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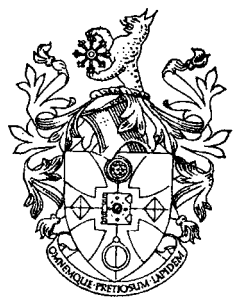

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SAUSSURITE AS A JADE SIMULANT*

By E. A. JOBBINS, B.Sc., F.G.A. and E. H. RUTLAND, Ph.D., F.G.A.

SIX carvings in an attractive green material, often with white and brown areas, have been examined by the authors during the past two years at the Institute of Geological Sciences, London. Reports of similar items from the gem-testing laboratories in London, New York and Los Angeles indicate that more pieces are on the market. Some have been purchased in Hong Kong or China as jade or 'new jade', but the yellowish cast of some and the unusual colour distribution raised doubts as to their identity. However, there is usually an overall resemblance to either or both the jade minerals.

All the carvings have been in the Chinese tradition and traces of green chromic oxide still present in cracks and grooves suggest that they are of recent manufacture. The surface finish of most objects has been smooth and without the slightly textured or dimpled appearance characteristic of many older jade carvings. This suggests polishing by diamond (or possibly one of the harder carbide abrasives), which cuts through the slight differences in hardness between differently orientated component mineral grains; the older and softer abrasives often accentuated these slight variations in hardness.

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Brief descriptions are given below of the carvings examined and, although it is realized that words are no substitute for personal examination or photographs, it is hoped that these notes will help the majority of readers who will not be able to see the specimens but who may be faced with the difficult task of assessing similar material.

Carving A: bird and flower group: several shades of medium green mottled with white. Some parts resemble 'spinach' nephrite jade (see photograph) but the head of the bird (mottled white with green) resembles certain jadeite jades from Burma.

Carving B: bird (goose-like): brown head and neck, brownish-green front part of body, with shades of green to pale green rear of body. The green shades are seen in jade but the browns are unusual.

Carving C: vase with foliage: mostly creamy-white, but with some streaked green and dark green areas.

Carving D: elephant: greyish-white with medium to dark green areas.

Carving E: bird and foliage: pale yellowish-green to dark green.

Carving F: 'leaf dish': streaked white, medium green and dark brown.

It will be noted (see the 'Summary of Determinative Work' on p. 3) that refractive index determinations have been omitted from the tables; they were attempted by the distant vision ('Lester Benson') method, but because of the shapes of the objects and the difficulty of positioning them on the refractometer, consistent readings were not easy to obtain. In general, figures around 1·55–1·56 for the white areas and 1·68–1·70 for the darker areas were observed, but they were not felt to be reliable and are only given as a guide. There was not normally sufficient material to carry out both x-ray powder work and refractive index determinations by the immersion method. However, in the case of specimen A it was possible to confirm the presence of a mineral with R.I. near 1·701, with a birefringence in the region of 0·005–0·009 and straight extinction, and these properties agree broadly with orthozoisite. Other grains of lower index were present, but no albite twinning characteristic of many plagioclase feldspars was seen in the scrapings examined.

SUMMARY OF DETERMINATIVE WORK

Specimen / *Dimensions*	*S.G.*	*Hardness*	*Absorption Spectrum*	*U.V. Fluorescence**	*X-ray Diffraction Results (with film numbers)*	*Notes*
A 22 cm high	3·06	White areas ~6 Green areas ~5	General absorption of blue/violet	Deep brownish	White area (X6805): major Ca-rich plagioclase, zoisite and minor quartz. Green area (X6806): major Ca-rich plagioclase, major diopside, zoisite, minor quartz	Saussurite, probably with significant proportions of parent gabbroic rock
B 9·2 cm high	2·94	>6 <7	Brighter green areas show Cr lines in red; general absorption of blue/violet	None seen	Brownish green/green areas (X6807): major Ca-rich plagioclase, minor quartz. Brown areas (X6730, X6807A): major Ca-rich plagioclase	Films show dominant Ca-rich plagioclase (max. S.G. 2·76) but S.G. is 2·94 so denser minerals must be present
C ca. 15 cm high	3·07	White areas >6 <7 Green areas (variable) >5 <7	Not distinctive	Whitish areas may show creamy-white to dull pink; dark areas inert	(X6351, X6351A): both show zoisite with some Ca-rich plagioclase	Saussurite
D ca. 10 cm long	2·88	Variable >5 <7	Not distinctive	None seen		Rounded, highly polished surface: removal of material for testing difficult. Probably saussurite
E ca. 22 cm high	2·85	>6 <7	Line in deep violet	Pale green areas show greyish; dark areas inert	(X6678): Ca-rich plagioclase and zoisite	Saussurite
F 14·5 cm long	2·91	>6 <7	Brighter green areas show Cr lines in red; darker areas show some absorption of blue/violet	Whitish areas fluoresce pale-buff; dark areas inert	White/greenish area (X6809): Ca-rich plagioclase, major zoisite. Brownish area (X6808): major Ca-rich plagioclase	Saussurite
Saussurite	3·06	>6 <7	Not distinctive	Buff fluorescence	(X6830): major zoisite, clino-enstatite	Saussurite, Pen Voose, Lizard, Cornwall. IGS registered number MI 32922
Saussurite	3·22	>6 <7	Not distinctive	Inert	(X6829): major diopside, zoisite, minor chlorite	Saussurite, Swiss Alps. IGS registered number MI 23044
Jadeite (typical)	3·33	6½–7	Usually a line at 4375Å (blue/violet); Cr lines in red in bright green varieties	Paler colours often show whitish fluorescence		Often shows fibrous/granular appearance on or just below the surface
Nephrite (typical)	2·8–3·05	6½ but sometimes as low as 5	Indistinct lines may be seen at 6890Å (red), 5090Å (green), 4900Å and 4600Å (blue)	Inert		

*Long wave (3650Å) results, short wave (2357Å) much reduced or inert.

It will be seen that the 'common denominator' minerals in the new material are a calcium-rich plagioclase and, almost always, a zoisite (of the ortho type). This association is similar to that described for saussurite, save that the plagioclase here seems to be rather more towards the calcic end of the plagioclase series than the sodic or albite end which was normally found in saussurites as previously described.

The history of saussurite started in 1780 when H. B. de Saussure described a green material found near the Lake of Geneva. At first he took it to be jade but, as more material of the same kind was found, differences became apparent. Other mineralogists advocated names such as Swiss jade, bitterstein and lemanite (after Lac Leman), but in 1806 his son, N. Th. de Saussure, named it in honour of his father, the discoverer, and this name prevailed. During the nineteenth century the rock was found in Silesia and Bavaria, Styria and Tirol, Switzerland (including some neolithic artefacts from lakeside dwellings, proving that saussurite has been carved for some thousands of years), France, Norway and Turkestan. In the U.K. saussurite was found in Ayrshire, on the island of Unst, Shetland, and at the Lizard, Cornwall; in the U.S.A. in Shasta County, California.

De Saussure had described a material with a hardness of $6\frac{1}{2}$–7 and a density of 3·261. The other localities provided data markedly different and the reason for the differences was found to lie in variations in the composition of the material. T. S. Hunt first recognized its close relation to zoisite in 1858; Cathrein and others showed that various accessory minerals were always present and that saussurite was therefore a rock and not a single mineral (which incidentally is true also of all but the purest jadeites). Though zoisite and plagioclase are the two main constituents, different saussurites usually also contain other minerals, notably epidote, garnet, natrolite, quartz and scapolite. The minerals are usually associated in a fine-grained aggregate and form a tough compact rock, often with a splintery fracture. Some fifty analyses made mainly during the late nineteenth century show very wide variations in composition, viz: SiO_2, 36–65%; Al_2O_3, 17–32%; CaO, 2–32%;

LEFT: 'Saussurite' carving (A); the green areas contain major diopside and are partly composed of the parent gabbroic rock.

BOTTOM RIGHT: 'Saussurite' carving (A); compared with 'spinach' green nephrite jade.

TOP RIGHT: Carving (B); shows as dominant calcic-rich plagioclase by x-ray methods; the presence of zoisite is suspected but not confirmed.

MgO, 0·2–6%; Na_2O, 0–10%; together with minor Fe_2O_3, FeO, K_2O and H_2O. The density range in these analyses is 2·95 to 3·41, but one specimen from Wildschonau in the Tirol went as low as 2·66.

Of the specimens described, C, E and F fall reasonably well into the saussurite bracket, and from its appearance and known properties specimen D can probably be included here also. Specimen A contains diopside as a major constituent with the calcic plagioclase and it is felt that in this case significant proportions of the unaltered or parent rock are present; this rock is certainly very basic, and may be said to have gabbroic affinities. Alteration (probably hydrothermal) of rocks of this type may initially produce lime-bearing solutions from the calcic plagioclase (anorthite), and these solutions will then react with further anorthite to produce zoisite and a more sodic plagioclase. The reaction has been expressed thus:

$$3CaAl_2Si_2O_8 + Ca(OH)_2 \leftrightharpoons 2Ca_2Al_3Si_3O_{12}OH$$
anorthite (plagioclase) + lime $\rightleftharpoons$ zoisite

but this is probably only part of the story. The albite found in many saussurites may arise as a residuum from the original sodic/calcic plagioclase, when the calcic elements have been removed as illustrated above.

Specimen B is dominantly a calcic plagioclase on the evidence of the x-ray results, but the specific gravity is much too high for a monominerallic plagioclase rock (maximum S.G. 2·76 for pure anorthite) and denser mineral(s) must be present. Zoisite (S.G. 3·25) does not appear to show up well in x-ray powder photographs of saussurite, and this may be part of the reason for its not being detected, *or* the scrapings (from 3 areas) may all have missed zoisite(or other mineral)-bearing areas.

The nomenclature of these new materials is not always easy. Save for the doubts on specimen B (and to a less extent A) they are all composed of dominant or very significant proportions of 'saussurite' and may reasonably be so described. Specimen A is apparently a saussurite/gabbroic rock type in a state of partial alteration, whereas specimens C – F are nearer the end product. All stages of alteration are possible, and it is certainly not desirable to propose a new name for a material of so variable a composition. It is probably best to include specimen A within the 'sack-term' saussurite. The new material is not related to either of the jade minerals, and should certainly *not* be described as 'new jade' or indeed any other name including 'jade'.

It is realized that the testing of these objects has involved the use of highly sophisticated instruments and methods not normally available outside specialized laboratories or university departments, and that the material will create problems in the future for many gemmologists and dealers. The generally lower S.G. and the absence of the characteristic fibrous/granular structure of jadeite surfaces or sub-surfaces will normally distinguish it from that mineral. However, the S.G. does overlap the nephrite range, as does the hardness although saussurite is often more variable in hardness from place to place than is nephrite; neither has any very characteristic absorption spectra. The new material is often streaked, and has a metamorphic aspect, which is less common (but not unknown) in nephrite. If a material resembles nephrite in one area and jadeite in another then the reader should be cautious and suspect saussurite. In all cases of doubt it is recommended that the specimen be tested by a laboratory having access to x-ray diffraction methods *and* the expertise to remove material for examination without disfiguring the object.

The authors gratefully acknowledge assistance from colleagues in the Petrographical Department at the Institute of Geological Sciences without whose co-operation this work could not have been completed; they also thank Mrs. D. Cliffe, Messrs. W. Barrett & Son Ltd and Harrods for the loan of specimens, and Mr. R. Webster for bibliographic details and discussion.

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THE EMERALD OCCURRENCE OF MIKU, ZAMBIA

By PROFESSOR DR HERMANN BANK, F.G.A.

IN the Journal of Gemmology, Vol. 13, No. 5, pp. 169-179, I. C. C. Campbell gives an interesting account of emeralds which are reported 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 . . . the exact location cannot be given. . . Information has been received that one origin of emerald is Miku, Zambia."

When the writer read this article he remembered that he had seen and examined emeralds from Zambia some years ago; that some of these stones had also been cut and evaluated by his firm. However, he was not allowed at that time to give any details of the mine or even to publish. He therefore wrote now to Zambia and readily obtained(1) a report by A. C. Hickman on the Miku emerald deposit which had been published in 1972 by the Ministry of Mines and Mining Development of Zambia in Lusaka and he therefore now feels free to summarize his experience together with the said report.

Geographical and geological situation

The locality map (Fig. 1) shows that Miku(2) is a river entering the Kafubu river, indeed in the Kitwe district of Northern Zambia. The deposit is called the Miku emerald deposit (sometimes also the Kafubu emerald deposit). It is situated south-west of the copper-belt, SW of Kitwe and WNW of Luanshya at longitude 28° 03′ 30″ E and latitude 13° 04′ 01″ S. It lies immediately south of the Miku stream very close to its confluence with the Kafubu river. The best way to go there takes 50 miles from Kitwe along the St Mary's Mission Road. The shorter way is only 27 miles, but it cannot be used in the rainy season.

Geologically speaking the region belongs to the basement complex of gneiss and foliated granite, garnet-kyanite and staurolite-bearing schist, quartzite, talc-magnetite schist, amphibole schist and quartz-mica schist in which pegmatites (quartz-feldspar-muscovite-tourmaline) and veins with quartz-tourmaline occur. According to Hickman (1972) the occurrence lies in an east-west striking band

(1) Many thanks to Mr. E. K. Horden, Lusaka, for sending the report.

(2) The exact locality has already been mentioned by the author at the International Gemmological Conference at Vitznau, Switzerland, in September 1972.

