin, Bernard Frank, Birmingham
Mones Roberdeau, Luis, Barcelona, Spain
Verges Tuset, Maria, Barcelona, Spain
Waters, Peter Aloysius, Morecambe

Qualified

Alabaster, Wendy Jane, Birmingham
Altaba Artal, Ma. Dolores, Barcelona, Spain
Andres Barbera, Jose, Valencia, Spain
Bloomberg, Maurice, Ilford
Bradshaw, Stephen Charles, London
Cartland, Anthony John, Leamington Spa
Christie, Rosalind Seaton, London
Clifford, Geoffrey Roy, Maidstone
Davenport, Charles Edward, Coulsdon
Folch Bru, Rosendo, Barcelona, Spain
Fuente Cullell, Carlos de la, Barcelona, Spain
Fuller, Donald George, St. Helens
Gooding, Diana Janet, London
Heather, John Christopher, London
Hilbourne, Anthony Charles, Twyford
Holden, Andrew Neil, Walsall
Just Chova, Jose Vicente, Valencia, Spain
Kirkpatrick, David John, Kenilworth
Lopez Verge, Ramon, Barcelona, Spain
Lowe, Christopher Edward, Burton-On-Trent
Murray, David Ernest, Stratford-On-Avon
Naim, Edward Youssef, London
Nemoto, Yoshio, London
Nicolau Santasusagna, Ramon, Barcelona, Spain
Platts, Jean Isabel, Sheffield
Poynder-Meares, Christopher Francis, Gloucester
Pragnell, Jeremy Martin, London
Reilly, Hugh J., London
Roca Cusachs, Juan, Barcelona, Spain
Saddington, Tom Frederick, Woking
Stephens, Arthur Leslie, London
Tattersall, Paul Lawrence, London
Tortosa Calveras, Francisco, Barcelona, Spain
Woolf, Michele Debra, London

EXAMINATIONS IN GEMMOLOGY 1972

In the 1972 examinations in gemmology organized by the Gemmological Association of Great Britain, 448 candidates sat for the preliminary examination, and 284 for the diploma examination. Centres were again established in many parts of the world.

Upon the recommendation of the examiners the Tully Memorial Medal and Rayner Prize have been awarded to Mr. Edward Jobbins, of London.

The Rayner Prize in the perliminary examination has been awarded to Miss Vicky Procter, of London.

The following is a list of successful candidates, arranged alphabetically.

DIPLOMA EXAMINATION

Qualified with Distinction

Anderson, Alice, Toronto, Ont., Canada
Carbonell Pujol, Rafael, Barcelona, Spain
Cook, Marion, Victoria, B.C., Canada
Doman, Eleanor Margaret, Ilford
Eason, John Robert, Manurewa, New Zealand
Jobbins, Edward Allan, London
Jones, David Lewis, Orpington
La Due, Martha J., Jenson, Kentucky, U.S.A.
Margarit Morant, Eugenio, Barcelona, Spain
Needham, Brian, Ilford
Noble, Clifford, Heckmondwike
Ohguchi, Hideki, Kanagawa Pref., Japan
Peacock, Pamela Mary, Stourbridge
Plotzeneder, Josef, Salzburg, Austria
Pujante Garzon, Francisco, Barcelona, Spain
Ratera Oliva, Jaime, Barcelona, Spain
Reyes Sainz de la Maza, Fernando de los, Sevilla, Spain
Schrader, Hans Werner, Idar-Oberstein, W. Germany

