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and

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GEMMOLOGICAL ASSOCIATION OF GREAT BRITAIN

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OF GREAT BRITAIN
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TRIPLE BILL

Three items of interest to Gemmologists

By B. W. ANDERSON

1. Blue zoisite: a new gem variety

For the keen gemmologist it is always an exciting event when a new gemstone or a new variety of some already known gemstone makes its appearance. Unfortunately such new arrivals seldom have any commercial importance—they may be too rare, too soft, or insufficiently attractive to make them more than collector's items.

Some fine transparent blue-violet crystals, eventually identified as zoisite, have recently been arriving from an East African source. This is said to be in Tanzania near the Kenya border, in the Gerevi Hills, and is near where some interesting vanadium-rich tourmalines have previously been found, as described by Mr. Robert Webster in the *Gemmologist* (March, 1961). These blue zoisites are unlike anything so far seen, and bid fair to be a really interesting addition to the coloured-stone range. It is too early to judge just how plentiful this material is, but enough sizeable pieces have been seen from several trade sources to indicate that it is not too scarce to be commercially handled.

Hitherto, zoisite has been known to gemmologists only in two massive polycrystalline forms suitable for decorative purposes. One of these is the pink variety, thulite, which owes its colour to a little manganese: the other is the handsome green chrome-rich variety which accompanies black amphibole and large hexagonal crystals of ruby in the Matabutu Mountains, Tanzania.

This blue variety was at first reputed to be dumortierite, which is known to occur in blue or violet massive forms with properties not dissimilar from those of the E. African crystals. But the only transparent monocrystalline specimen of dumortierite on record is a brown cut gemstone brought home from Ceylon in 1950 by Mr. Kenneth Parkinson, and purchased by the writer. This was at first thought to be a new mineral, as its properties did not match any given in the literature. However, chemical and X-ray analysis carried out in the Mineral Department of the Natural History Museum proved its identity beyond doubt. For the record, here are the properties of this unique specimen: refractive indices, 1·686, 1·722, and 1·723 for the three principal rays, showing a strongly negative birefringence of 0·037: density, 3·41, and hardness, $8\frac{1}{2}$. The astonishingly high hardness was measured quantitatively for us by Dr. W. Stern, using an indentation method.

The discrepancies between this brown dumortierite and the blue crystals from E. Africa (the properties of which are given below) were so considerable that it was reassuring to have the mineral correctly determined as zoisite by X-ray analysis in the laboratories of the Geological Survey and the Natural History Museum.

Crystals of the blue zoisite so far examined have all been incomplete, showing an odd prism or pinacoid face or two, but never a complete zone. It is uncertain therefore whether the habit is the usual one given in text-books for this orthorhombic mineral. There is one perfect cleavage (said to be parallel to the 010 plane) and on one cleavage surface C. J. Payne was able to obtain accurate refractive index readings on our Abbé-Pulfrich refractometer. The values were, $\alpha = 1{\cdot}6917$, $\beta = 1{\cdot}6927$, $\gamma = 1{\cdot}7005$. The birefringence was thus 0·0088, and strongly positive. The density of a number of pieces was determined by hydrostatic weighing in ethylene dibromide, and proved to be remarkably constant at 3·354-3·355. Two pieces which had slightly lower

densities were seen to have hollow tubular inclusions, which readily accounted for the difference. The hardness was 6 or perhaps a little higher, the mineral scratching window-glass but being itself scratched by a sharp fragment of quartz.

The spectroscope revealed a fairly broad absorption band in the orange-yellow, centred near 5950Å. The strength and position of the band varied somewhat with direction through the mineral, as might be expected from so pleochroic a substance (see under). There were two fainter broad bands in the green (5280Å) and blue (4550Å). It was interesting also to detect several narrow lines in the deep red, resembling weak chromium lines. These, and the broad 5950 band, are reminiscent of the green vanadium tourmalines described by Webster, and it seems quite possible that the colour of this blue-violet zoisite is due to traces of vanadium.