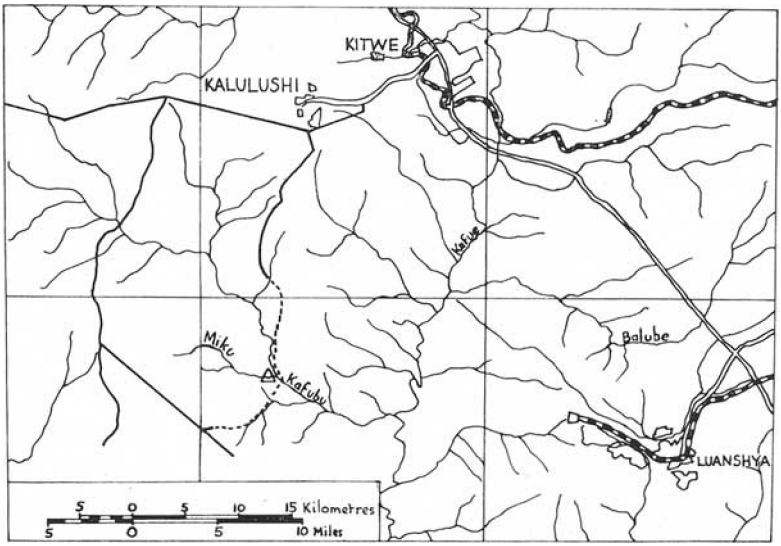

FIG. 1. Locality map showing position of the Miku emerald deposit.

of talc-chlorite-amphibole-magnetite schist, which is almost certainly the metamorphic derivate of an ultra-basic igneous(3) rock (intercalated with metasediments of pre-Katangan age). This schist is easily weathered and then brown, green or red in colour.

The talc-magnetite schist (here also often called country-rock) consists of magnetite (5 to locally 15% of the rock; according to x-ray fluorescence analysis the magnetite contains Cr^{3+} substituting for Fe^{3+}), talc and chlorite; these two minerals form a felty intergrowth containing amphibole (tremolite/actinolite). The schistosity of the rock varies; it is rarely strong, sometimes not even visible.

To the geographic south a sequence of low-grade amphibolitic and quartz-mica schist can be noted, occasionally with sericitic quartzites. To the geographic north a major quartzite crops out (locally called "Muva quartzite"), an almost monomineralic coarsely recrystallized quartzite with veins of quartz, veinlets of iron ore and pods of tourmaline. Further to the north foliated granites, gneisses, and garnet-kyanite or staurolite-bearing quartz mica schists can be observed.

The granites and gneisses consist of quartz, microcline, sodic plagioclase, biotite, and muscovite. Sometimes there is to be seen

(3) The igneous origin is deduced from the composition and the presence of trace amounts of chromium and nickel (proved by x-ray fluorescence) according to a communication from Matheson to Hickman.

a "greisen"-formation and boron metasomatism which results in quartz-tourmaline veins and in disseminated tourmaline in the schists. Geological mapping has also discovered simple pegmatites near the Kafubu river.

Regarding the *tectonic* situation we can say that the area belongs to the southern limb of a pre-Lufilian antiform which is probably overturned to the south. Regional Lufilian refolding has produced north-westerly shearing and is also responsible for the fracturing of many minerals including the emerald (which has probably been produced by mineralizing fluids from pre-Katangan granitization). Since the effects of these movements (folding, shearing, etc.) are widespread it seems unlikely that there are any deposits with unfractured emerald crystals in this region.

The deposit of emeralds, called the Miku-deposit.

Soon after G. J. Baker (1931) had discovered the emerald occurrence as a geologist of the Congo Border Concession Co. he also gave the first report on the Miku emerald deposit. Baker (1931) thought that the deposit was not of sufficient size to be considered as a source of beryl and that it was only a very doubtful prospect as an emerald mine because all the emeralds were fractured. Brock (1940) summarized the work of the Rhokana Concession Geologists (the Company's prospecting licence expiring in 1941) and came to

FIG. 2. Miku Emerald Deposit.

the same conclusion as Baker (1931). In 1953 Rio Tinto Finance and Exploration Co. Ltd acquired the rights. Sharpe (n.d. 1964) described the character of the deposit and Rio Tinto Finance . . . pegged a claim in 1962. Miku Enterprises Ltd purchased the claim some years later and some exploration work was done. Initially trenching was carried out together with field mapping and geographical and geochemical techniques. This led to the discovery of an area of coincident magnetic and beryllium anomalies.

The geological and geochemical field-work was carried out by Hickman; the geophysical measurements were made by Mazac and Hickman. The writer obtained some of the material for gemmological studies, cutting and evaluation. The emeralds occur mainly in a rock which consists almost entirely of biotite/phlogopite (the optical properties are midway between biotite and phlogopite) in which also small crystals of tourmaline of 0·02-0·03 mm are found. Between the host rock and the country rock there is sometimes a transition zone consisting of tourmaline, phlogopite, tremolite, actinolite, and pseudomorphoses of talc after amphibole.

When unweathered, the host rock is deep brown; where chlorite is present, it has a greenish tinge. It can be (1) fine-grained massive, containing the best emeralds, (2) coarser massive or schistose and very coarse (with only few emeralds), or (3) veins of phlogopite. "Knots" of several inches in diameter, in which coarse biotite has grown concentrically, occur singly or in groups and are sometimes associated with the veins. These varieties are not systematically distributed; the more finely grained rock is more common in the northern part of the deposit. Between the host rock and the transition zone chlorite and talc can be found and tourmalines sometimes occur as "suns" in the transition rock. A drillhole showed the distribution in the depth:

57–67 feet: a green talc-magnetite schist
67–72 ,, a green talcose sludge
72–93 ,, a grey to dark-grey quartz-amphibole-chlorite schist with fine veinlets of quartz
93–94 ,, fragments of vein-quartz and tourmaline associated with phlogopite/biotite
94–111 ,, a grey quartz-amphibole-chlorite schist.

In *geophysical* context Hickman is of the opinion that since chromium is essential for the formation of emerald it is necessary to find out the extent of the only rock in which chromium has been

traced: the talc-chlorite-magnetite schist. This schist is easily detectable because of its high magnetic susceptibility compared with the other rocks of the region which have a low magnetic susceptibility.

From the *geochemical* aspect there are various good prospecting methods of beryl, since beryllium is a relatively immobile element in secondary geochemical dispersion. A well-defined Be-anomaly with a peak has been discovered.

Crystallization

The emeralds occur (mainly in the fine-grained phlogopite/biotite rock) generally as single crystals of the hexagonal system with prism, pinacoid and bipyramids. They range in size from microscopic dimensions up to two inches in length. Clusters or parallel crystals are found rarely.

Colour

There are beryls of a milky-white colour, pale green beryls and very nice green emeralds. Some of these have the greenish-yellowish tint of Sandawana emeralds (from Rhodesia), some have colours like Colombian emeralds.

Chemical composition

Hesom analysed a purified sample. The Table below shows the result in comparison to Sandawana.

	Miku Hesom, W. G. (in Hickman 1972)	*Sandawana* (acc. to Martin 1962)
SiO_2	62·23%	63·84%
Al_2O_3	15·41	18·06
Cr_2O_3	0·33	0·60
Fe_2O_3	0·04	—
FeO	0·07	0·30
BeO	11·90	13·28
MuO (probably MnO)	0·02	
MgO	0·76	0·75
CaO	0·31	
Na_2O	2·63	2·03
K_2O	2·89	0·05
Li_2O	NIL	0·10
Cs_2O	traces	
H_2O+	2·59	1·07
H_2O-	0·06	—
	99·24	100·08

A spectrographic analysis (Matheson, pers. comm.) showed traces of rubidium, nickel and zinc.

Refraction of light, birefringence, specific gravity

Hickman (1972) mentions optical data supplied by Matheson—refractive indices

$$n_\varepsilon = 1{\cdot}581 \qquad n_\omega = 1{\cdot}585$$

with a very small birefringence of 0·004: optical character, negative. With gemmological equipment Campbell (1973) found a higher birefringence and higher refractive indices—

$$n_\varepsilon = 1{\cdot}581 \qquad n_\omega = 1{\cdot}588$$
$$n_\varepsilon = 1{\cdot}583 \qquad n_\omega = 1{\cdot}590$$

birefringence 0·007 (negative),

and Anderson (1969) already mentioned Zambian emerald—

$$n_\varepsilon = 1{\cdot}581 \qquad n_\omega = 1.588$$

The writer found partly also a somewhat higher birefringence which he published at the Vitznau International Gemmological Conference—

$n_\varepsilon = 1{\cdot}580$	$n_\omega = 1{\cdot}590$	$n_\varepsilon - n_\omega = 0{\cdot}010$
$n_\varepsilon = 1{\cdot}581$	$n_\omega = 1{\cdot}590$	$n_\varepsilon - n_\omega = 0{\cdot}009$
$n_\varepsilon = 1{\cdot}580$	$n_\omega = 1{\cdot}589$	$n_\varepsilon - n_\omega = 0{\cdot}009$
$n_\varepsilon = 1{\cdot}581$	$n_\omega = 1{\cdot}589$	$n_\varepsilon - n_\omega = 0{\cdot}008$

The Specific gravity is given by

Hickman (1972) as—	2·71 g/cm³
Campbell (1973)	2·74-2·76 g/cm³
Anderson (1969)	2·75 g/cm³
the writer	2·74 ±0·002 g/cm³

Inclusions

Hickman (1972) mentions small flakes of biotite/phlogopite which occur in abundance.

According to Campbell (1973) five types of inclusions are evident in these emeralds supposed to come from Zambia:

1. black biotites in the form of irregularly shaped specks, dots, etc.
2. "bread-crumb"-type inclusions
3. mica or a mineral similar in appearance
4. extremely fine pin-point inclusions giving a cloudy or milky appearance
5. in some stones, feathers.

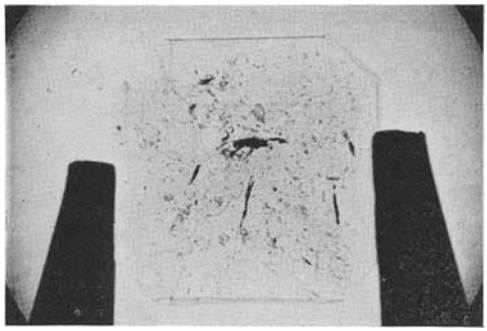

FIG. 3. Biotite/phlogopite inclusions in Miku emerald.

Fig. 3 shows nice biotite/phlogopite inclusions as seen by the writer.

Mineralization

Two aspects of the mineralization are of particular interest—(*a*) the origin of the various elements (especially the minor ones) and (*b*) the emplacement of the tourmalinite vein. Around the deposit there is a widespread occurrence of tourmaline (as a monomineralic rock, together with vein-quartz or disseminated in the country-rock). There is evidence of pegmatitic or pneumatolytic activity (beryllium and lithium). The presence of beryllium and boron and the numerous quartz deposits are a good indication for a pneumatolytic origin of the deposit. Gold is also present which presumably is also of pneumatolytic origin.

The country rock consists of talc $Mg_3[(OH)_2 \mid Si_4O_{10}]$, chlorite (Mg, Al, Fe) $\pi_{12}[(Si, Al)_8 O_{20} (OH)_{16}]$, amphibole (actinolitetremolite) $Ca_2(Mg, Fe)_5[(OH, F) \mid Si_4O_{11}]_2$, magnetite $Fe_3 O_4$, and also contains chromium. The formation of phlogopite $KMg_3[(F, OH)_2 \mid Al\ Si_3O_{10}]$, biotite $K(Mg, Fe, Mn)_3[(OH, F)_2 \mid AlSi_3O_{10}]$, and beryl $Al_2Be_3[Si_6O_{18}]$, required the introduction of potash (K) and beryllium (Be) respectively. The formation of tourmaline needed boron (B) and sodium (Na). The small amount of chromium (Cr) necessary to produce emerald out of beryl was present in the country rock.

The absence of gradational boundaries to the vein and its cross-cutting mode of occurrence indicate that it originated by crystallization from fluids in a fissure. Residual fluids containing

some boron as well as beryllium, sodium and potash produced the emerald-rich mica-bearing rock.

Hickman (1972) compares Miku with some other emerald deposits and states that with two exceptions (Colombia and Brazil)(4) the country rocks of all important occurrences include ultrabasic rocks or their metamorphic derivates. All deposits also show evidence of pegmatitic activity. So also at Miku the characteristic factors are present:

1. ultrabasic rocks to provide the vital chromium for the colour
2. granitic activity to contribute the beryllium-bearing residual fluids.

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(4) In Brazil only the old occurrence Bom Jesus dos Meiras (Brumado) is different; the other occurrences (Santana de Ferros, Vittoria da Conquista and especially Carnaiba, etc.) are of the same type as described here.

AN APPETITE FOR GEMMOLOGY

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

OBVIOUSLY a pun is expected from such a title, but none was intended. However, one can safely say that none go hungry in our laboratory gemmologically speaking.

Since our move from 15 Hatton Garden to 36 Greville Street much has happened. The Laboratory, which was nurtured and brought from its early beginnings in 1925 to its prominence under the guidance and leadership of B. W. Anderson, has been a landmark in Hatton Garden for a long time.

The wind of change which has blown through Hatton Garden since the redevelopment project of the Gamage building has caused a lot of firms to move and start a desperate hunt for suitable premises —not least among these being our own laboratory, which although not part of the large Gamage site was unfortunate enough to become a separate redevelopment problem at the same time. Despite many fancy ideas, it seemed (and is) imperative that the Laboratory remains in Hatton Garden in or near the centre.

We were to have a series of small crises one after another in this my first nine months in charge of the Laboratory. As well as feeling rather shorn lambs in the untempered wind following Mr. Anderson's retirement we were beset by difficulties of staff shortage. Following the Trade Descriptions Act many small businesses in Great Britain unearthed their little bits and pieces and we were inundated with a never-ending flow of jewellery items consisting often of colourless cluster surrounds to coloured centres in rings, earrings and brooches.

Most were nearly enclosed at the back; almost all were filthy and needed cleaning thoroughly; and it was insufficient to state that they were not diamonds. One had laboriously and messily to immerse, fluoresce, phosphoresce, cross-filter, absorb, float and in fact—short of filing the table facets with a diamond file—do every tetchy type of test beloved of book gemmologists but abhorred by trade gemmologists.