Qualified

Abhyankar, Jagannath Shripad, Poona, India
Amarasuriya, Sunil Tissa, Idar-Oberstein, W. Germany
Anttila, Aimo, Helsinki, Finland
Astrain, Calvo, Rafael, San Sebastian, Spain
Baker, Nancy Jane, Manotick, Ont., Canada
Bennett, Frederic Charles, Manchester
Besteiro Rafales, Josefina, Barcelona, Spain
Bezuidenhout, Mary Elizabeth, Bloemfontein, S. Africa
Blackwell, Alan F.A., Barnehurst
Blanco Artigues, Jose Ma., Lerida, Spain
Boyce, Anthony James, Doncaster
Butterworth, Joan Louise, Rochdale
Campbell, Alan J., Birmingham
Chikayama, Yoko, Tokyo, Japan
Clarke, Roger David, Maidstone
Conesa Landines, Bernardo, Barcelona, Spain
Connard, Charles Roger, Southport
Contreras Vila, Pedro, Barcelona, Spain
Coulter, Peter, Northwich
Cranton, Keir, Surbiton
Crutchley Smith, Betty, Nottingham
Del Monico, Anneliese, West Haven, Conn., U.S.A.
Faulds, Matthew Christopher Mwamlima, London
Ferguson, Louisa, Neilston
Fernando, S. U. H., Idar-Oberstein, W. Germany
Ferrandiz Torrents, Pedro, Barcelona, Spain
Finch, Stephen Reginald George, Rochester
Fisher, Emmett W., Houston, Texas, U.S.A.
Frampton, Derek Nigel, Bognor Regis
Frost, Julia Josephine, Cambridge
Gammage, Michael John Ellis, Northwood
Gans, Louis Benjamin, Amsterdam, Holland
Garcia Ainoza, Joan, Barcelona, Spain
Gardiner, Wilfred Charles, Reading
Gargano, Frank, Rochester, N.Y., U.S.A.

Gomez Escola, Ana Ma.,
Barcelona, Spain
Goodger, W. Donald,
Don Mills, Ont., Canada
Gopalji, Kantilal P., London
Granda Uson, Ma. de Fatima,
Barcelona, Spain
Green, Arnold, Wembley
Gunawardana, Panadure Lohakaruge
Abhaya, Nugegoda, Sri Lanka
Gunther, Birgit,
Idar-Oberstein, W. Germany

Haile, Neville Seymour,
Kuala Lumpur, Malaysia
Hammonds, Robert,
Newcastle-Upon-Tyne
Hayburn, John, Hong Kong
Heikkila, Juhani, Helsinki, Finland
Holgate, Richard Stanley, Blackpool
Hudspith, Thomas William,
Chester-Le-Street

Jackson, Ian, London
Johnson, John, London
Johnson, Robert Charles, Nuneaton
Jones, Claude Barrington,
Northampton
Jones, Michael John Bewsey,
Sevenoaks

Kean, John Snowden, Ayr
Korevaar, Huibert Jacobus,
Amsterdam, Holland

Lee, Keith Alfred, Hartlepool
Lyall, Linda, Alloway
Lynch, Eric, Wallsend-on-Tyne

MacDonald, Kenneth Charles,
Leicester
Magnussen, Rita Helene,
Drobak, Norway
Marin Calvo, Ma. Luisa,
Barcelona, Spain
Martin, John Frederick,
Liberal, Kansas, U.S.A.
Miller, Graham John, Chesham
Modahl, Oivind, Oslo, Norway
Mones Mendoza, Luis,
Barcelona, Spain
Munoz Aisa, Ma. Teresa,
Barcelona, Spain
Murto, Kalevi, Helsinki, Finland

Nemoto, Christine,
Khartoum, Sudan
Nemoto, Ki, Khartoum, Sudan
Nickel, Karin Ingrid,
Los Angeles, Calif., U.S.A.
Nogues Carulla, Joaquin Ma.,
Barcelona, Spain

Ord, Ronald, Harrogate

Par, Maung, London
Penny, Christopher, London
Popperwell, Elizabeth, Stockport
Popplewell, Wilfrid, Bristol
Pschichholz, Dieter,
Wurzburg, W. Germany

Razquin Munoz, Efren,
Barcelona, Spain
Rehtijarvi, Pentti, Helsinki, Finland
Richmond, Philip Simon, Mansfield
Runciman, William Alan,
Aranda, A.C.T. Australia

Sanchez Almer, Francisco Javier,
Castellon De La Plana, Spain
Sayer, Glynis Vera, Rochester
Schapiro, Simon, London
Scharf, Walter,
New York. N.Y., U.S.A.
Scott, Annie Murray, Perth
Shindler, Albert, Kenton
Simons, Paul Armand,
Amstelveen, Holland
Smidt, Maria Josephina Antonia,
Salisbury, Rhodesia
Soler Serra, Jorge, Barcelona, Spain
Soratie, Kyllikki, Helsinki, Finland
Stevens, Peter, Harlington, Middx.
Stocken, Charles Galahad,
Oranjemund, S.W. Africa
Straatman, Eduard Karel Victor,
Bussum, Holland
Sukapaa-Harsunen, Leena,
Kauniainen, Finland
Sweeney, John Michael,
Rowlands Gill, Co. Durham