There was no noticeable fluorescence under long-wave or short-wave ultra-violet, nor under crossed filters—thus chromium was presumably absent. Under X-rays there was a feeble bluish glimmer.

Probably the most remarkable feature of this new zoisite lies in the strength and beauty of its pleochroism. The three colours belonging respectively to the three principal vibration directions and seen, two at a time, through the dichroscope when the stone is turned in different directions, are a magnificent sapphire-blue, a rich purple, and a rather pale sage-green. Where possible, the lapidary would be well advised to cut the stone in such a way that the two deeper colours are those seen in directions at right angles to the table facet. The crystals actually vary considerably in depth of tint. The paler types may prove a little insipid when cut, like a pale mauve spinel, sapphire, or amethyst; but those of deeper colour should provide gemstones of very considerable beauty.

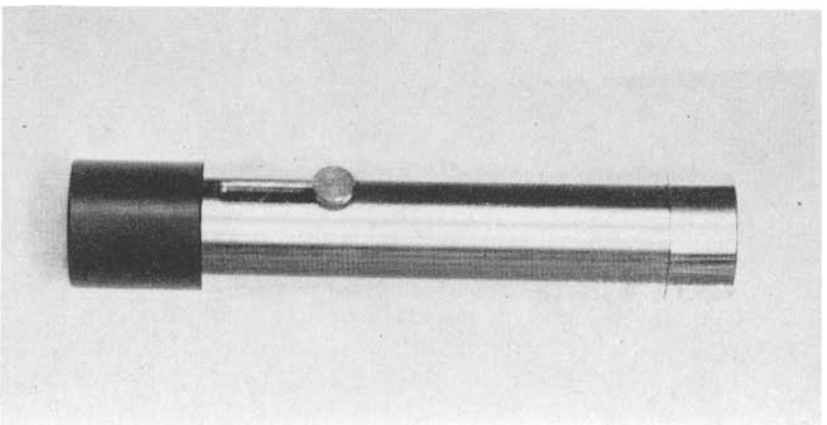
2. An inexpensive spectroscope

The spectroscope has for many years been recognized as one of the three really essential gem-testing instruments; but the young gemmologist may well hesitate to buy one for his own use owing to its high price. Before the war the most suitable prism spectroscope for viewing the absorption spectra of gemstones (the Beck 2458) was priced at under £4, while to-day it costs more than £20.

This represents a higher relative increase than that for any other instrument—more than fivefold, as compared, for instance, with the threefold increase in cost of a standard Rayner refractometer.

Thus, to find in a catalogue of miscellaneous instruments and scientific gadgets issued by "Sound and Science Ltd." (a firm with several London branches) a direct-vision prism spectroscope priced at only £6 15s. 0d. (Nov. 1967) was extremely interesting, and I thought it worth while obtaining one of these instruments and giving it a trial to see whether it was suitable for gemmological use. I may say at once that I was impressed at the excellence of its workmanship and performance.

It consists of a simple tube, 3·6 inches in overall length, containing a collimating lens and the usual train of prisms. At one end is a fixed slit and at the other the eyepiece, focusing being achieved by means of a smoothly sliding knob in the side of the tube (see illustration). Both the slit and the eyepiece ends are safely sealed from dust by a glass window. The width of the slit (which is simply a narrow slot in a metal plate, probably cut with a diamond saw) is perfectly chosen for the observation of sharp, bright line spectra such as those emitted by mercury, neon, or sodium vapour lamps. This is obviously the prime object of this simple instrument and the added refinement of an adjustable slit is quite unnecessary for emission spectroscopy. The gemmologist, on the other hand, often needs to search for bands in the obscurity of the blue and violet part of the spectrum where there is also



considerable general absorption, and then the ability to open the slit slightly to admit more light, even though it means some loss of definition, is a very real advantage.