With this plentiful supply of testing and a somewhat new staff we had to keep looking at premises which might be a possibility. We drew plans of layouts to fit the various places we hoped to have and tried desperately to shed ourselves of 50% of our possessions to squeeze our 950 sq. feet of laboratory space into a tight 350 sq. feet

in a prestige position. Good friends offered to store some of our mineral collections and I had my eye on a rather nice early Victorian glazed bookcase should the necessity arise! However, fate took a turn and we were not to be squeezed up on the third floor but spread a little in the lower ground floor of our present abode. The bookcase, alas, still graces our laboratory!

Having finally found and decided upon new premises we then had to interview new potential staff, since one of our recent lads was leaving. So there we were—a move imminent, lots of gemmology awaiting practised hands, and a very new young man to help us. Alan Clewlow is our most recent addition. A B.Sc. (geochemistry) from University College, he started his career with us the hard way, on the day of our move. At least, having taken part physically in the moving and setting up, he knows where things are right from the start.

When we moved, we had about 35 tea chests full of equipment apart from the obvious items of furniture. We had a separate heavy lifting section of the removal people to handle the x-ray set, which is lead-clad for safety. Another firm lowered a new safe down through the pavement lights, while the x-ray was trundled up the old staircase and down the other. The new premises were still being cleaned, decorated, plumbed and rewired as the apparatus flowed down the stairs in a seemingly never-ending stream. It all had to be done at once because of the demands on the services of our very reliable firms of builders and electricians; everyone else on the move wanted them. We moved within seven days of the termination of our lease—a chirpy young lady representing the developers brightly told me I was entitled to stay till midnight of 25th December! It was a tight situation, hardly improved by a fluey cold which worsened daily.

We stripped our old laboratory of everything, much of which had been built over a long period, such as panels of switches for specialist items, transformers, rheostats, many representing the work of Robert Webster, who in his day was our electrician, bookkeeper and, of course, gemmologist. Standing alone in the echoing silence of the old lab., checking that everything had been taken, I looked around at the emptiness, at the marks where apparatus had stood, the stains on the floor, the scars of movement, a rectangle of shiny floor space which had so recently supported my desk. The banisters and sides of the staircase had been removed somewhat

hastily to allow the x-ray set to be lifted through. It looked a battlefield, and just around the corner in Greville Street was waiting a whole lot of items and pressing problems, gas men, electricians, carpenters, all saying, "where shall I put this, where do you want that, do you want a plug here, where is the dark room to be?", etc., etc.

We did manage to unpack nearly all of the boxes; we did get the x-ray set in place and working; we did set up our absorption bench, our pearl table and various benches for general work; and we did make mistakes. By and large though, we have used our past experience to good purpose and I feel the Laboratory in its new habitat with newer staff presents itself ready to tackle the new era of gemmology. It is no use harking back upon the theme of the old days of the Laboratory, for that is an era which will never occur again. We still do very similar work and have even improved our method of record keeping. The amount of work has increased and we are not yet fully staffed and so our day is really full, so much so that I doubt if ever again will a flood of written items flow from this Laboratory. However, we do still have our items of interest which I hope to be able to write up from time to time.

With a new assistant to teach and help I find I am now looking anew at stones which I might have passed by quickly in normal testing time, but now of necessity I am doing my practical gemmology over again and physically leaving no stone unturned! We had a peculiar little stone recently, not at all difficult to test but intriguing because it seemed a wasted effort. It was a composite stone—a rectangular green stone in a ring. The table had a sharp clear reading of 1·52 (glass), a layer of colour in the middle and glass below; it seemed a lot of trouble for the end result. We have had at least two other composite stones recently; both have been beryl on beryl composites with a green layer between. The refractive indices have been fairly high and the top layer clear and colourless, the lower portion being full of inclusions. These stones were green when viewed through the Chelsea filter and had an organic dye-stuff broad band in the red end of their spectrum. Another interesting item was a four-stone half-hoop ring of colourless stones; three were yttrium aluminates giving a violet fluorescence under x-ray excitation and refractive index of 1·835, with one end stone glass with an R.I. of 1·56. Another was a colourless three-stone ring with a centre marquise flanked by a brilliant-cut

stone at each side; all were yttrium aluminates. An interesting fact noticed on a green yttrium aluminate was that despite using only 1·81 liquid on the diamond refractometer we saw a reading at 1·835.

Another interesting stone was a pleasant yellow orthoclase which gave refractive indices 1·522–1·527 and had diffuse broadish bands in the blue end of the spectrum.

The spectroscope is one of our most regularly used instruments —it is so manœuverable and gives results on cut, rough, large and small-sized stones. Explaining to our newest recruit the method of approach to testing a diamond for irradiated colour, I stressed x-ray fluorescence, absorption spectra and long and short wave effects together with crossed-filter work. As I was talking a customer brought in a cinnamon-coloured diamond in a ring. Here was a practical test with which to demonstrate the facts as taught. The stone behaved impeccably. It gave a blue fluorescence under x-ray excitation. The absorption spectrum showed two faint lines at 5040 and 4980Å. Between crossed filters it glowed a straw to yellow brown. Inspection in methylene iodide revealed zoning bands.

Tests seem to run in groups for we had a series mostly of yellow to brown diamonds set in cluster rings to test in a short space of time. Together with these we had a loose pale unhappy green-hued diamond. This looked to be an old-fashioned radium-treated stone. Inspection revealed an elusive but nevertheless discernible line at 4155Å—a Cape stone! X-ray fluorescence was chalky blue, but the stone was inert between crossed filters. We decided to check the stone overnight on a film. The stone under test and a known comparison stone were both placed on a strip of film, and left in a light-tight box overnight in the safe. We were all very pleased to see a good strong autoradiograph fogging the film next morning. The stone under test gave a stronger outline than our known example.

SALMANAS' *METHOD* AND OTHER GREEK FORMULAE FOR THE CARE AND MANUFACTURE OF PEARLS

By P. G. MAXWELL-STUART, M.A.

AMONG the Greek texts which M. Berthelot collected together under the general title of *Collection des Anciens Alchimistes Grecs* (Paris 1888) is a short essay attributed to an Arab technologist Salmanas, otherwise unknown to us, which is remarkably free from much of the mumbo-jumbo and downright nonsense which disfigure the work of many of the Greek chemists and alchemic practitioners. It may be of interest to compare this with other recipes for the care of pearls belonging to anonymous authors of much the same period, whose work is contained in manuscripts of the early Middle Ages, but whose wisdom may have come from earlier experience. As far as I am aware, none of them has been translated before into English.

The methods they describe are somewhat surprising to any trained scientist. They appear to have used a number of weak acids which would have been capable of dissolving much of the pearls' surface dirt, but they threw in so much other junk (if that is the correct word) that what they probably achieved was a coating of the pearl with a white compound. Similarly, where they claim to have made pearls it is more likely that a crystal of some white salt or other had been formed by their efforts. If someone had time and laboratory space, however, it would be interesting to see what resulted from some of these experiments.

I. SALMANAS: METHOD OF MAKING A ROUND PEARL

1. Take very fine crystals, put them in a glass jar, and pour in citrus juice so that they are quite covered. On top of this liquid scatter a small quantity of (powdered?)(1) *Ulva Lactuca* which has been roasted and pulverized. Next, seal it up; carefully smear the stopper with the clay you have prepared. Hang up this jar so that it can be heated by the hottest rays of the sun for a whole day. Each hour take the jar and shake it vigorously so that the granules inside are shaken up too. Next day remove the stopper and filter the liquid, taking care not to spill the compound which has resulted

1. A question mark after a word in brackets means that the Greek is not clear. Much of the language used is technical and of course we no longer employ these techniques.

from these granules. Put another similar liquid into the jar and do the same thing over again. Repeat the operation a third time. When you see that the crystalline matter has expanded and absorbed the liquid, pour on top another liquid exactly the same. After the granules have dissolved completely and formed a single compound, take the compound and put it into a strainer. Fill this with (distilled?) water, shake up the two together, and then leave the water to settle for an hour. Filter it carefully once more and repeat all this several times until the sharp taste of citrus juice has completely disappeared.

2. Now take this compound and put it into a little glass dish. Cover this dish with another which has a wider rim so that the mouth of the larger envelopes that of the dish underneath. The upper dish should have a hole on top to allow the moisture in the compound to evaporate. This hole must be overlaid with a loose-meshed cloth called *Charerion.*(2) Put it all out in the hottest hours of the sun and when the compound has dried out keep it carefully.

3. Take 1lb mercury and some (ammonium chloride?) prepared with lime; pound it up for 2, 3, 5, or 7 days. When it is dried out sublimate and purify it. Once this compound is dry take ½lb of it and mix it with 1lb mercury. Pound it carefully until all the mercury has disappeared, that is to say, has been absorbed. Now retract the preparation into glass jars above a low fire until you see it become white like snow. Next, take 4 parts of the dry crystalline compound and 6 parts of the mercury compound and mix everything together in a dish of thick glass. Crush and grind it well with a glass pestle; moisten it with the white juice of the plant *Zocaron.*(3) Let the leaven become thick like dough: grind it up well and with care. Take as much of this leaven as you need, put it into a white silk straining-cloth and make from it pellets of the thickness you want. The implements you will need for making up the pellets are a silver pestle, silver tongs, and silver finger-stalls. Make up your pellets with these, but be very careful that your hand does not touch them—do not even sweat—in case the dust (of chloride of mercury) touches you. It is poisonous and it turns dark and becomes useless.

2. From *khárá*, Persian, a strong silk cloth.
3. We do not know what this plant is. The name may be a coinage of the author, since it does not appear elsewhere. Cyranides, a lapidary of the 1st or 2nd century A.D. uses the word *zocros* to refer to a kind of white vulture, but I doubt whether there is any etymological connexion between the two words.

Next, boil the silk cloth and wrap the pellets in pieces of white silk which have been rubbed with grease. Put each of these pellets into a jar, shake it so that they gently roll around for quite a while. When you see that the pellets have become fine and round, pierce them with a silver wire, and after you have done this shake them up again in the jar.

4. After that take some *zocara* and put them on to a clean plate. Make some astringent solution and sprinkle it on the fleshy part of the plants. These will shrink because of the astringency and will throw off viscous matter. Take a small quantity of this and pour it into a jar; roll each of the round pellets in it. Furnish each of them with a silver wire and use it to retrieve them adroitly. Take a strainer (sometimes known as a sieve); make fine holes in it and fix to these holes, from the inside, the wires which support the round pellets. Now take another sieve, fit it to the first, and fill it with cotton which you must press down lightly and spread all round. Take the jar which contains the pearls, place them inside this sieve, and let them dry there for ten days. Finally, put each pellet into a glass jar the shape of a drinking-bowl. Roll them around in it until you hear that they sound like stones. Then give them some shine in the same way as lapidaries do their stones.

5. Take some pool or river fish, the same size or smaller than tunny; split them on the left side and remove their entrails. Wash well the cavity which is left so that no blood remains behind. Then take the large intestine, make a hole in it, insert some powdered nitron, use water to start off a reaction, and then leave it for one hour. Wash the intestines well with this nitron and rub them with your hand. Next, wash them in water and when you have done that take the aforementioned pellets, insert them one by one into the intestine, and attach them by means of a silk thread which has been boiled in water. Fix each pellet by means of its own thread. Put the intestines with their pellets into the hollow bellies of the fish; cover up the split skin with silk and put the whole thing on an earthenware dish. Have ready a small oven; get it really hot so that it turns pale because of the temperature inside. Now put in the fish on their earthenware platter, close the oven tight, and seal up the door. Leave them to cook for three hours. Then take the fish out of the oven and let them cool. Remove the intestines with their pellets. Open them, take out the pellets, put them into a

piece of linen, and wash them with soap in warm water and fish-oil. You will find perfect round granules in no way different from the finest natural pearls.

II. Treatment of Pearls

The sixteen recipes which follow are by various hands, anonymously collected under the general title *Treatment of Pearls.*

1. *Cleaning pearls and the procedure for making them shine, which the author says he has used often.*

First put some oil in a mussel-shell and heat it over a fire of papyrus or other reed. When it has become warm put the pearl in it. Next, remove the pearl from the oil and smear it with an ointment made of pyrites and white lead.(4) Then wash it well in water, smear it again, and let it dry. Wash it once more, smear it again, and do this in all seven times. After treatment and washing, put it into some orange juice. If one mixes this juice with the ointment everything anointed with it becomes white. If the pearl is soaked in wine it becomes scaly. Generally, if one engraves letters on it by means of black and green encaustic the letters will absorb (the encaustic, and so become permanent).

2. *Dissolution of pearls.*

Crush little pearls very fine, put the powder into a glass jar with some acid citrus juice, and put it over a sawdust fire for three days and nights. They will be thoroughly dissolved.

3. *Another procedure.*

Grind some fine wheaten flour, knead it with acid citrus juice and wild cabbage sap. Add willow sap and squill juice. Drop in the pearl and let it dissolve. You know how to continue from there.

4. *Whitening pearls.*

Take some scammony, grind it very fine, and shake it. Take a decoction of pure barley; pound it up with the scammony so that the mixture is fairly fluid, and pour it into a glass vessel. Suspend the pearl in it and protect it with another phial. Encase it in clay and leave it for nine hours. The pearl turns white. Without doing anything else leave it for seven or 13 days in sunlight or in horse's dung. Dissolve the sulphate of lime in very sharp vinegar.

4. White lead is, of course, the common name for basic lead carbonate, a white pigment; so it is possible that the pearls were not being cleaned but having a layer of white pigment added to them. Naturally, in course of time it would wear off.

5. *Preparation of a pearl.*

Take siderite stone, some powdered arsenic, (magnesia?)[5], and sulphate of lime. Grind them up in equal quantities. Boil them, following the same procedure as for bisulphuret of mercury. Take the sulphate of lime and dilute it with honey. Feed it to a bird but do not give him anything else to eat and do not let him fly free but shut him up in a cage or basket. Put a *kerbion*[6] on top and give the bird the powdered compound. Clean out his intestines by giving him grasshoppers to eat for three days; then feed him the sulphate of lime. You will find, secreted in the *kerbion*, a smooth, shining mystery.