Van Den Berge, Gerard, St. Amandsberg, Belgium
Vidal Solsona, Jaime, Barcelona, Spain
Vila Demestre, Anna, Barcelona, Spain
Wainwright, Nicholas Anthony, Caldy
Walton, Brian, Dukinfield
Watson, Philip, Rickmansworth
Webb, Ronald John, Auckland, New Zealand
Westerback, Simo, Helsinki, Finland
Wightman, Francis Geoffrey, Nottingham
Wood, Kathleen Alice, Sheffield

PRELIMINARY EXAMINATION

QUALIFIED

Acedo Delgado, Manuel, Barcelona, Spain
Adams, David, New Malden
Adams, John Hilton Trevelyan, Pevensey Bay
Alijas Sanz, Adelaida, Valencia, Spain
Allin, Frederick Garner, Port Elizabeth, S. Africa
Allin, Peggy, Port Elizabeth, S. Africa
Alonso Querol, Montserrat, Barcelona, Spain
Amor Cubeiro, Carmen, Barcelona, Spain
Amukotuwa, Sarathkumara Lakshman Ajith, Colombo, Sri Lanka
Andersen, Lis-Mari, Horten, Norway
Anderson, Sarah Anne, Deal
Andreu Griera, Juan, Barcelona, Spain
Anton Martinez, Miguel, Valencia, Spain
Arano Sierra, Ma. Pilar, Barcelona, Spain
Ashcroft, Vera, Liverpool
Bagant Pons, Jorge, Barcelona, Spain
Barker, Margaret Mary, Southport
Barrows, Mark Coleman, Halesowen, (Worcs.)
Baster, Patricia, London
Begg, Ruth Patricia, London
Bender, Maria Margaretha Agatha, Delft, Holland
Berry, John Hugh, Birmingham
Betts, Stuart Edward, London
Beuken, Maria Ludovica Johanna Adriana, Schoonhoven, Holland
Blackmore, Lynda Muriel, Pinner
Bollen, Neil, Bristol
Bonet Coll, Jose, Barcelona, Spain
Boraks, Victor, Jos, Nigeria
Borao Clemente, Pascuala, Valencia, Spain
Bowden, Desmond John, Colchester
Brown, Anthony John, London
Cain, John Victor, Birmingham
Canals Cadafalch, Ma. Montserrat, Barcelona, Spain
Carbonell Alos, Concepcion, Valencia, Spain
Carlsen, Gunnar J., Haugesund, Norway
Cepak, Livio, Trieste, Italy
Chaloner, Rosemary Jane, Altrincham
Clark, Victoria Elizabeth, Fife
Comas Masmitja, Ma. Pilar, Barcelona, Spain
Constable, J., Birmingham
Cooke, Victoria Jane, Blidworth, Notts.
Costa Ramon, Maria, Barcelona, Spain
Cox, Edward Charles, Auckland, New Zealand
Culi Perarnau, Jose, Barcelona, Spain
Dahlan, M.S.M., Marata, Sri Lanka
Daly, Patrick Joseph E., Chelmsford

Dancer, Joan Elizabeth, Sheffield
De Ligny, Willem Pieter, Hooguliet, Holland
De Silva, S. P. N., Hong Kong
De Vos, Helena Pieternella Gemma, Schoonhoven, Holland
Dewhirst, Stephen Clive, Stockport
Duvert, Gisele, Annemasse, France

Eaton, John, Orpington
Eli Fritsch, Juan Adolfo, Madrid, Spain
Espinosa Munoz, Luis, Barcelona, Spain
Esquerra-Torrescasana Llobet, Jose Eloy, Barcelona, Spain
Estany Volart, Ramon, Barcelona, Spain

Fahie, Charlotte Mary, Colchester
Farreny, Riera, Andres, Barcelona, Spain
Fellows, Norman John, London
Firth, Roy, Ambleside
Flo Tomas, Ma. Rosa, Barcelona, Spain
Folch Soler, Mercedes, Barcelona, Spain
Frodin, Peter John, Gayton, Cheshire
Fryer, Frederick Alfred, London