The dispersion of the spectroscope under review is slightly greater than that of the Beck 2458 to which we are most accustomed, and which is probably ideal in that it enables the viewer to cover the whole visible spectrum with ease—but towards the red end of the spectrum the new instrument scores in revealing the narrow chromium lines in ruby, emerald, and alexandrite in unaccustomed detail, while under good conditions the important diamond line at 4155Å could be detected. An added pleasure is the complete absence of dust streaks, while the focusing is very smooth and positive, and requires little adjustment between one end of the spectrum and the other.

On balance one can say that this little hand-spectroscope is a very good buy for the gemmologist who feels debarred from using any of the standard instruments of this kind on the grounds of cost. He must, however, be prepared to provide himself with a really powerful source of light, such as a 300 or 500 watt projection bulb, suitably housed, condensed by means of flasks of pure water or containing copper sulphate solution, according to the part of the spectrum to be examined. The spectra of ruby, emerald, alexandrite, red spinel, zircon, almandine, didymium (in various host minerals), enstatite, peridot, sapphire, are amongst those which should be clearly visible. Only the absorption bands in the violet, such as the jadeite 4370 and turquoise 4300Å bands, should be appreciably more difficult to obtain than in the more expensive spectroscopes with adjustable slits.

The "hand spectroscope" described above has no special number or title. It is snugly housed in a plush-lined box, and is made in Japan.

3. A pearl from the common whelk

It is well-known that a number of shell-fish other than the recognized salt-water "pearl oysters" or fresh-water "pearl mussels" are capable of producing pearls of a sort, though these are seldom of much commercial value. The nature of the pearl or concretion must necessarily depend largely upon the texture and type of lining found in the shell of the mollusc—since the normal function

of the cells which secrete the "pearl" is simply to build a shell in which the soft-bodied creature can live with a fair degree of safety. Thus the nacreous beauty of the pearls most valued in commerce can only be derived from molluscs whose shells are lined with mother-of-pearl.

Certain non-nacreous pearls, however, in particular the "pink pearls" found in the giant conch (*Strombus gigas*) are sufficiently attractive to find a place in jewellery. These have a porcelain-like surface (in common with that of the shell lining) enlivened by a curious sheen at certain angles, having a characteristic and attractive flame-like pattern. Conch-pearls, as their alternative name suggests, are usually pale pink in colour. Very similar pearls, but white in colour, are occasionally found in the giant clam (*Tridacna gigas*). A characteristic of these products is a density around the 2·85 mark which is appreciably higher than that of the coral they somewhat resemble, or of nacreous pearls.

It was something of a shock when a pretty little pearl showing the typical "flame pattern" of conch pearl, though having very little colour, was sent to us by the National Association of Goldsmiths with the story that it had been found in the flesh of a common whelk, *Baccinum undatum*, so extensively used for food amongst those who have a taste for shell-fish. In addition to the surface structure, the density of the whelk pearl, which weighed 1·23 carats was found to be high (2·80), though not quite up to the usual conch value.

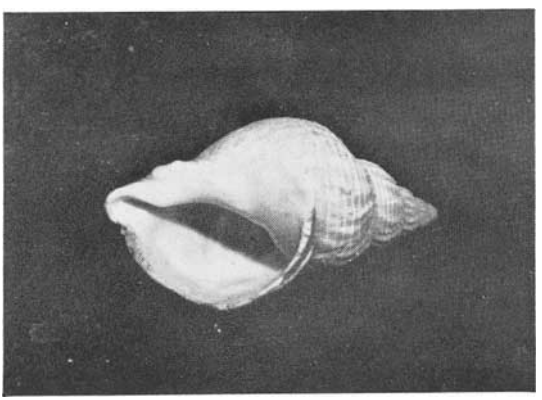


FIG. 2. *Common whelk.*

PEANUT OBSIDIAN FROM SONORA, MEXICO

By PAUL L. BROUGHTON

SEVERAL years ago a new American lapidary material entered the market of Southern California and its use gradually spread throughout the country and nearby Mexico. The material is popularly referred to as peanut obsidian, though it is, in fact, a spherulitic perlite. This black natural glass contains, in amounts up to one half of its volume, quarter-inch in diameter hematite-red spherulites. When cut on cabochon it produces a pleasing effect similar to bloodstone, except red on black. The matrix and spherulites take an even glassy polish, both equally matched in hardness to prevent serious undercutting.