6. *Another procedure*

Take some little pearls. Put them into a glass jar with some strong vinegar and some white juice from Cyrene; let them stand for 16 days. Seal the jar and leave it in a warm place for a night and a day. Next, add some citrus juice, shake it, and leave it alone for a short while. Then let them solidify according to the shape you had in mind. Sulphate of lime is used to fix the shape.

7. *Whitening of dark or dirty pearls.*

Put the pearls inside an onion or a similar (bulb?); cover it all up with wheaten dough and cook it in an oven or stove. The pearls become white.

8. *Another procedure.*

Take some small pearls, put them into citrus juice, and let them absorb the citric acid. Decant this several times until the liquid becomes clear. Then put the pearls into a piece of cloth (and rub them) until the dirt is loosened. After it has become loose wash them for one day and insert the suety lump into the heart of an onion. Put the onion into an oven until the "suet" is cooked; then take it out and let it cool. You will find that the pearls have become white. Clean and polish them as you wish according to the method of a specialist. Afterwards some people make a bird drink from the evening until 6 a.m. and then let the bird die of thirst by depriving it of liquid. When they sacrifice it they find the dirty parts (of the pearls) clean.

5. This is a very vague term, even in the Greek, and may refer to the carbonate, oxide, or hydroxide of magnesium.

6. *Kerbikarion*, a word apparently borrowed from Latin, is found in an Egyptian papyrus of the third century A.D. meaning a receptacle for dates. It can also mean "pillow" and therefore in our context must mean something like a small bag.

9. *Whitening pearls which have turned yellow.*

Take the pearls, place them in white bitch's milk, cork them up, and leave them for seven days. Lift out the pearls, each of which is attached to a single hair, and see if they have become white. If not, put them in the milk again until you are successful.

If you smear a man (with it), he turns scaly (leprous). Such is the power of this liquid, sprinkled with 1 mna of damp Samian earth.[7]

10. *Fixation of pearls.*

Put them in black bitch's milk and when they have become of a waxen consistency put them into moulds.

11. *Whitening pearls.*

Take two spoonfuls of barley paste, rub (them) together, and let the pearl soften up for six hours.

12. *About pearls.*

Put them to harden in fig milk, or spurge juice, or white hellebore juice, and leave them there overnight. When they have become hard model each of them with the viscous matter which you have already strained off and let them dry for a month. Next, put them in quicklime. Sprinkle water gently, drop by drop, until the quicklime has become watery, then leave it until it dries out. When you lift them out you will find the pearls hardened. Let the stuff to be modelled form a hardened mixture with the white gum-water. Dry it out like this. So that the pearls harden easily when you introduce them into the dampened quicklime mixture and after they have acquired the right consistency, wash them well for an hour in pure, clear oil, and suck them (clean). Then, if you find they have not become bright, put them in a bowl of barley paste. Knead them as though you were making a wheaten loaf, then cook them—in an oven. In this way you clean and polish them. You will be amazed at the result. Attach a hair (to each pearl) before trying to harden it.

13. *Whitening pearls which have turned yellow.*

Take the ends and the off-white part of a squill, from the middle of the leaves, and some soap-wort; grind them up in equal quantities. When you have made this preparation, put in the pearls so that they are quite covered. If they are too hard add some virgin's urine and a little pure honey.

7. This is not part of the recipe, of course, but has slipped in from somewhere else by mistake.

14. *Cleaning pearls.*

Take garlic, grind it up with water, and put it in a little jar. Suspend the pearl from the middle of a hair, and let it soak in the liquid for a day and a night. Then await your intuition. If there is no result, powder some more with some very fine ash. Wrap it in a piece of linen cloth and turn (the vase) clockwise over a fire until the ash has disappeared, and the pearl has an offshoot. You will find it white and clean, and it should be healthy from every point of view.

15. *Cleaning the British pearl.*

Take some Cyrene juice, (whisk it up?) with water, and put it into a small flask. The juice does not dissolve but forms a separate layer in the water. Take the pearl and suspend it from a horse's hair. The pearl should have no cracks. Put it into the juice and at once the juice engages with it. Leave it there for a day and night. Take it out, rub it, and you will find it has become clean and white. If it needs to be cleaned still more, leave it for a day and night. Repeat the process as often as necessary, and do it with care until you have succeeded.

16. *Cleaning lead-coloured pearls, according to a monk.*

Take some garlic and grind it up along with the urine of someone who has not yet reached puberty. Put it into a little flask and drop in the pearl. Leave it to soak for three nights and days. Then take some Cyrene juice and a little oil and heat them. Hang the pearl in it by means of a horsehair. Roll it around (in the liquid) until you see that it has become white. First, then, take garlic; then put it in oil, and take it out when the oil is seething. Use this juice. If the result is no good, use balm instead of oil and you will succeed.

III. Polishing Pearls

Finally, here are two further recipes for polishing pearls, once again by anonymous authors.

1. Take a water-melon or a cucumber and open it in the middle. Place the pearl inside and put the cucumber in an oven until it falls apart. (In this way) the pearls become shining.

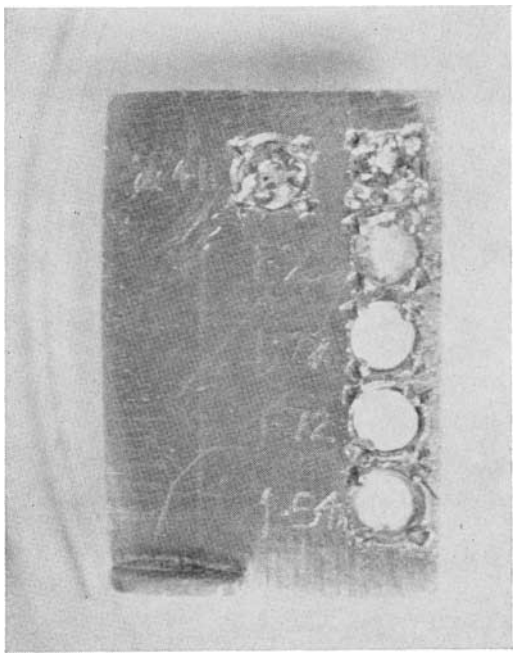
2. Fry a pearl inside a bird or a pigeon [sic!] and keep it there until the hour of Paternoster. Then split open the bird and take out the pearl.

DIAMOND TESTING BY IMMERSION— A USEFUL GADGET

By DAVID WILKINS, F.G.A.

IN one of the chapters in "Gem Testing"* Basil Anderson suggests immersing a diamond brooch in one of the highly refractive liquids to see if any of the stones "disappear", thus indicating an inexpensive replacement or "foreigner". This is a very simple and convincing test which, unfortunately, doesn't work if the stones are in a closed-back setting.

Usually it is sufficient to prove "not diamond", but occasionally closer identification is required, and to assist in this a working jeweller friend, also an F.G.A., made up for me a small stand, some 20 mm × 13 mm, set with two diamonds, a zircon, a synthetic sapphire, a synthetic spinel and, very difficult to obtain, a clear quartz (see photograph).



*8th edn.: p. 187.

Placed in the dish containing the brooch and liquid, the degree of "invisibility" is quite surprising, sufficient to convince the most sceptical customer, for this is one of those tests which may easily be carried out on the shop counter.

If you want a really superb demonstration of this effect to startle a class of students, try one of those large perspex models of the various cuts of diamonds immersed in a glass beaker half full of toluene. One word of warning, though—don't leave it in for more than a few seconds or the perspex starts to craze.

I find toluene by far the best liquid for most immersion work, and have never been able to agree with those who denigrate it. It is cheap, clear and highly volatile, such that after taking the brooch out of the liquid, a quick shake, a good lungful of "blow", a few seconds close to the desk lamp and it may be handed back to the customer. Compare that with the scrubbing required to eradicate the mothball smell of monobromonaphthalene.

Gemmological Abstracts

ANDERSON (B. W.). *Spectroscope: an indicator of variation.* Gems & Gemology, 1972/3, XIV, 4, 98-101.

A report of a talk given at the XIVth International Gemmological Conference in Vitznau, Switzerland, the theme being the marked changes in absorption spectra of gemstones with slight changes in their structure. The discussion was mainly in respect of zircon, red spinel and apatite. R.W.

BANK (H.). *Farbloser und blauer transparenter Colestin aus Madagaskar.* (Colourless and blue transparent colestine from Madagascar.) Z. Dt. Gemmol. Ges., 1973, 22, 3, 99-100.

This transparent stone has recently been encountered on the market; it was found to be an Sr-sulphate (Sr (SO_4)), hardness 3-3½, density 3·98, R.I. 1·619-1·631. E.S.

BANK (H.), BERDESINSKI (W.), DIEHL (R.). *Durchsichtiger Rhodonit aus Broken Hill, Australia.* (Transparent rhodonite from Broken Hill, Australia.) Z. Dt. Gemmol. Ges., 1973, 22, 3, 101-103.

Rhodonite is generally not transparent and only rarely translucent, although Webster in 1970 described a transparent faceted rhodonite. The authors have now also found some of this material while examining red manganese pyroxene from Broken Hill. The rhodonite was found to be $CaMn_4$ (Si_5O_{15}), triclinic, density 3·66-3·68, R.I. 1·724-1·737. E.S.

BANK (H.), BERDESINSKI (W.), DIEHL (R.). *Durchsichtiger roetlicher Pyroxmangit aus Broken Hill, Australia und die Möglichkeiten seiner Unterscheidung von Rhodonit.* (Transparent reddish manganese pyroxene from Broken Hill in Australia and the possibilities of distinguishing it from rhodonite.) Z. Dt. Gemmol. Ges., 1973, 22, 3, 104-110.

The submitted material had a deep red colour with a slight brown tinge and was said to be rhodonite. Properties of manganese pyroxene are given, including formula ($(Mn\ Fe)_7$ (Si_7O_{21})),

crystallographic details with optical angles, density (3·76), cleavage, hardness (5-6). The difference between this material and rhodonite is to be found in the lattice constants. The relationship between the axis and the optical axis angles varies as does the double refraction. E.S.

COLDHAM (T. S.). *Sapphire mining in Northern New South Wales.* Australian Gemmologist, 1973, 11, 10, 14-19. 4 illus.

A good account of the sapphire mining in the Inverell–Glen Innes district of New South Wales, Australia. The area has, during the last five years, been more intensively worked using modern equipment. The sapphire is recovered from alluvial gravels, the area first being tested by drilling 3-inch diameter holes in a grid pattern for sampling, or by cutting "costeens", a series of narrow cuts across the river flats. A "proved" area is then worked by removing the overburden to reach the "wash" containing the sapphire. This is removed by dumper trucks to a "dumpbox" where it is washed to remove the larger boulders, after which the residue is passed through trommels and then to pulsators to concentrate the heavy minerals from which the sapphire is hand-picked out with also the larger zircons and garnets. The stones recovered are graded for quality and then marketed through Thailand, Hong Kong and Europe. R.W.

COPELAND (L. L.). *The derivation of gem names.* Gems & Gemmology, 1972/3, XIV, 4, 118-125.

A useful compilation of the etymologies of gem names. Those names commencing with A to J are given and the series is to be continued in a future issue. R.W.

CROWNINGSHIELD (R.). *Developments and highlights at G.I.A's Lab. in New York.* Gems & Gemology, 1972/3, XIV, 4, 111-117. 18 illus.

A discussion is made of the dark blue aquamarine recently marketed and which may be referred to as "maxixe beryl". The fading of such stones is a possibility and further research on these beryls is still being carried out. Some Oriental carvings have been proved to be nephrite, some serpentine, some green grossularite, and some an unnamed rock mixture containing feldspar, zoisite and serpentine. An actinolite cat's-eye, a chrysoberyl cat's-eye which

looked like a doublet and a 40 carat cat's-eye apatite which was damaged when being cleaned up after setting were encountered by this laboratory. A laser-drilled diamond showing a penetration of 4 mm, twice normal, was seen and some discussion made on it. A diamond crystal with a botryoidal surface structure and a "finger-print" inclusion in a synthetic ruby are mentioned. Some experiments on the hardness of strontium titanate suggest that the hardness is 5 to 6. Some amber examined under the polariscope showed that pressed amber behaves as a doubly refractive aggregate, whereas block amber shows a normal strain pattern. It is suggested that pressed amber may be differentiated from block amber by using ether, the pressed amber softening while block amber does not. R.W.

DERN (H.). *Ein neuer interessanter Schliff.* (A new interesting cut.) Z. Dt. Gemmol. Ges., 1973, 22, 3, 133-134.

A new cut especially for the amateur cutter, having 28 facets on the upper face, suitable mainly for square-type stones with cut-off corners producing as a basis a type of octagon, leading with a trap cut to an apex which is formed by the four main facets. It was used on a transparent sanidine, but is suitable for other stones, and a patent has been applied for covering also diamonds. The girdle has 32 facets and takes up about one-quarter of the pavillion. E.S.

EPPLER (W. F.). *Ungewöhnliche Dreiphasen-Einschlüsse im Kunzit.* (Unusual three-phase inclusions in kunzite.) Z. Dt. Gemmol. Ges., 1973, 22, 3, 93.

The author describes and shows a photomicrograph of a cut kunzite weighing 15 carats most probably from California exhibiting three-phase inclusions, the second phase being a very thin circle-shaped formation. E.S.

EPPLER (W. F.). *Natürlicher und synthetischer Türkis.* (Natural and synthetic turquoise.) Z. Dt. Gemmol. Ges., 1973, 22, 3, 94-98.

Short history of mining and later synthesis of turquoise, also mentioning the "copper mines" of King Solomon near Elath. The synthesis which is dealt with mainly is the one marketed by Gilson in 1970 and has a lower R.I. (1·60) than natural turquoise (1·62). Various imitations are also listed, such as "Viennese turquoise", "neolith" and "neoturquoise". E.S.

GOWER (W.). *Confirmatory test for sphene.* Australian Gemmologist, 1972, 11, 8, 26.