Gangaramani, Dipak, London
Gasco Pascual, Ignacio, Valencia, Spain
Gill, Robert, Boston
Gonzalez, Juan Manuel, Valencia, Spain
Grainger, Michael George Freethy, London
Grainger, Paul Edward, Manchester
Green, Roger, Leicester
Grice, George Herbert, Dublin, Ireland
Gunther, Birgit, Idar-Oberstein, W. Germany

Haile, Neville Seymour, Kuala Lumpur, Malaysia
Hamel, George Jan Willem, Leiderdorp, Holland
Hammond, Frances, Hamilton, Bermuda
Harris, Robert John, Birmingham
Harvey-O'Riordan, K., London
Hebbrecht, Julien, Gouda, Holland
Heintzberger, Cornelis Petrus, Bilthoven, Holland
Hermanus, Sigmund Damasco, Schoonhoven, Holland
Higham, Joyce Rita, Prescot
Hinchliffe, Roger, Eastbourne
Hinton, Christopher Arthur, Dudley
Hlibchuk, Stephen Roland, Coleman, Alberta, Canada
Holgate, Richard Stanley, Blackpool
Horovitz, Herbert, Geneva, Switzerland
Hussein, Noordeen Mohamadu, Colombo, Sri Lanka

Irwin, Alan, Menlo Park, Calif., U.S.A.

Jaliwala, Mansoor A., Bombay, India
Jakes, Margaret Diane, Sheffield
Jeffries, Colin Levi, Newport
Jimenez Torro, Vicente, Valencia, Spain
Jobbins, Edward Allan, London
Juan Prevosti, Leopoldo, Barcelona, Spain
Jubany Casanovas, Jorge, Barcelona. Spain
Juckes, Lewis Menne, Rotherham

Kaku, Baikei, Kobe, Japan
Kalina, Freda Frances, London
Kawahara, Makio, Fukuoka City, Japan
Klein, Adrian H., London
Knight, Louise A., London
Knight, Lawrence Peter, London
Knoske, Gene, E. Milwaukee, Wisconsin, U.S.A.
Koike, Kiyokatsu, London
Komiakoff, Leo Nicholas, New York, N.Y., U.S.A.
Kramer, Theodore P., Beltsville, Maryland, U.S.A

Krijger, Baldeus,
Schoonhoven, Holland
Kumekawa, Naotake,
Yokohama City, Japan
Laing, Michael Neilson, London
Lancaster, David Joseph,
Johannesburg, S. Africa
Latre David, Fernando,
Valencia, Spain
Latre David, Jose, Valencia, Spain
Liberg, Finn Ove, Hamar, Norway,
Llopis Lopez, Manuel,
Valencia, Spain
Lopez Perez, Oceano,
Barcelona, Spain
Lovell, John Richard,
Auckland, New Zealand
Lupon Escanilla, Clemente,
Barcelona, Spain
McDowell, B. M.,
Wellington, New Zealand
McGrath, David Michael, Bowden
MacOlive, John Richard Woodward,
Krugersdorp, S. Africa
Majo Llopart, Miguel,
Barcelona, Spain
Malin, Kathleen Marian, London
Malone, Benjamin Darley,
Port Charlotte, Fla., U.S.A.
Mant, Kevin John, Walton-on-Thames
Marble, Carolyn Calvin,
APO N.Y., New York, U.S.A.
Marsh, David Kenneth, Leeds
Martin, Stephen Thomas, Rochester
Martorell, Gisbert, Ma. Isabel,
Valencia, Spain
Mason, John, Harrogate
Matthews, Shelagh Joan,
Port Elizabeth, S. Africa
Maury, Robert Lee,
Port Charlotte, Fla., U.S.A.
Merriman, Patricia Jean, Wallasey
Metcalfe, Brian, Lymington
Minty, Janet, London
Mjelva, Halge Roenneberg,
Aalesund, Norway
Moate, George Richard,
Knockholt, (Kent)
Moninos Pellicer, Vicente,
Valencia, Spain
More Andujar, Francisco,
Barcelona, Spain
Morton, Harold, Liverpool
Moxon, Sally, Pinner
Mozolowski, Barbara, Fife
Muller, Helen, Leeds
Munro-Ferguson, Molly Ann Luttrell,
Evanton, Scotland
Muthukumaraswamy, Chelliah,
Wattala, Sri Lanka
Navarro Collado, Clemente,
Valencia, Spain
Neagle, Trevor George,
Norton, Teesside
Nickel, Karin Ingrid,
Los Angeles, Cal., U.S.A.
Nissanka, Geeta Sri,
Colombo, Sri Lanka
Nowak, W., Bexley
Oliver, Graham Denis,
Wellington, New Zealand
Ono, Yoji, Hyogo-Ken, Japan
Pardo Llorens, Emilio,
Barcelona, Spain
Palmer, E. M., Liverpool
Par, Maung, London
Parkin, Lesley Karen, Nottingham
Patak, Alexander O.,
New Castle, Pa., U.S.A.
Patni, Lalitkumar Jayantilal,
Bombay, India
Pavitt, John Anthony Leighton,
Bangkok, Thailand
Pease, Belinda, Geneva, Switzerland
Pechuan Castello, Emilia,
Valencia, Spain
Penny, Michael John, Wisbech
Perlas Zurita, Ma. Lourdes,
Barcelona, Spain
Pike, Ian Kenneth,
Cairns, Queensland, Australia
Procter, Vicky, London
Pschichholz, Dieter,
Wurzburg, W. Germany
Quitllet Pou, Guillermo,
Barcelona, Spain