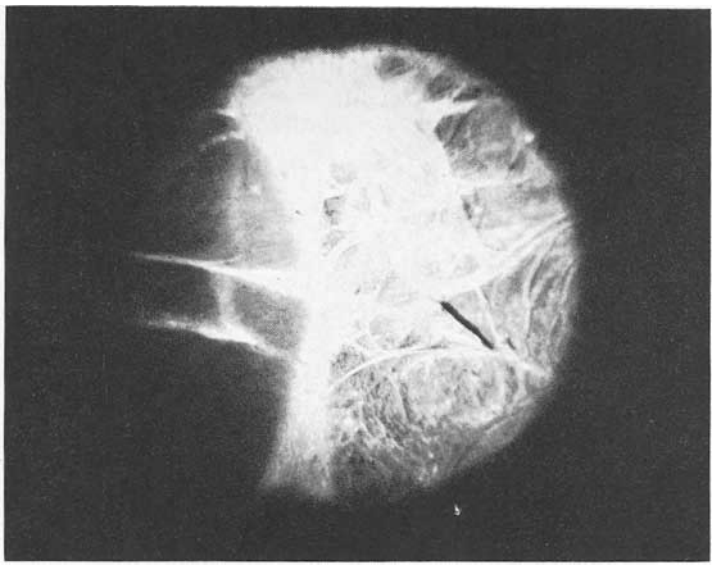
Thin section examination reveals the perlitic texture of the "obsidian". The spherulites consist of thin rod-like radiating crystals of feldspar, stained red by hematite. Secondary chalcedony appears to encase each spherulite and constitutes the fill of the cracks in the spherulite itself. An X-ray diffractometer analysis of the spherulite verified the presence of interstitial cristobalite, as well as the feldspar being near oligoclase in composition.

The original material was discovered by one Alberto Maas near Alamos, Sonora, Mexico. In the proximity of the original outcrop, a deposit of an agatized variety was later discovered. The matrix of this variety had been altered to an earthy grey colour. The spherules in this case are relatively large, up to two inches across, and consist of red, grey, white and brown concentric layers. Another variety of the material is with a porcelain-like matrix with the typical quarter-inch red spherulites. Dr. Frederick H. Pough asserts that it was altered by devitrification to bentonite,[1] rendering it too soft for most lapidary uses.

The term "peanut obsidian" has its own interesting etymology. Originally, the term "almasite" was proposed by one James Kraft, a renowned American jade carver, who formed the financial backing of Alberto Maas' exploitation of the Alamos deposit. As it turned out, the name had already been applied to a lead metasilicate from a small gold and copper prospect nearby. Gradually, the term peanut obsidian, in reference to the red "peanut" spherulites, received acceptance by the lapidarists familiar with the material.