To add confirmation that a stone was a sphene the distance of doubling of the back facet edges was measured by a scale fitted on to a microscope and compared with that of a similar sized zircon. A similar problem was overcome by using a petri dish in which a hair had been laid on the surface and three stones, a zircon, the unknown and a synthetic rutile laid on top of the hair. By visual observation it could be seen that the relationships were approximately 1 : 2 : 4, which, with other findings, confirmed the unknown stone to be a sphene. R.W.

HUDSON (D. R.). *Gemstones in the system BeO–MgO–Al_2O_3–SiO_2.* Australian Gemmologist, 1972, 11, 5, 5-7. 1 diagram.

The relationship between the minerals within the system is given and the characters of these minerals are discussed. The article concludes with an exposition of the geological occurrences. R.W.

LECKEBUSCH (R.). *Farbursachen der Fluorite.* (Causes of colour in fluorites.) Z. Dt. Gemmol. Ges., 1973, 22, 3, 123-126.

Pure fluorite being colourless, the author examined colourless as well as violet, blue, green, yellow and red spectrographically. The absorption spectra are shown. E.S.

LIDDICOAT (R. T.). *Developments and highlights at G.I.A's Lab. in Los Angeles.* Gems & Gemology, 1972/73, XIV, 4, 102-108. 14 illus.

A good account of the examination of the new synthetic alexandrites is given. Their properties are similar to those of the natural alexandrites as they have a density of 3·73 and refractive indices of 1·746-1·755. The colours are reminiscent of the Russian alexandrites rather than those of Ceylon. The inclusions consist of layers of dust-like particles, a tendency to strong banding and natural-looking "fingerprint" inclusions and also the typical veil-like feathers so common as an indication of synthetic stones grown by the flux-fusion technique. Some comment is made on the colour nomenclature of—and on the inclusions in—corundums from East Africa. Unusual banding in a milky-white Type IIb diamond is mentioned, and a number of diamond doublets and a glass cat's-eye are referred to. R.W.

MALES (P. A.). *Rutilated quartz and ilmenite.* Australian Gemmologist, 1972, 11, 5, 3-4.

A discussion on the inclusions seen in conjunction with the rutile needles in rutilated quartz. Are they ilmenite or are they hematite? R.W.

MALES (P. A.). *Diamond crystals from the Isabella River, Oberon District, New South Wales.* Australian Gemmologist, 1972, 11, 8, 23-25. 1 illus.

Two diamond crystals found on the Isabella river, a tributary of the Abercrombie river, were examined. The stones are considered to be tetrahexahedral in form. Some discussion is made of the surface growth marks. R.W.

MACFALL (Russell P.). *The hall of gems of the Field Museum.* Lapidary Journal, 1973, 27, 5, 746-771.

An account of the celebrated gem collection housed at the Field Museum of Natural History, Chicago. Items of importance include material from the cabinet of G. F. Kunz, a 4-carat rhodochrosite from Colorado, a kunzite of 294·8 carats, and one of the world's two largest faceted topazes. American gems include a 137 carat faceted blue beryl from Stoneham, Maine, and an uncut thomsonite from Minnesota measuring $4\frac{1}{2} \times 2\frac{1}{2}$ inches.. M.O'D.

OUGHTON (J. H.). *Another colour-changing sapphire.* Australian Gemmologist, 1972, 11, 5, 4.

Tells the story of a natural white sapphire which changed to a pale yellow after irradiation with ultra-violet light of both long and short wavelengths. The colour was intensified after a further hour's treatment under a short-wave ultra-violet lamp. The colouration reverted in daylight but could be brought back by further irradiation with ultra-violet rays. Comparison is made with the behaviour of a supposedly x-ray treated yellow sapphire. It is suggested that the stone had been treated in some way. Improvement in colour by some type of irradiation of an emerald and blue sapphires is also mentioned. R.W.

OUGHTON (J. H.). *The stone that was nearly a taaffeite.* Australian Gemmologist, 1972, 11, 8, 25-26.

Tells of a lilac-pink stone which seemed to show a clear birefringence of 0·008 for refractive indices of 1·719 and 1·727.

The density was 3·64. The stone was finally identified as a synthetic spinel. No reason, except anomalous double refraction, could be given for the effect. A second "freak" synthetic spinel having similar properties turned up. R.W.

REEVE (R. J.). *Brazilianite.* Australian Gemmologist, 1972, 11, 5, 8-10. 3 tables.

A review of the literature on brazilianite which was first found in Brazil during 1945. The crystallography of the material, its chemical composition and properties are discussed. Something is told of its occurrence and its relation to other minerals. R.W.

RODGERS (Peter). *Gemstones of Kintyre.* Gems, 1973, 5, 5, 13-16.

Rocks of the Old Red Sandstone period overlay a mica schist in the Mull of Kintyre, and amethyst, garnet, malachite, galena and various agates may be found. Cornelian and jasper are plentiful on the beach of the island of Dava. Agates are found in conglomerates of the south coast cliffs. M.O'D.

SASNAITIS (E. R.). *Amber: the gold of the north.* Australian Gemmologist, 1973, 11, 10, 3-7.

A well-written general article on amber. The types of amber and localities where it is found are mentioned and some of the properties of amber are given. Something is told of the mythology and history of amber. Insects and debris of flora and fauna found in amber tell of life in the tertiary period of geological history. The fashioning of amber is discussed and "pressed amber" described and artificial colouration is said to have been practised. Mention is made of forged inclusions in amber and it is stated that equipment is now available which identifies such man-made inclusions. It would have been useful if this had been enlarged upon. R.W.

SMID (J.) and KRISTEK (J.). *Der vertikale Lichtofen—eine neue Apparatur zur Erforschung der Schmucksteinsynthese.* (The vertical light oven—a new apparatus for research into precious stone synthesis). Z. Dt. Gemmol. Ges., 1973, 22, 3, 111-122.

The light oven is an apparatus which heats an object using the optical system of focusing light rays; it has lately been applied to the one crystal syntheses of high melting materials. The article deals

with the general principles of this arrangement showing the application to the syntheses of congruent melting crystals with a melting point of up to 3000°C by means of vertical zone melting. Interesting examples include oxides used in the jewellery industry such as corundum, spinel, strontium titanate, yttrium aluminate. The oven can be used for metallic and non-metallic materials and seems to avoid impurities coming into contact with the growing crystal.

E.S.

STEINERT (H.). *Diamanten-Produkte einer Kavitation?* (Are diamonds the products of cavities?) Z. Dt. Gemmol. Ges., 1973, 22, 3, 129-131.

Differences in diamonds of different pipes seem to point to the fact that they only crystallize during the eruption of the kimberlite magma. But this seems unlikely as it is believed that—together with pyrope—they are formed under terrific pressure deep under the earth's crust. A new theory has been advanced by the Russian E. M. Galimov, who suggests that diamonds are the product of a cavitation process. The kimberlite magma includes various liquids which are rich in gases. When the pressure is low these gas bubbles are eliminated, but under high pressure they produce an implosion with high pressure and temperature. E.S.

STEVENS (Jane Perham). *The treasure of tourmaline at Newry.* Rocks and Minerals, 1973, 48, 4, 219-224.

A find of high-quality tourmaline was made at the Dunton Quarry, Newry, Maine. Colours include reds and greens and minerals in association were lepidolite, clevelandite and beryllonite.

M.O'D.

TILLANDER (H.). *The Scandinavian diamond nomenclature.* Australian Gemmologist, 1972, 11, 5, 21-22.

A reprint of an article published in the *Journal of Gemmology*, 1971, 12, 5, 167-170, on the Scan D.N. diamond classification.

R.W.

ANON. *"Red" diamonds from Siberia.* Australian Gemmologist, 1972, 11, 5, 14-20.

A reprint from the *International Diamond Annual*, this article gives a very good survey of the finding of diamonds in Siberia. Something is told of how they occur and how they are mined and the sizes

and shapes of the crystals are described. The crystals are generally small, but some larger crystals have been found and they are referred to. There are other Russian sources of diamond, such as in the rivers flowing into the Sea of Azov in the Ukraine and in rivers flowing into the Black Sea. There are other finds in the Kola Peninsula and in the area of the Pechora river north-west of the Urals. R.W.

BOOK REVIEWS

FLETCHER (Edward). *Rock and gem polishing.* Blandford Press, London, 1973. Illustrated in black-and-white and in colour. pp. 112. £1·30.

The book enters immediately into the setting-up of lapidary equipment and clear photographs in close-up illustrate the techniques of simple gemstone fashioning. All forms of lapidary work are discussed and particularly useful sections give advice on the selection and purchase of rough gem material, including also lists of societies and clubs. The geological formations in which gems are largely to be found are graphically illustrated and the book ends with a series of maps giving British gem locations. M.O'D.

FRONDEL (Clifford). *The minerals of Franklin and Sterling Hill. A check list.* Wiley-Interscience, New York, 1972. pp. 94. Illustrated in black-and-white. £4·60.

The previous check-list compiled from this highly mineralized area was published in 1935, since which time at least 66 new occurrences have been discovered. Particularly celebrated for the minerals found in association with zinc ores, gemmologists will remember the fine willemite which is at times found in a condition suitable for cutting and which fluoresces bright yellow-green in

short-wave ultra-violet light. Other gem materials found in the area include garnet, sphalerite, corundum, malachite, rhodochrosite, rhodonite (said to fade), tourmaline and idocrase. M.O'D.

POGUE (Joseph E.). *Turquois.* Memoirs of the National Academy of Sciences. Vol. 12, part 2. Second and third memoir. (Reprinted with additional material.) The Rio Grande Press, Glorieta, New Mexico, 1973. pp. 162. Illustrated in black-and-white and in colour. $15·00.

This classic work has been reprinted and augmented by the addition of a bibliography, coloured plates, a list of currently operating mines and a new introduction. The material in the main work is a little dated but the additional data are of the greatest interest and the coloured illustrations of high quality. M.O'D.

ROGERS (Cedric). *Rocks and minerals.* Ward Lock, London, 1973. Illustrated in black-and-white and in colour. pp.144. £1·75.

A well-illustrated book designed to introduce the reader to minerals. The material is lucidly written and includes an account of the development of mineralogy and reminiscences by the author. The simple chemistry needed for mineral study is particularly well handled and the crystal systems, here combining hexagonal and trigonal, are also very clear. Useful hints are given on prospecting and housing a collection. M.O'D.

WILLS (Geoffrey). *Jade of the East.* Weatherhill Orientations, New York, 1972. pp. 196. Illustrated in black-and-white and in colour. £10·00.

This is an account of the jades of Asia and New Zealand with many coloured illustrations of the highest quality. The author discusses the jade minerals with particular reference to their archaeological significance; he gives a résumé of the possible uses for some of the archaic Chinese artefacts, paying tribute to the work in this field of the late Professor Howard Hansford, who was responsible for interring some of the more colourful surmises previously made in this area. An interesting section, accompanied by a map, details the routes by which jade from Turkestan reached China. Later chapters deal with shapes, symbols and decoration and jades from other areas. There is a bibliography and an index. M.O'D.

RIGBEY (L. J.). *The amateur faceter.* D. Bradford Barton, Truro, 1972. pp. 83. Illustrated in black-and-white and in colour. £1·50.

A companion to similar books on the arts of the lapidary and the jewellery maker, the present volume explains the technique of faceting. A brief explanation of the optical principles involved is followed by chapters on suitable materials and their selection, preforming, types of equipment and diagrams of various cuts. The diagrams illustrating the operation of faceting equipment are large and well-drawn. Figures for refractive index are inaccurate for peridot and emerald, almandine is mis-spelt and only demantoid among the garnets can be said to possess a high dispersion. However, these are faults in no way affecting the general acceptability of the book. M.O'D.

Australian Gems & Crafts Magazine. No. 1. Sept./Nov. 1973. P.O. Box 1071J, Melbourne 3001, Australia. Annual subscription $8·50.

This first issue numbers 40 pages and contains articles which maintain a happy balance between serious geology and mineralogy and rockwork exploits. It is interesting to note that a green jade has been discovered near the town of Cowell, South Australia, and to learn more details of the blue lace agate of Tasmania. Fine gypsum crystals have been found on the Yorke Peninsula. The magazine will act as a much-needed clearing-house for Australian gemhunting information and British readers will find much to enjoy. M.O'D.

The Jade Trader. 1973. Published by Jade Sales, P.O. Box 100, Novato, California 94947, U.S.A. Foreign subscription $2·50 by post-paid airmail.

A new quarterly bulletin containing up-to-date information on the jades; so far the American jades have been discussed with particular reference to Wyoming material, and there have been articles on polishing and details of current prices. Further articles, including one on Chinese jades, are planned. M.O'D.

ASSOCIATION NOTICES

GIFTS TO THE ASSOCIATION

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

Mr G. Massie, Sheffield, for a piece of pyrite on barite from the Glebe Mine, Derbyshire.

Toktraders International, Tokyo, Japan, for two specimens of radiated smoky quartz.

Mr R. Webster, London, for a cut blue synthetic quartz, 16·18 cts.

Mr E. Robson, Nairobi, Kenya, for specimens of kyanite and ruby rough from Kenya.

The Gemmological Association of All Japan, Tokyo, for *Gem Identification by the Inclusions* by A. Chikayama.

Mr E. A. Thomson, London, for a piece of Gilson synthetic rough turquoise.

MEMBERS' MEETINGS

London

A talk was given at Goldsmiths' Hall on the 29th October, 1973, by Mr B. W. Anderson entitled "The Pleasures of Discovery". A full report will appear in a future issue of the *Journal*.

Midlands Branch

A meeting of the Branch was held in Birmingham on the 21st November, 1973, which was entirely devoted to opal. The main speaker was Mr Bernard Lowe.

Scottish Branch

Stirling was the venue for a meeting of the Scottish Branch held on the 12th November, 1973. A talk entitled "Diamonds in Industry" was given, illustrated by colour slides.

THE JOURNAL OF GEMMOLOGY

The Editor apologises for the late appearance of this issue due to printing delays caused by the power-shortage and the consequent three-day week.