Rabassa Magrane, Juan Jose, Barcelona, Spain
Ranasinghe, Wilson Peiris, Gampaha, Sri Lanka
Ratnayake, Senaka Banda, Colombo, Sri Lanka
Roberts, James Ian, Worksop
Robson, Edward Nairobi, Kenya
Rosser, Leonard Robert, Lancaster
Runciman, William Alan, Aranda, A.C.T. Australia
Ruplinger, Peter K., San Diego, Cal., U.S.A.
Rust, Izak C., Port Elizabeth, S. Africa
Sanchez Cabello, Antonio, Valencia, Spain
Scarratt, Kenneth, Ilford
Scharf, Walter, New York, U.S.A.
Schenk-Mayenfels, Edith, Idar-Oberstein, W. Germany
Schrader, Hans Werner, Idar-Oberstein, W. Germany
Sekkelsten, Ase M.L., Oslo, Norway
Shanmuganathan, Kandasamy, Colombo, Sri Lanka
Shaw, Sandra, Dublin, Ireland
Sims, Paul Edward, Bristol
Smith, David, London
Sojo Bruguera, Regina de, Barcelona, Spain
Southon, Carolyn Mary, Sevenoaks
Stenberg, Richard M., Springfield, Massachusetts, U.S.A.
Stevens, Eric Leslie, French's Forest, N.S.W. Australia
Stocken, Charles Galahad, Oranjemund, S.W. Africa
Such, Paul Nigel, Heswall, Cheshire
Tait, Alistir W., Edinburgh
Taylor, Alec Ewen, East Lothian
Tenenbaum, Abraham, Bne-Braq, Israel
Thuraisingham, Sangarappillai, Colombo, Sri Lanka
Turner, Alan, Ramsgate
Van Den Berge, Gerard, St. Amandsberg, Belgium
Van Der Heyden, Eveline Louise, Schoonhoven, Holland
Van Der Loo, Albert, Rotterdam, Holland
Van Haeringen, Anne Maria, Schoonhoven, Holland
Van Silburn, John, Walsall
Van Thiel, Carolina Sophia Josephina Maria, Schoonhoven, Holland
Vasudeva, Bharadwaja, Colombo, Sri Lanka
Vendrell Saz, Mario, Barcelona, Spain
Wagstaff, Karen, Newark
Watanabe, Teruo, Tokyo, Japan
Webb, Michael, Solihull
White, Angela Mary, Orpington
Winter, Colin Howard, Dorking
Wright, David, Bury
Yabsley, Anthony John, Guernsey, C.I.
Yang, Jinhua, Tokyo, Japan

COUNCIL MEETING

At a meeting of the Council of the Association held on Tuesday, 10th October, 1972, the following were elected to membership:

Fellowship

Altaba Artal, Dolores (Mrs.), Barcelona, Spain. D. 1971
Alforja Matoses, Enrique, Valencia, Spain. D. 1971
Andres Barbera, Jose, Valencia, Spain. D. 1971
Blackwell, Alan F. A., Barnehurst. D. 1972
Campbell, Alan J., Wolverhampton. D. 1972
Chapman, Ross N., Mackay, Queensland, Australia. D. 1970
Coulter, Peter, Northwich. D. 1972
Cranton, Keir, Surbiton. D. 1972
Doman, Eleanor M., Ilford. D. 1972
Finch, Stephen R. G., Cuxton, Nr. Rochester. D. 1972
Frampton, Derek N., Bognor Regis. D. 1972
Gunther, Birgit, Idar-Oberstein, W. Germany. D. 1972
Hayburn, John, Hong Kong. D. 1972
Hudspith, Thomas W., Chester-le-Street. D. 1972
Jackson, Ian, London. D. 1972
Johnstone, Sheila A. (Mrs.), Calgary, Alberta, Canada. D. 1951
Jones, Michael J. B., Sevenoaks. D. 1972
Jones, David L., Orpington. D. 1972
Lehtola, Maire (Miss), Helsinki, Finland. D. 1971
Lopez Sabater, Jose A., Valencia, Spain. D. 1971
Penny, Christopher, Frampton, Nr. Boston. D. 1972
Pschichholz, Dieter, Wurzburg, W. Germany. D. 1972
Schapiro, Simon, London. D. 1972
Scott, Annie M., Perth, Scotland. D. 1972
Watson, Philip, Rickmansworth. D. 1972
Wightman, Francis G., Nuthall, Nottingham. D. 1972
Fisher, E. W., Houston, Texas, U.S.A. D. 1972

Transfers from Ordinary Membership to Fellowship

Amarasuriya, Sunil Tissa, Idar-Obestein, W. Germany
Baker, Nancy Jane, Manotick, Ont., Canada
Bezuidenhout, Mary Elizabeth, Bloemfontein, S. Africa
Boyce, Anthony James, Doncaster
Chikayama, Yoko, Tokyo, Japan
Cook, Marion, Victoria, B.C., Canada
Del Monico, Anneliese, West Haven, Conn., U.S.A.
Eason, John Robert, Manurewa, New Zealand
Faulds, Matthew Christopher Mwamlima, London
Ferguson, Louisa, Neilston
Frampton, Derek Nigel, Bognor Regis
Gammage, Michael John Ellis, Northwood
Gans, Louis Benjamin, Amsterdam, Holland
Gargano, Frank, Rochester, N.Y., U.S.A.
Goodger, W. Donald, Don Mills, Ont., Canada
Green, Arnold, Wembley
Gunawardana, Panadure Lohakaruge Abhaya, Nugegoda, Sri Lanka
Haile, Neville Seymour, Kuala Lumpur, Malaysia
Holgate, Richard Stanley, Blackpool
Jobbins, Edward Allan, London

Jones, Claude Barrington, Northampton
Jones, Michael John Bewsey, Sevenoaks
Korevaar, Huibert Jacobus, Amsterdam, Holland
La Due, Martha J., Jenson, Kentucky, U.S.A.
Martin, John Frederick, Liberal, Kansas, U.S.A.
Needham, Brian, Ilford
Nemoto, Ki, Khartoum, Sudan
Nickel, Karin Ingrid, Los Angeles, Calif., U.S.A.
Noble, Clifford, Heckmondwike.
Ohguchi, Hideki, Kanagawa Pref., Japan
Popplewell, Wilfrid, Bristol
Runciman, William Alan, Aranda, A.C.T., Australia
Scharf, Walter, New York, N.Y., U.S.A.
Shindler, Albert, Kenton
Simons, Paul Armand, Amstelveen, Holland
Smidt, Maria Josephina Antonia, Salisbury, Rhodesia
Stevens, Peter, Harlington.
Stocken, Charles Galahad, Oranjemund, S.W. Africa
Van Den Berge, Gerard, St. Amandsberg, Belgium
Webb, Ronald John, Auckland, New Zealand
Wood, Kathleen Alice, Sheffield