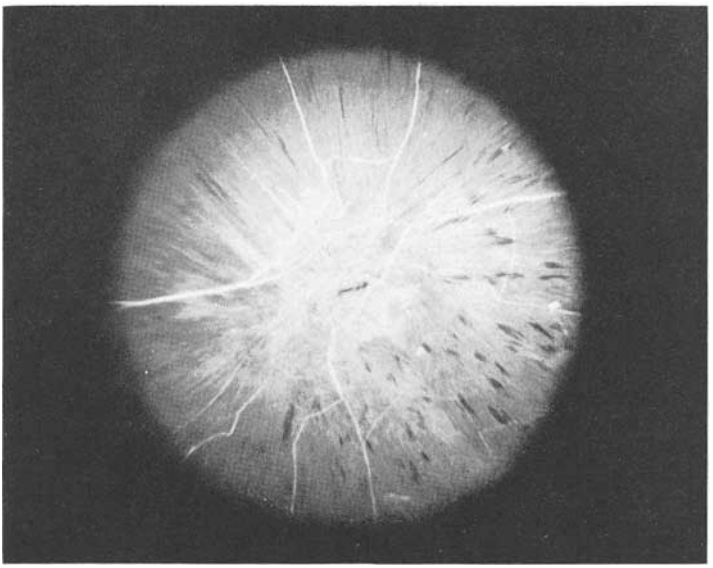
REFERENCE

1. Maurice Hebner, *Written Communication*, March 19th, 1966.

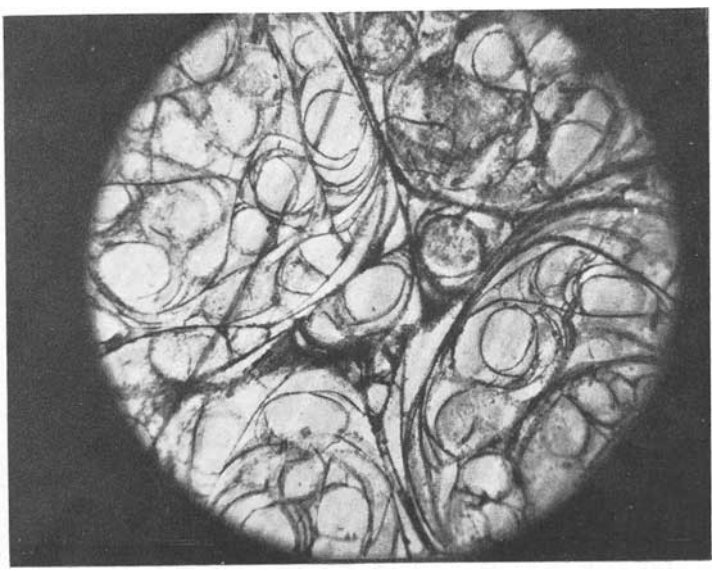


A rare agatized variety of peanut obsidian Specimen about three inches across.

Photomicrograph of the contact between the spherulite (left) and the perlitic structure obsidian (right). Note the wide chalcedony (vertical white streak) deposit at the contact.



Full view of the spherulite showing cracks filled by secondary chalcdony.



Typical texture of the peanut obsidian perlitic texture.

POSTAL GEMS

By S. B. NIKON COOPER

FOR the benefit of any impecunious gemmologist who would like to start a gem collection but lacks the wherewithal to do so, I would suggest that a collection of crystals and minerals in postage-stamps be made. This need not be a reversion to old school-day habits; it can be an informative and interesting pastime. There are many countries which have chosen to portray gems and crystals on their postage-stamps, and this number will doubtless increase as the "thermatic" side of the hobby spreads, with the countries concerned realising the economic and prestige value to themselves in supporting this.

Switzerland leads the field with a whole series of "Pro Patria" issues. These, designed by N. Stoecklin, give particularly colourful and life-like illustrations of gem crystals, showing clearly matrix and gem-habit, with details of symmetry and striation, etc., well in evidence for the student.

Quartz is well represented, with illustrations of smoky quartz (1960), rock crystal (1958), amethyst (showing a rare "sceptre" crystal (1959), and with, I think, a poor-ish, highly coloured illustration of fortification-agate (also 1959).

There are two illustrations of fluorite: one (1958), showing a typical interpenetrant twin, and the other (1961), giving an illustration of the classic Chamonix pink octahedral form. Feldspar (1960), almandine garnet (1958) and tourmaline (1959) are also included in this series.

The Russians, with a superb set of stamps, issued in 1963, have portrayed their own, Ural, gem region. These are particularly beautiful stamps showing malachite, rhodonite, ribbon-jasper, amethyst and emerald—and the one no-one interested in crystallography should be without: a topaz of the "Ural" type, with the "c" face particularly prominent.

S.W. Africa, too, has contributed a series on its native gems, but I would wish the standard of printing here were as high as that of the first two countries mentioned. This series, showing crystals and cut stones, is of tourmaline, topaz, golden beryl and diamond.