Nottingham Branch

The inaugural meeting of the Branch was held on the 1st October, when Mr D. T. K. Lewis was elected Chairman and Mrs B. Crutchley Smith Secretary.

Mr R. Webster gave a talk entitled "The Expanding Horizons of Gemmology" to the Branch on the 12th November. The talk was illustrated by colour slides, and Mr Webster demonstrated how one could differentiate between natural and synthetic gemstones.

OBITUARY

Mr Eric C. Vineall, Southend-on-Sea, who gained the Association's Diploma in 1949, died on the 16th November, 1973.

Mr C. Houchin, Bromsgrove, died in December, 1973. Mr Houchin gained the Association's Diploma in 1928.

PRESENTATION OF AWARDS

Despite travel difficulties, some 300 members and successful candidates at the examinations were present for the reunion and award-giving ceremony at the Goldsmiths' Hall on the 19th November, 1973.

As Mr Norman Harper, the Chairman, pointed out, among those present were members from Holland, Japan, Canada, South Africa, Switzerland and the United States. Over 800 had sat for the examinations, 100 more than the previous year.

Mr Gordon Andrews, who had won the Tully Medal over 40 years ago, presented the awards in a ceremony which was made more picturesque than usual with one of the Japanese candidates being robed in national costume.

Mr Andrews recalled that he had enrolled for gemmological classes in 1929 and had been involved in the subject ever since. In those early days the candidates totalled only about a score or so. In a couple of years, he forecast that the total would be around the 1,000 mark.

As Director of Examinations he had encountered some memorable papers. One was written partly in English, partly in German and partly in Japanese. The examiners were very meticulous in

their assessment of papers. They checked and re-checked. Neither brilliant theoretical nor outstanding practical ability received particular favour, but all-round ability of a high standard was sought.

Success depended on previous preparation, he said, quoting Confucius. He hoped that the new Diploma holders would continue their studies and meet the challenge presented by the many synthetic gems that were about today.

"It is always difficult to distinguish between the true and the false," he said, "but this ability is as essential in life as it is for gemstones."

Dr Claringbull said the occasion marked the culmination of Mr Andrews' association with the G.A. and provided an opportunity to thank him for the long service he had given to gemmology.

He believed that the international character which had evolved upon the Association was due to the high esteem in which its examinations were held, while its work facilitated and encouraged international relationships.

GEMMOLOGICAL ASSOCIATION OF AUSTRALIA

The Gemmological Association of Australia's 26th Conference and 2nd Gemmological Symposium will be held in Melbourne on the 27th and 28th April, 1974. Visitors are welcome. For information please write to: Mr C. R. Stott, G.P.O. Box 5133AA, Melbourne, 3001, Victoria, Australia. Symposium theme—Diamonds, General Topics and Discussion.

"Synthetic Diamonds". Professor H. C. Bolton, B.Sc., Ph.D.(London), Department of Physics, Monash University, Melbourne.

"Marketing Diamonds". Mr B. Corcoran.

"Industrial Uses of Diamonds". Mr Gellie, Anglo-American Agencies.

"Russian Diamond Fields". Dr G. Troup, D.Sc.

"Reciprocal Influence Between Gemmology and Lapidary". Mr J. S. Taylor, F.G.A.A.

"Further Work on Zoisite". Dr D. Hutton.

"Electron Microscope". Mr Dawson, C.S.I.R.O.

UNIVERSITY OF STELLENBOSCH

A new gemmological section (De Beers Laboratory) was established in the geological department of the University of Stellenbosch, South Africa, on 29th October, 1973.

At the end of the inauguration ceremony Professor J. N. de Villiers, Rector of the University of Stellenbosch, awarded Dr E. Gübelin the title of "Honorary Professor" in recognition of his valuable contribution towards gemmological research and successful promotion of gemmology throughout the world.

Needless to say that we are all delighted with this honour although Dr Gübelin considers this not so much for his personal reward but more so because this is the first academic award of its kind ever to be bestowed upon a gemmologist in the narrow sense and consequently to the science of gemstones in a wider sense. He is happy that through this tribute gemmology has been elevated into the ranks of academic dignity.

GEM DIAMOND EXAMINATION

Thirty candidates entered for the Association's 1973 Gem Diamond Examination. The following is a list of successful candidates, arranged alphabetically.

Besteiro Rafales, Josefina, Barcelona, Spain
Bradford, Kenneth J., Westcliff-on-Sea
Bridges, Reginald James, Chigwell
Clarke, Roger David, Maidstone
Coulter, Peter, Northwich
Gopalji, Kantilal P., London
Granda Uson, Ma. Fatima, Barcelona, Spain
Holgate, Richard Stanley, Thornton Cleveleys
Johnson, Robert Charles, Nuneaton
Jones, Claude Barrington, Northampton
Jones, David Lewis, Orpington
Margarit Morant, Eugenio, Barcelona, Spain
Mercade Galles, Jaime, Barcelona, Spain
Miller, Graham John, Chesham
Monte Domenech, Joaquin, Barcelona, Spain
Munoz Aisa, Ma. Teresa, Barcelona, Spain
Needham, Brian, Ilford
Nogues Carulla, Joaquin Ma., Barcelona, Spain
Pujante Garzon, Francisco, Barcelona, Spain
Redknap, Samuel Frederick, Twickenham
Sayer, Glynis Vera, Strood
Sole Barneda, Domingo, Barcelona, Spain
Stevens, Peter James, Harlington
Walton, Brian, Dukinfield
Watson, Philip, Rickmansworth
Williams, Anthony Martin, London
Woo, Shun Wai, Hong Kong

EXAMINATIONS IN GEMMOLOGY 1973

In the 1973 examinations in gemmology organized by the Gemmological Association of Great Britain, 544 candidates sat for the preliminary examination, and 283 for the diploma examination. Centres were again established in many parts of the world.

Upon the recommendation of the examiners the Tully Memorial Medal has been awarded to Dr. George Hamel, of Leiderdorp, Holland, and the Diploma Rayner Prize to Mr. Patrick Daly, of Chelmsford, Essex.

The Rayner Prize in the preliminary examination has been awarded to Miss Lorraine Fish, of London.

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

DIPLOMA EXAMINATION

TULLY MEMORIAL MEDAL

Hamel, George J. W., Leiderdorp, Holland

DIPLOMA RAYNER PRIZE

Daly, Patrick J. E., Chelmsford

QUALIFIED WITH DISTINCTION

Ahad, Daisy, Rangoon, Burma
Andreu Griera, Juan, Barcelona, Spain
Bloom, Charles Neil, London
Daly, Patrick J. E., Chelmsford
Estany Volart, Ramon, Barcelona, Spain
Farreny Riera, Andres, Barcelona, Spain
Hamel, George J. W., Leiderdorp, Holland
Hebbrecht, Julien Emiel Petrus, Gouda, Holland
Juckes, Lewis Menne, Rotherham
Knoske, Gene E., New Berlin, Wisconsin, U.S.A.
Krijger, Bart, Amsterdam, Holland
Maury, Robert Lee, Port Charlotte, Fa., U.S.A.
Mjelva, Helge Roenneberg, Aalesund, Norway
Mozolowski Horczyczak, Barbara, Barcelona, Spain
Pease, Belinda Alison Gordon, Geneva, Switzerland
Procter, Vicky, London
Stenberg, Richard M., Springfield, Mass., U.S.A.
Taylor, Michael Philip, Enfield
White, Paul John, Nuneaton
Win, Kyaw, Rangoon, Burma
Winter, Colin Howard, Dorking

QUALIFIED

Acedo Delgado, Manuel, Barcelona, Spain
Addis, R. C., London
Allin, Peggy, Port Elizabeth, Rep. of S. Africa
Amor Cubeiro, Carmen, Barcelona, Spain
Anton Martinez, Miguel, Valencia, Spain
Arano Sierra, Ma. Pilar, Barcelona, Spain

Ashcroft, Vera, Liverpool
Atherton, Stanley, Chorley
Bagant Pons, Jorge,
Barcelona, Spain
Barrows, Mark Coleman, Halesowen
Bayarri Bosch, Federico,
Barcelona, Spain
Betts, Stuart Edward, London
Bollen, Neil David, London
Bonet Coll, Jose, Barcelona, Spain
Bros Font, Ana Ma.,
Barcelona, Spain
Burnett, Brian David, Formby
Butler, Tomiko S.,
Silver Spring, Md., U.S.A.
Chaloner, Rosemary Jane,
Altrincham
Chantara, Kem, London
Chetty, Samuel Francis Casie,
Upplands Vasby, Sweden
Chlupacek, Joseph M.,
Merrillville, Indiana, U.S.A.
Clark, David Jonathan, London
Cooke, Victoria Jane, Blidworth
Cox, Edward Charles,
Auckland, New Zealand
Crombie, Jonathan Mark, London
Culi Perarnau, Jose Ma.,
Barcelona, Spain
Cummings, Bruce W.,
Wilton, Con., U.S.A.
Dabaghi, Khalil, Beirut, Lebanon
De Silva, S. P. N., Hong Kong
Dewhurst, Stephen Clive, Stockport
Dickenson, John William, Liverpool
Dunn, Pete J.,
Washington D.C., U.S.A.
Esquerra Torrescasana-Llobet,
Jose Eloy, Barcelona, Spain
Felix, Karen Hilde, Soest, Holland
Fellows, Norman John, Ascot
Flo Tomas, Ma. Rosa,
Barcelona, Spain
Forbes, Brian Winston Travers,
Eikenhof, Transvaal, Rep. of S.A.
Frodin, Peter John, Gayton
Fryer, Frederick Alfred, London
Fulwiler, Jill Ann,
Los Angeles, Cal., U.S.A.
Gill, Joseph Osborne,
Denver, Colorado, U.S.A.
Grainger, Michael George Freethy,
London
Green, Roger, Leicester
Haakonsen, Hans Olaf,
Sandefjord, Norway
Hanrott, Michael Richard, Banstead
Higham, Joyce Rita, Prescot
Hinchliffe, Roger, Eastbourne
Htay, Han, Rangoon, Burma
James, Julia Jacqueline Ann, Redhill
Jeffries, Colin, Newport
Jordaan, Barend Daniel,
Stellenbosch, Rep. of S. Africa
Juan Prevosti, Leopoldo,
Barcelona, Spain
Kalina, Freda Frances, London
Karunaratna, Avanti Yasmin,
Nelson, New Zealand
Kawahara, Makio,
Fukuoka City, Japan
Kilpatrick, Constance M. P.,
Aberdeen
Klean, Christopher, London
Klein, Adrian Henry, London
Ko, Maung, Rangoon, Burma
Kyaw, Aung, Rangoon, Burma
Kyi, Khin Win, Rangoon, Burma
Leek, Janet Sylvia, Alcester
Liberg, Finn Ove, Hamar, Norway
Linden, Howard Morris,
Westcliff-on-Sea
Littman, Steven David,
Glenside, Penn., U.S.A.
MacDonnell, Mark L.,
Budleigh Salterton
MacOlive, John Richard Woodward,
Krugersdorp, Rep. of S. Africa
Malin, Kathleen Marian, London
Malone, Jr., Benjamin Darley,
Port Charlotte, Fa., U.S.A.
Mant, Kevin John, Southampton
Marble, Carolyn C.,
A.P.O., N.Y., New York, U.S.A.

Mason, John, Harrogate
Massie, George Alexander, Sheffield
Mathu, Ann Mumbi,
Idar Oberstein, W. Germany
Matthews, Shelagh Joan,
Port Elizabeth, Rep. of S. Africa
Melvin, Ena Margaret,
Auckland, New Zealand
Merriman, Patricia Jean, Wallasey
Minty, Janet, London
Mitchell, Stuart Roger, Bradford
Montanes Moreno, Diego,
Malaga, Spain
More Andujar, Francisco,
Barcelona, Spain
Munro-Ferguson, Molly Ann
Luttrell, Evanton
Neagle, Trevor George, Norton
Niinobe, Hiroko, Kobe, Japan
Nightingale, Stephen, Scarborough
Oliver, Graham Denis,
Wellington, New Zealand
Oomen, Joannes Bernardus Andreas
Marie, Oosterhout, Holland
O'Rourke, John William,
Rostrevor, S. Australia
Peterson, David L.,
Mead, Washington, U.S.A.
Reynolds, James Ian, Mexborough
Roberts, James Ian, Worksop
Robson, Edward,
Nairobi, Kenya, E. Africa
Rust, Izak Cornelis,
Port Elizabeth, Rep. of S. Africa
Scarratt, Kenneth Vincent Granville,
Ilford
Scott, Gillian Margaret, London
Sims, Paul Edward, Bristol
Sri Nissanka, Geeta,
Colombo, Rep. of Sri Lanka
Stenson, Ann P. Sabina,
Ottawa, Ontario, Canada
Such, Paul Nigel, Sutton Coldfield
Tait, Alistir Wood, Edinburgh
Taylor, Clive Julian, Gravesend
Thompson, Harry, Birkenhead
Trigg, Roger Clive,
Cape Town, Rep. of S. Africa
Valta, Akseli, Helsinki Finland
Van Der Loo, Albert,
Rotterdam, Holland
Van Servellen, Anne Maria,
Rotterdam, Holland
Vendrell Saz, Mario,
Barcelona, Spain
Walton, Cecil, Prescot
Watanabe, Teruo, Tokyo, Japan
Whitaker, Peter William,
Huntingdon
Win, Thein, Rangoon, Burma
Yamaguchi, Takashi, London
Yang, Jinhua, Tokyo, Japan