ORDINARY

Alfsen, Edgar J., Sao Paulo, Brazil
Alfsen, Emmy., Sao Paulo, Brazil
Arnold, Alan P., Metairie, Calif., U.S.A.
Ayache, Nicolas, Chislehurst.
Azeez, R., Singapore
Bae, Hyung Soon, Seoul, Korea
Barclay, John, Orkney, Transvaal, S. Africa
Barnes, Clifton H. Jr., Arvada, Col., U.S.A.
Barot, Bharatkumar R., Cambay, India
Barot, Nandkishor R., Guildford.
Bingham, Brian W. W., Blackpool
Bistany, Karl J., Beirut, Lebanon
Bloom, Charles N., London
Chapman, Jennifer A., Hythe
Chiyosakabe, Ikuto, Mizuho-ku, Nagoya, Japan
Cohen, Allan A., Downsview, Ont., Canada
Cohen, Louis, Winnipeg, Manitoba, Canada
da Cruz Pecora, Alberto W., Sao Paulo, Brazil
Dabaghi, Khalil, Beirut, Lebanon
Dando, Nigel J., Bath.
Danner, Dr. Wilbert R., Vancouver, B.C., Canada
Dave, S. J., London
David, Michael, Beverley Hills, Calif., U.S.A.
Edmonds, Derek, Hove.
Egawa, Eiko (Mrs.), Camberley.
Egawa, Toshio, Camberley
Evangelides, Gary T., Johannesburg, S. Africa
French, Anthony J., Brockenhurst.
Gabrielle, Louis M., Willowdale, Ont., Canada
Gibson, Christopher A. C., Naviasha, Kenya
Glenister, David A., Johannesburg, S. Africa
Goossens, Johannes P., Durban, S. Africa
Goynshor, Frederick J., Chicago, Ill., U.S.A.
Goynshor, Richard D., Glencoe, Ill., U.S.A.
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Hallemans, Jean J., Scienz, Douvaine, France

Hattori, Sigeo, Nishi-ku, Nagoya, Japan
Hebbrecht, Julien, Gouda, Holland
Helmholz, Dr. Paolo, Valdagno, Italy
Hishinuma, Phil, S., Chicago, Ill., U.S.A.
Holmes, A. J. Jr., Lumberton, N.C., U.S.A.

Jackson, Peter J. R., Haslemere
Jones, Claude B., Northampton

Katch, Takenori, Otokuni-gun, Kyoto, Japan
Kenderdine, Fenella H., Hong Kong
Kennedy, Burton A., Charlotte, N.C., U.S.A.
Kennedy, Esther I., (Mrs.), Charlotte, N.C., U.S.A.
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Knegtmans, Charlotte, Amsterdam, Holland
Korpershoek, Hein R., Fortaleza, Brazil
Ko Yiu-Lun, Jimmy, Hong Kong
Ko Kiu Wai, Richard, Hong Kong
Kraeff, Alexander, Ankara, Turkey
Kuriyama, Kazuo, Shinjuku-ku, Tokyo, Japan

Le Prou, Edmond E., Te Puke, N. Island, N. Zealand
Levy, Morris, London

MacDonnell, Mark L., Otterton
MacDonnell, Pamela J., Otterton
McLean, John, Vaal Reef, W. Transvaal, S. Africa
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Margolis, Yetta R. (Mrs.), Surfers Paradise, Queensland, Australia
Maynard, Anthony M., Beverley Hills, N.S.W., Australia
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Muris, Simon C., London

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Nakagawa, Yoshio, Abenoku, Osaka, Japan
Nakai, Keiji, Minami-ku, Osaka, Japan
Nakaniwa, Shoichi, Kita-ku, Osaka, Japan
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Norioka, Shigeaki, Nada, Kobe, Japan

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Robson, Edward R., Nairobi, Kenya
Rossiter, Alison J., Clevedon, Som.
Rowe, Leonard J., Hanworth, Middx

Saladin, Stephan C., Lucerne, Switzerland
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Shimizu, Yoshihiro, Nishinomiya, Japan

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Ishida, Toyoaki, Taito-ku, Tokyo, Japan
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Yajima, Yoshitaka, Chuo Ueda City, Japan
Yamashina, Toshio, Neyagawa City, Osaka, Japan
Yamauchi, Kaname, Amagasaki, Osaka, Japan

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