Diamond, of course, as a symbol of national prosperity is featured by several countries: a stylized representation from S. Africa (1966) marks that country's association with the Queen of Gems. An issue from Tanganyika (1961) serves to remind me, at least, of the Williamson pipe discovery in that country. Another (1967), comes from the new territory of Lesotho (Basutoland), and finally, the gem-cutting industry of the Low Countries has not been forgotten and is marked by an issue from Belgium (1965).

Rhodesia has recently produced two "gem" stamps, showing crystals and cut stones, reminding us of her own Sandawana emeralds.

Lastly, though hardly gem-minerals, E. Germany has come into the stamp field with her 1965 issue, featuring two illustrations: of sulphur and proustite.

All in all, a colourful little collection can be built up, and one which I believe will grow as other countries follow the lead. One looks forward to the day when Brazil—to name at least one—will issue her stamps. Again, such a collection has one great factor in its favour: whereas stamps have value, these issues are, all of them, of recent date, and mercifully not in the same price-range as the gems they represent.

INCLUSIONS IN BLACK STAR-PYROXENE

By J. F. R. PONAHLO

QUITE recently B. F. Martin[1] studied diopsides of black colour exhibiting a type of asterism and published some photographs of inclusions. In another paper in this journal W. F. Eppler[2] studied the phenomenon of asterism in a brown diopside and suggested that the exsolved material could possibly be clinoenstatite. In his publication reference was made to an article by R. Liddicoat[3], who reported on the formation of both broad and narrow rays of a four-rayed star, obviously also seen in cabochon-cut black diopsides.

It was during a recent visit of the author of this article to Idar-Oberstein that a number of black star-pyroxenes could be inspected, and from a quick glance upon more than 100 specimens and after investigations of samples with a 12 × lens it became evident that the rays of the star intersect at nearly the same angles of roughly 105°, thus corroborating the findings of Martin on a larger number of specimens.

Since more than a year such star-stones had been intermittently investigated in the author's own laboratory and a short summary of this work might be of interest to gemmologists.

Density measurements, determinations of the refractive indices by means of a Rayner-refractometer and preliminary tests with a microscope gave results that were consistent with the findings previously published, only the values of the double refringence of 0·028-0·030 were higher than those found by Martin. No specimen tested was of other colour than a deep satin-black. All samples were polished cabochons. It was said the raw material would come from India, but the author's endeavour to get a piece in the rough was frustrated. According to Eppler they are of a brown colour, but obviously this was a different material, for brown colours could only be found in thin, translucent slices of unpolished sections.

To get a better insight into the nature of the inclusions it was necessary to prepare thin slides, polished flat samples and some fine powder for the X-ray analysis of this opaque pyroxene.

When polishing a cabochon on its flat base for subsequent studies in incident light, strong reflections from small inclusions were observed which, under low magnification, showed an unmistakably metallic character. During the preparation of a powder for X-ray analysis a strong magnetism of the particles was observed. It was very difficult to separate this powder into magnetic and non-magnetic particles. Even in fine powders the effect of magnetism was noticeable.

The diffraction diagrams taken on a Philips X-ray goniometer with Cu-Kα radiation of two specimens gave consistent results. The host material was a monoclinic pyroxene of "augite" structure C2/c, to use the notation of Bown and Gay[4]. Of other reflections only those of magnetite could be found. As expected a number of reflections from magnetite coincide with some from the host-mineral indicating also epitaxy. Only the most prominent lines of magnetite which reinforce some rather weak reflections of the augite, and two characteristic reflections of magnetite which were free from coincidence could be used for the identification of the inclusions. The diagrams were compared with data from literature and checked against diagrams taken from natural, light-green diopside and black augite crystals.

It is known from Bown & Gay[4] that in naturally occurring pyroxenes only magnetite and ilmenite are found as magnetic inclusions. By comparison of the X-ray data ilmenite was certainly absent. Under the microscope and in incident light these coarse, plate-like inclusions with a sort of metallic lustre were isotropic, whereas ilmenite should be hexagonal-rhombohedral. Therefore these inclusions could only be magnetite.