PRELIMINARY EXAMINATION

PRELIMINARY RAYNER PRIZE

Fish, Lorraine Alison, London

QUALIFIED

Abbestee, Wouter Pieter,
Amsterdam, Holland
Aguayo Villar, Ma. Isabel,
Barcelona, Spain
Aguilar Casamayor, Carlos,
Zaragoza, Spain
Ahad, Daisy, Rangoon, Burma
Ambjornsen, Truls Petter,
Fredrikstad, Norway
Amoros Angel, Julio, Valencia, Spain
Appleby, Jonathan Mark, London
Ariyaratna, Don Hettiarachige,
Colombo, Rep. of Sri Lanka
Arla Pont, Antonio, Barcelona, Spain
Ashley-Cooper, Elizabeth, London
Attinger, Gina, Zurich, Switzerland
Auddy, Sanjay Kumar, Birmingham
Ayache, Nicolas, Beirut, Lebanon
Ball, Stephen Ewart, London
Ballin, Peter Edward, Birmingham

Barnes, Clifton H.,
Grand Junction, Col., U.S.A.
Bartlet, Kenneth Joseph,
Episkopi, Cyprus
Bates, Andrew, Nottingham
Baxter, Jeannie, Sheffield
Beebe, Roxanne,
Woodside, Cal., U.S.A.
Benas, Ruggero,
Port Elizabeth, Rep. of S. Africa
Bensink, Anna,
Schoonhoven, Holland
Bernal, Virginia Miranda, London
Bernard, David Alfred William,
Carshalton Beeches
Birtley, George, Hull
Blackley, R., Ilford
Blanco Moreno-Lueje, Genaro,
Barcelona, Spain
Blasi Casal, Juan, Barcelona, Spain
Bloom, Charles Neil, London
Boix Morato, Manuel,
Barcelona, Spain
Borg, Raine, Myyrmaki, Finland
Brady, George Clifford, Epping
Brandenburg, Wieger Matthijs,
Schoonhoven, Holland
Bravo Agudelo, Ma. Luisa,
Barcelona, Spain
Bredebusch, Elisabeth, Hong Kong
Breden, Robert J., Kirkby
Bronkhorst, Saskia E.,
Gouda, Holland
Brown, David Bernard, Preston
Buckland, Neil Anthony, Bordon
Buijs, F. J., Schoonhoven, Holland
Burnham, Donald Charles,
Ancaster, Ont., Canada
Butler, Tomiko S.,
Silver Spring, Md., U.S.A.
Butt, Dilriaz Hussian, Bradford
Butterfield, John Phillip,
Huddersfield
Carr, Peter, Royston
Campon Fernandez, Enrique,
Oviedo, Spain
Chaigneau, Edel V.,
Utrecht, Holland
Chantara, Kem, London
Cheung, Matilda Ching Yee, London
Chin, Kian Hee, Johore, Malaysia
Chow, Peter Suet Chung, London
Clark, Stuart Duncan, Sale
Clayton, Rosamond Susan,
Hong Kong
Colom Farre, Jorge,
Barcelona, Spain
Cornelissen, Fleur A.,
The Hague Holland
Cowen, Margaret H., Hong Kong
Crawley, Annette, Liverpool
Cruella Segura, Ana,
Barcelona, Spain
Cucurull Ripoll, Jose,
Barcelona, Spain
Culley, Stephen John, Harrogate
Cuttilan, T. R.,
Colombo, Rep. of Sri Lanka
Dabaghi, Khalil, Beirut, Lebanon
Dack, Jane P., Hong Kong
Dando, Nigel John, Bath
Danvers, Roger Alan, Birmingham
Davidner, Gail Ruth, London
Davies, David Nigel, Caerphilly
De Silva Samararatne, Ananda,
Galle, Rep. of Sri Lanka
de Zoysa, Nimal D.,
Colombo, Rep. of Sri Lanka
Del Cerro Arrasa, Francisco-Javier,
Barcelona, Spain
Diaz Alabart, Silvia, Madrid, Spain
Dickinson, David, Bath
Dickinson, Nigel William, Bath
Din Richard Aziz, Edgware
Dix, Peter William, Purley
Dorking, Shirley Jacqueline,
Plymouth
Drayson, Nicholas Keith, London
Dunn, Pete J.,
Washington, D.C., U.S.A.
Duran, David William, London
Durgabakshi, Vinodhini,
Colombo, Rep. of Sri Lanka
Dwyer-Hickey, Peter R., Ilford
Eagleton, David, Sheffield

Elliott, Douglas Howard,
A.P.O. New York, N.Y.. U.S.A.
Ellis, Edwina, London
Fabrega Carbonell, Enrique,
Barcelona, Spain
Fearnley, John Stewart, Seascale
Fearnside, Gerald Michael,
Sutton Coldfield
Fernandez Nunez, Javier,
Valencia, Spain
Fernandez-Monge Glez Audicana,
Manuel, Bilbao, Spain
Fernando, K. S. S.,
Panadura, Rep. of Sri Lanka
Ferrer Arbona, Santiago,
Valencia, Spain
Findlay, Kenneth William,
Johannesburg, Rep. of S. Africa
Fish, Lorraine Alison, London
Fishwick, John, Nottingham
Fletcher, H., Derby
Fojud, Betty Eleanor, Nottingham
Forman, Ian Arthur, Buckingham
Forsey, Stella,
Wellington, New Zealand
Frankham, Elaine, Liverpool
French, Anthony James,
Brockenhurst
French, Frank Geoffrey, Purley
Fulwiler, Jill Ann,
Los Angeles, Cal., U.S.A.
Gabrielle, Louis Michael,
West Hill, Ontario, Canada
Galofre Munne, Ma. Rita,
Barcelona, Spain
Garcia Igual, Arturo,
Valencia, Spain
Gaunt, Adrian J., London
Gayton, Mildred Prudence,
Southport
Gibbons, Frederick Charles, London
Gibson, Sarah, Frizington
Gill, Joseph Osborne,
Denver, Col., U.S.A.
Gonzalez Gimenez, Anastasio,
Barcelona, Spain
Gonzalez Rosich, Daniel,
Barcelona, Spain
Goossens, Johannes Petrus,
Durban, Rep. of S. Africa
Goynshor, Frederick Jay,
Chicago, Ill., U.S.A.
Grupe, William Arthur,
Los Angeles, Cal., U.S.A.
Gunawardana, Panadura Lohakaruge
Gamini, Nugegoda, Sri Lanka
Gustin, I. M., Hong Kong
Hackett, Christopher John,
Chislehurst
Handley, Michael, Crawley
Harrison, Andrew, Harrow
Hart, Frederick Lloyd,
Pottstown, Pa., U.S.A.
Haskings, Theresa M., Nottingham
Heaviside, Desmond, Middlesbrough
Hemans, David Austen, London
Hettema, Jan Anton Hyacint Maria,
Schoonhoven, Holland
Hewitt, Robert Henry, Gosforth
Hindle, Kenneth, Blackpool
Hofelt, Joris, Schoonhoven, Holland
Howell, Philip Edward, Worthing
Htay, Han, Rangoon, Burma
Hunter, Thomas Stuart, Liverpool
Ishikawa, Taeko, London
Jacobson, Brian M., Dublin
Jason, Neville Howard, Prestwich
Jayakody, Don Francis,
Ja-Ela, Rep. of Sri Lanka
Jayasinhji, Prince, of Dhrangadhra,
New Delhi, India
Jones, Peter Richard, Bury
Kamerbeek, Joseph Marie Willy,
St. Maarten, Netherlands Antilles
Kan, Eishi, London
Kenderdine, Fenella Hope, Sevenoaks
Kennedy, Esther I.,
Charlotte, N. Carolina, U.S.A.
Kim, Yong Sung, Tokyo, Japan
Klean, Christopher, London
Ko, Maung, Rangoon, Burma
Korevaar-Van Es, Marianne,
Amsterdam, Holland
Koskiahde, Mauno, Turku, Finland
Kyi, Khin Win, Rangoon, Burma

Larah, Howard Anthony, Manchester
Layton, Margaret Clare, London
Le Roux, Emmerentia Elizabeth, Johannesburg, Rep. of S. Africa
Levy, Moshe, Edgware
Levy, Martyn George, Edinburgh
Lewis, Sheila Judith, Kenton
Lindau, Georg, Munich, W. Germany
Littman, Steven David, Glenside, Pa., U.S.A.
Lo, Louis Yick-Sun, Hong Kong
Lopez Vano, Ma. Carmen, Valencia, Spain
Luff, Gillian Gay, London
Lyall-Grant, Mary Jennifer, London
Lynch, Errol Barrington, London
McDarby, Elizabeth Margaret, London
McDonald, Lori Gay, Palo Alto, Cal., U.S.A.
MacDonnell, Mark L., Budleigh Salterton
MacGregor, Elizabeth Jane, Mozambique, P.E. Africa
McKenzie, Malcolm, Frizington
McLean, John, Welkom, Rep. of S. Africa
Mathu, Ann Mumbi, Idar-Oberstein, W. Germany
Matsuda, Tsuyoshi, Kobe, Japan
Matsumoto, Kikuo, Gunma-Ken, Japan
Mazloum, Charles, Beirut, Lebanon
Mitchell, Stuart Roger, Bradford
Molina Bosch, Juan, Barcelona, Spain
Montane Baro, Miguel, Andorra La Vieja, Spain
Montanes Moreno, Diego, Malaga, Spain
Munne Cardona, Ana Ma., Barcelona, Spain
Nagamatsu, Akira, Chiba-Ken, Japan
Nakaniwa, Shoichi, Osaka, Japan
Nelson, Keith Elwin, Arvada, Colorado, U.S.A.
Nichols, John Howard, London
Nicol, William Maxwell, Dunstable
Niinobe. Hiroko, Kobe, Japan
Nizous, Mohideen Saibo Mohamed, Kalutara, Rep. of Sri Lanka
O'Donnell, Ann, Leeds
Offord, Robert John, London
Oomen, Joannes Bernardus Andreas Marie, Oosterhout, Holland
Oostvogel, Frits Antoine Joan Maria, Schoonhoven, Holland
O'Rourke, John William, Rostrevor, S. Australia
Out, Louis J., Maassluis, Holland
Palomares Carbonell, Remedios, Valencia, Spain
Pardoe, John Dominic, Bristol
Parker, Eunice Isabel Anne, Feltham
Parkinson, Joanna May, Chiredzi, Rhodesia
Parkman, David Roderick Bernard, Birmingham
Pascual Rubiella, Laureano, Barcelona, Spain
Pe, Win, Rangoon, Burma
Pedro Arro, Margarita, Barcelona, Spain
Pennell, Ian Murray, Egremont
Peterson, David L., Mead, Washington, U.S.A.
Piccione, Amedeo, San Remo, Italy
Pinder, William Robert, Earlville, N.Q., Australia
Poole, Frederick Lucas, Invercargill, New Zealand
Quera Serras, Pedro, Barcelona, Spain
Rashid, Noorul Fairosa, Colombo, Rep. of Sri Lanka
Raw, D. R. L., Basingstoke
Reynolds, Walter Ernest, Cuffley
Richards, Haik, London
Riche Feliu, Susana, Barcelona, Spain
Rivero Fernandez, Gloria, Barcelona, Spain
Robinson, Rosemary Elizabeth, Plymouth

Roche, Mary Scholastica Rita Margaret, Colombo, Sri Lanka
Rodber, Jocelyn Carol, Bridport
Rogers, John Brandon, Birmingham
Roper, Vicki, London
Romero Abad, Julio, Barcelona, Spain
Rosenberg, Paul, Lake Worth, Florida, U.S.A.
Rowe, Leonard James, Hanworth
Rubia Barrios, Luis de la, Malaga, Spain
Russo, Mario, Bari, Italy
Sapieha, Teresh Jadwica, Nairobi, Kenya, E. Africa
Sanchis Bernat, Santiago-German, Valencia, Spain
Schwartzman, Sonja S., Bethesda, Md., U.S.A.
Scrymgeour, David John, Newton Abbot
Sellas Molist, Juan, Valencia, Spain
Sieders, Margaretha Elisabeth, Schoonhoven, Holland
Simm, Geoffrey, Bolton
Simon, Gail Natalie, Liverpool
Simpson, Maurice, Doncaster
Sluis, Jan, Vlaardingen, Holland
Smith, Dennis Charles, London
Soler Casulleras, Francisca, Barcelona, Spain
Srimal, Vijay Singh, Bangkok, Thailand
Stanford, Paul Lewis, Guernsey
Stubbs, Michael David, Palmerston North, New Zealand
Swetman, Stanley Albert, Croydon
Tanaka, Masakazu, Kobe, Japan
Tasker, Glenn V., Worthing
Taylor, Ian Frank, Doncaster
Teik, Thum Koh, Kedah, W. Malaysia
Teske, Jan, Lisse, Holland
Thomas, Claud, London
Thomas, Geoffrey, London
Thomas, Judy, London
Tormo Cruanes, Delia, Valencia, Spain
Townsend, Michael John, Wakefield
Turner, Oswald Edward, Port Elizabeth, Rep. of S. Africa
Turner, Peter Dennis, Halifax
Turner, Sylvia Lily, Port Elizabeth, Rep. of S. Africa
Twyman, Roger Keith, Maidenhead
Uden, Penelope Alison, Seaford
Ueda, Makoto, Chiba, Japan
Van Der Does, Albert K.Th., Alkmaar, Holland
Van Der Garden, E. P., Arnhem, Holland
Van Der Lubben, Marianne, Rijswijk, Holland
Van Der Molen, Leonora, Schoonhoven, Holland
Van Duijn, Helena, Schoonhoven, Holland
Van Gogh, Johan Roelant, Amsterdam, Holland
Van Gogh, Mieneke, Epe (Gelderland), Holland
Van't Hoff, S. I. J., The Hague, Holland
Van Westen, Linda, Purmerend, Holland
Vaquer Navarro, Ramon, Barcelona, Spain
Villar Lopez, Luis Fernando, La Coruna, Spain
Vos, Ruud, Arnhem, Holland
Vries, Jannie, Schagen, Holland
Wailes, Rosemary Margaret, Hong Kong
Waterhouse, Philip Arthur, Auckland, New Zealand
Watkins, Sandra, Craven Arms
Wechgelaar, Dick J. H., Zaandam, Holland
Weeks, Milton D., Annandale, Va., U.S.A.
Weiss, Dale Sharon, Los Angeles, Cal., U.S.A.
West, Eileen Beryl, Dartford
White, Paul John, Nuneaton
Wicks, Sylvia Beryl, London