In thin slides prepared in the laboratory the width of these inclusions could be measured and values were found between 30 and 150 microns, their length being ten to twenty times their width. Inclusions of such dimensions cannot cause asterism—which would be based on an interference phenomenon.

Higher magnifications than 150 × revealed the existence of

a matrix of brown material. It consisted of a system of fine lamellae showing signs of orientation similar to those of the broad and large inclusions. These lamellae were short, usually between three to ten microns, very rarely extending to 40 microns. The thickness seemed to be half of the width. Although with the equipment at hand no accurate measurement could be made, the average width of these inclusions (thickness) was certainly less than one micron, possibly not more than 0·4 microns. The excellent contrast these inclusions showed against the surrounding pyroxene can only be due to marked differences in the refractive index of both phases.

From Bown & Gay we know about the types of exsolved pyroxene phases which could occur in pyroxene host material. But it is most unlikely that such exsolution lamellae of less than one micron in diameter could be distinguished from the surrounding at magnifications between 250 × and 500 ×. Moreover, taking into consideration the colour, the high relief, the similar orientation to the coarse of magnetite, this would lead to the conclusion that these lamellae could also be magnetite. The only other alternative would be TiO_2, either as rutile or as brookite. As the amount of this phase is too small to be identified by means of X-ray methods and as special oil-immersion systems would be needed to trace the optical character of these inclusions the final answer should be left to a future investigation. Occasionally some mica was found, where the coarse magnetite plates are broken into small fragments.

Returning to the question of what causes the star-effect the following explanation can be given. If the coarse phase of plate-like inclusions of magnetite is the only cause for this effect, the observed asterism is but a phenomenon of reflection and should be designated as "schiller". Reflection from smaller and broader plates of magnetite can easily account for the difference in the width of rays as observed by Liddicoat in some cases. The other effects reported by Martin can be ascribed to small deviations of the angle between the two principal directions of the oriented magnetite plates and to a non-linear arrangement of some of these inclusions, both of which could be seen during observation in transmittent and incident light.

As the author is going on to study the orientation of both inclusion systems relative to each other and to the host it is too

early to predict whether there exists an interference phenomenon in addition to the schiller-effect. From what is known in the present state of investigation it seems rather unlikely that the schiller-effect would be accompanied by an interference phenomenon. So far we can only compare this star-effect with similar ones found among the orthorhombic members of the pyroxene family.

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3. Liddicoat, Jr., R. T. *Ref. in* (2) *Gems and Gemmology,* Winter 1965-66, 370-371.
4. Bown, M. G. and Gay, P. *The Identification of Oriented Inclusions in Pyroxenes.* Am. Mineral Vol. 44, May-June, 1959.

Gemmological Abstracts

ANON. *Non-metallic minerals, No.* 2. A review of resources, production, trade, consumption and prices relating to sulphur, gypsum, and anhydrite, asbestos, asphalt and bitumen, magnesite, graphite, mica and diamonds. London (Commonwealth Secretariat), vi + 170 pp., 77 tables, 1967. Price 35s.

Synthetic diamonds for industrial uses are now being produced in Sweden, the Irish Republic, Japan, the Soviet Union, and Czechoslovakia as well as in the U.S.A. and South Africa: total production is probably around a fifth of that of all natural diamonds, and a quarter of that of natural industrial stones alone. Known resources of gem diamonds in non-Communist countries will probably last for little more than another 15-20 years at 1965 rates of production but for the existence of offshore deposits.

R.A.H.

HUDON (D. R.), WILSON (A. F.) and THREADGOLD (I. M.). *A new polytype of taaffeite—a rare beryllium mineral from the granulites of central Australia.* Min. Mag., 1967, 36, 279, p. 305.

A green mineral found in the Musgrave Ranges in central Australia during 1966 was found to be a 9-layer rhomohedral polytype of taaffeite. It is pale olive-green, with refractive indices $\omega = 1{\cdot}739$, $\varepsilon = 1{\cdot}735$, and a specific gravity of 3·68. It contains 6·78% of FeO. S.P.