Wills, John Wilson,
Durban, Rep. of S. Africa
Win, Kyaw, Rangoon, Burma
Win, Thein, Rangoon, Burma
Wolfe, Peter Howard, Windlesham
Wong, Robert Shing Hang,
Hong Kong
Wood, Ronald Stanley, Peterborough
Woodhouse, Neville, Chesterfield
Woollard, Simon Jeremy, Exeter
Woolley, Henry William George,
Oxford
Wright, Harry, Midlothian
Wright, John Michael, Burnley
Yamaguchi, Takashi, London
Yao, Gladys, Hong Kong
Zacharewicz, Henryk,
Toronto, Ont., Canada

COUNCIL MEETING

At a meeting of the Council of the Association held on Monday, 29th October, 1973, the following were elected to membership:

FELLOWSHIP

Addis, Robert C., London. D. 1973
Allin, Peggy, Port Elizabeth, S. Africa. D. 1973
Anderson, Alice M., Toronto, Ont., Canada. D. 1973
Atherton, Stanley, Adlington, nr. Chorley. D. 1973
Bayarri Bosch, Federico, Barcelona, Spain. D. 1973
Betts, Stuart E., London. D. 1973
Burnett, Brian D., Formby. D. 1973
Butler, Tomiko S., Silver Spring, Maryland, U.S.A. D. 1973
Chaloner. Rosemary J., Altrincham. D. 1973
Cooke, Victoria J., Fountain Dale, nr. Blidworth, Notts. D. 1973
Crombie, Jonathan M., London. D. 1973
De Silva, S. P. N., Hong Kong. D. 1973
Dewhirst, Stephen C., Stockport. D. 1973
Dickenson, John W., Liverpool. D. 1973
Fellows, Norman J., Ascot. D. 1973
Fryer, Frederick A., London. D. 1973
Fulwiler, Jill A., Los Angeles, Cal., U.S.A. D. 1973
Gill, Joseph O., Vancouver, Washington, U.S.A. D. 1973
Grainger, Michael G. F., London. D. 1973
Higham, Joyce R., Ecclestone Park, nr. Prescott. D. 1973
Hinchliffe, Roger, Eastbourne. D. 1973
Kawahara, Makio, Fukuoka City, Japan. D. 1973
Klean, Christopher A., London. D. 1973
Klein, Adrian H., London. D. 1973
Liberg, Finn O., Hamar, Norway. D. 1973
Linden, Howard M., Westcliff-on-Sea. D. 1973
Mason, John A. C., Harrogate. D. 1973
Mathu, Ann M., Idar-Oberstein, W. Germany. D. 1973
Matthews, Shelagh J., Port Elizabeth, S. Africa. D. 1973
Merriman, Patricia J., Wallasey. D. 1973
Mitchell, Stuart R., Bradford. D. 1973
Mjelva, Helge R., Aalesund, Norway. D. 1973
Munro-Ferguson, Molly A. L., Evanton, Ross-shire. D. 1973

Oliver, Graham D., Wellington, New Zealand. D. 1973
Oomen, Joannes, Badgodesberg. W. Germany. D. 1973
Roberts, James I., Worksop. D. 1973
Scott, Gillian M., London. D. 1973
Sims, Paul E., Bristol. D. 1973
Such, Paul N., Sutton Coldfield. D. 1973
Tait, Alistir W., Edinburgh. D. 1973
Taylor, Clive J., Gravesend. D. 1973
Thompson, Harry, Birkenhead. D. 1973
Van Der Loo, Albert, Rotterdam, Holland. D. 1973
Van Servellen, Anne M., Rotterdam, Holland. D. 1973
Walton, Cecil, Whiston, Prescot. D. 1973
Watanabe, Teruo, Tokyo, Japan. D. 1973
White, Paul J., Nuneaton. D. 1973

Transfers from Ordinary Membership to Fellowship

Ashcroft, Vera, Liverpool
Bloom, Charles N., London
Chetty, Samuel F. C., Vasby, Sweden
Chlupacek, Joseph M., Merrillville, Indiana, U.S.A.
Clark, David J., London
Cox, Edward C.. Auckland, New Zealand
Cummings, Bruce W., Wilton, Con., U.S.A.
Dabaghi, Khalil, Beirut, Lebanon
Daly, Patrick J. E., Chelmsford
Dunn, Pete J., Washington, D.C., U.S.A.
Frodin, P. J., Wirral
Green, Roger, Leicester
Hamel, George J. W., Leiderdorp, Holland
Hebrecht, Julien, Gouda, Holland
Jordaan, Barend D., Stellenbosch, S. Africa
Kalina, Freda F., London
Karunaratna, Avanti Y., Stoke Nelson, New Zealand
Kawahara, Makio, Fukuoka City, Japan
Kilpatrick, Constance, Aberdeen
Knoske, Gene E., New Berlin, Wisconsin, U.S.A.
Leek, Janet S., Alcester
Littman, Herbert, Highland Park, New Jersey, U.S.A.
MacDonnell, Mark L., Otterton
MacOlive, John R. W., Krugersdorp, S. Africa
Malin, Kathleen M., London
Malone, Ben D., Highlands, N. Carolina, U.S.A.
Marble, Carolyn C., New York, N.Y., U.S.A.
Massie, George A., Sheffield
Maury, Robert L., Port Charlotte, Fa., U.S.A.
Melvin, Ena M., Auckland, New Zealand
Neagle, Trevor G., Norton
Nightingale, Stephen, Scarborough
Nissanka, Geeta S., Colombo, Ceylon
O'Rourke, John W., Rostrevor, Australia
Pease, Belinda A. G., Geneva, Switzerland
Peterson, David L., Los Angeles, Cal., U.S.A.
Robson, Edward R.. Nairobi, Kenya
Scarratt, Kenneth V. G., Ilford, Essex
Stenberg, Richard M., Springfield, Mass., U.S.A.
Stenson, Ann P. S., Ottawa, Ont., Canada
Trigg, Roger C., Cape, S. Africa
Winter, Colin H., Dorking
Yamaguchi, Takashi, London
Yang, Jinhua, Tokyo, Japan

Abdulla, Mohamedali G., Mombasa, Kenya
Abeysinghe, Deenabandu, D., Colombo, Ceylon
Airey, Lawrence D., Blackpool
Akagawa, Hikaru, Tokyo, Japan
Akehurst, Richard D., Oxted
Allen, David M.. Blachly, Oregon, U.S.A.
Appleby, John A., Dublin
Appleby, Jonathan M., London
Amamiya, Kumiko, Chiba, Japan
Andres-Gayon y Rosales, Juan I., Madrid, Spain
Arai, Teruko, Tokyo, Japan
Arita, Takashi, Saga City, Japan
Arnold, Alan P., Metairie, Louisiana, U.S.A.
Bartolotti, Anna, Lugano, Switzerland
Bekrova-Doyle, Drahomira V., Rio de Janeiro, Brazil
Benjamin, John, Wembley Park
Besse-Desbiolles, Francoise M., Geneva, Switzerland
Bitomsky, Harold F., Queensland, Australia
Blampied, Richard E., St. Helier, Jersey
Bloomhill, Edward, Bulawayo, Rhodesia
Boers, Leonie, Didam, Holland
Bolder, John A., Didam, Holland
Bolli, Bruno, St. Gallen, Switzerland
Bosher, John P., London
Brummer. J. J., Islington, Ont., Canada
Cadranel, Maurice, London
Caffoor, Ali A. A., Dehiwala, Ceylon
Cann, Denis L., Pevensey Bay
Capell, Eline, Port Elizabeth, S. Africa
Carry, Peter D., Liverpool
Castle, Graeme R. W., Timaru, New Zealand
Chapman, Arthur F., McCrae, Victoria, Australia
Cheung, Matilda C. Y., London
Chiba, Ryuko, Tokyo, Japan
Clark, Frances F., Menlo Park, Cal., U.S.A.
Collie, Ann E., Cape Town, S. Africa
Connelly, Frank S., Dundee
Coutts, J. M., Johannesburg, S. Africa
Croston, John, Salford
Crowley, Anthea M., London
Dagogo-Jack, Sumner K., Port Harcourt, Nigeria, W. Africa
Daras, Edith, London
Demiliani, Vittorio, Genoa, Italy
De Silva, Noeline B., Colombo, Ceylon
Dorn, Moniko M., Johannesburg, S. Africa
Duckworth, Andrew S., Bolton
East-Almond, Beatrice F. C., Malvern, Victoria, Australia
Edomonds, W. P., Salisbury, Rhodesia
Engineer, Thrity P., Hong Kong
Findlay, Kenneth W., Johannesburg, S. Africa
Forsyth, James P., Norfolk, Va., U.S.A.
Fowler, Jonathan A., Mayfield
Franz, Rudolf S., Cape, S. Africa
Freeman, Michael J., Bulawayo, Rhodesia
Freyser-Ligthart, M. W., Vooburg, Holland
Frogley, Warrick G., Wellington, New Zealand
Fujii, Masao, Tokyo, Japan
Fujii, Takayoshi, Tokyo, Japan
Fujimoto, Naomi, Osaka, Japan
Fujiwara, Toshiko, Kobe, Japan
Fullerton, Kenneth J., Singapore
Fullerton-Smith, Richard E. A., Auckland, New Zealand
Garcia, Ruben, Lisbon, Portugal
Gill, Robert M., Boston
Goldberg, Richard, Canberra, A.C.T., Australia

Graham, Kenneth L., Gainesville, Fa., U.S.A.
Guan, Sow H., Selangor, W. Malaysia
Guruswamy, Lakshman D., Colombo, Ceylon
Haefner, Richard, New Paltz, New York, U.S.A.
Hager, Freddy S., London
Hall, Warren S., Croydon
Handley, Michael, Plummers Plain, Nr. Horsham
Harada, Hatsuko, Miami, Fa., U.S.A.
Harada, Kazuo, Fukuoka City, Japan
Hariman, Eddie, Malang, Indonesia
Haynes, Simon J., Henley-on-Thames
Hebbard, Christopher R., Fareham
Heckman, Hayo W., The Hague, Holland
Hendrickson, James E., Los Aitos, Cal., U.S.A.
Hollyhock, William M., Gosport
Honeker, Vera M., Esher
Houghton, Gary, Sarnia, Ont., Canada
Hummel, Frank A., Weiser, Idaho, U.S.A.
Hunter, Robin G., High Wycombe
Ichinose, Kichiro, Hyogo-ken, Japan
Imai, Kiichi, Tokyo, Japan
Imai, Takayasu, London
Inoue, Kazuo, Tokyo, Japan
Ishikawa, Koki I., Tokyo, Japan
Ishikawa, Taeko, London
Itoh, Keiko, Tokyo, Japan
Iwata, Mitsuo, Hyogo, Japan
Javeri, Kishan, Kobe, Japan
Jones, Daniele J. J., Ascot
Jucker, Walter O., Salisbury, Rhodesia
Kaku, Eishu, Kobe, Japan
Kanari, Akiko, Tokyo, Japan
Kato, Yoshio, Chieyu-city, Japan
Kawachi, Akihiro, Tokyo, Japan
Kenai, Seiji, Yokohama-city, Japan
King, Sally A., London
Kitano, Keiko, Yokohama-city, Japan
Kobayashi, Eizo, Kofu-city, Japan
Koh Siew Lian, Ivy, Singapore
Kojima, Mieko, Yokohama-city, Japan
Komar, David I., London
Krasner, Harold. Johannesburg, S. Africa
Kume, Hironao, Tondabayashi-city, Japan
Kurakami, Genji, Kofu-city, Japan
Kurakami, Yukitaka, Kofu-city, Japan
Laing, Michael N., Troon, Ayrshire
Laing, William S., Glasgow
Lally, Kathleen M., Northwood
Lee, Kevin W. T. Y., Hong Kong
Leyser, Gerarda S. M., Arnhem, Holland
Lewis, Sheila J., Kenton
Lim, Audrey S. N., Singapore
Lincoln, Anthony D., Waltham Abbey
Lindau, George, Munich, W. Germany
Logsdon, Maxon A., Wethersfield, Conn., U.S.A.
Lo Wing Yat, Sunny, Hong Kong
Macgregor, Elizabeth J., Lourenço Marques, Mozambique
Maeda, Kikuko, Tokyo, Japan
Marchand, Hummer D., Northampton, Mass., U.S.A.
Maris, Sophia A., London
Matthews, Barry E., Trinity, Jersey
Matui, Yoshihiro, Fukuoka-city, Japan
Mayama, Kozo, Tokyo, Japan
McDarby, Elizabeth M., London
Megel, Gary E., Colorado Springs, Col., U.S.A.
Mehta, Narendra M., Bombay, India
Mills, Peter M., Canterbury
Miwa, Tatsumasa, Tokyo, Japan
Momozawa, Toshiyuki, Tokyo, Japan

Morfett, John, London
Mori, Issei, Osaka, Japan
Morris, Eric F., Christies Beach, S. Australia
Mostert, Stella, Montreal. Quebec, Canada
Mtiiye, Riessen, Moshi, Tanzania
Muchmore, Leslie R., Liskeard
Munasinghe, Shirani R., Colombo, Ceylon
Muraoka, Midori, Tokyo, Japan
Nadarajah, Veeragathy, Colombo, Ceylon
Nagai, Shigeru, Hiroshima-city, Japan
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EXAMINATIONS 1974

The dates for the 1974 examinations are as follows:

Examinations in Gemmology

Preliminary	Theory	Tuesday, 18th June
Diploma	Theory	Wednesday, 19th June
	Practical	Thursday, 20th June or Friday, 21st June (London). Other centres as arranged.

Final date for entry for Examination in Gemmology—1st March.

Gem Diamond Examination

Theory	Monday, 10th June (afternoon).
Practical	U.K.—Monday, 10th June or Tuesday, 11th June (mornings). Other centres as arranged.

Final date for entry for Gem Diamond Examination—1st April.

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