FRONDEL (C.) and MARVIN (U. B.). *Lonsdaleite, a hexagonal polymorph of diamond.* Nature 1967 Vol. 214 (5088) pp. 587-589 (May 6).

From observations on the carbonado in the Canyon Diablo iron meteorite, it is suggested that irregular masses and morphological single crystals of diamond occur together as they do in terrestrial diamond deposits and that both have been more or less completely converted to micro-crystalline aggregates of the hexagonal, wurtzite-like polymorph by terrestrial or preterrestrial shock. S.P.

MEEN (V. B.), TUSHINGHAM (A. D.) and WAITE (G. G.). *The Darya-i Nur diamond and the Tavernier "Great Table"*. Lapid. Journ., 1967, 21, 8, p. 1000.

A report, based upon a study made possible through a grant from the Henry Birks Family Foundation, Montreal, Canada, of the examination of the pink Darya-i Nur diamond in the Iranian Crown Jewels. The authors believe that the Darya-i Nur is the major portion of the "Great Table" diamond seen by Tavernier in 1642. A pink brilliant-cut diamond, the central stone in the tiara of the Empress Farah, is considered to be part of the Darya-i Nur stone. S.P.

MARION (C.), PICOT (P.) and SCHUBNEL (H-J.). *Nature des inclusions du diopside noir etoile de l'inde.* Assoc. Francaise de Gemmologie. Bull. 12, 1967.

Studies made with cabochon-cut brown-black diopside from India, displaying asterism, indicated that the inclusions causing the asterism are ex-solutions of thin lamellae, which are mainly formed by magnetite, together with ilmenite and spinel. S.P.

FLANIGEN (E. M.), BRECK (D. W.), NUMBACH (N. R.), and TAYLOR (A. M.). *Characteristics of synthetic emeralds.* Amer. Mineralogist, 1967, 52, pp. 744-772.

Large single-crystals of synthetic emeralds have been grown by both hydrothermal and molten flux techniques and are of excellent quality comparable to the finest natural gemstones from Colombia and the Urals. Emeralds grown from lithium molybdate, vanadium pentoxide and lithium tungstate fluxes are described. Crystals as large as 25 carats have been grown: a seed plate cut perpendicular to the *c*-axis is used, to give a hexagonal prism-shaped crystal. Cr varies from 0·05 to 1·4%; for gems 0·2-0·4% Cr seems to give the most aesthetically pleasing colour. The properties and characteristics of the various varieties of synthetic emeralds are listed and the distinctions between the varieties are outlined. The origin of an emerald (natural, synthetic flux or synthetic hydrothermal) can be defined by determination of characteristic properties. R.A.H.

WHITE (W. B.), ROY (R.), and CRICHTON (J. McK.). *The "alexandrite effect"; an optical study.* Amer. Mineralogist, 1967, 52, pp. 867-871.

An investigation of the crystal field environment giving rise to the well known change from green to reddish purple when the lighting on an alexandrite is changed from daylight to a low colour temperature incandescent light shows that this colour change is due to presence of trivalent chromium in a distorted octrahedral site in the crystal structure. The effect is related to the critical wavelength minimum in the absorption spectrum and is not unique to alexandrite or to the trivalent chromium ion. In synthetic stones, generally corundum, the presence of trivalent vanadium gives a similar effect. R.A.H.

LIDDICOAT (R. T.). *Cultured pearl farming and marketing.* Gems and Gemology. 1967, XII, 6, 162-172.

An abridged version of a talk given at a Conclave in Boston. In addition to a general survey of cultured pearl production and farming, there is information about a new strain of *Pinctada martensi* (i) in the warm waters of Kyushu. These grow to a larger size than the oysters from Age Bay and may produce larger cultured pearls. The rate of nacre deposition on the bead nucleus is discussed, and something is told of the bleaching and staining of cultured pearls. The article closes by describing an appraisal system.

11illus. R.W.

ANDERSEN (O.). *A Prospector's guide to the Anakie sapphire fields.* Gems and Gemology, 1967, XII, 6, 173-178 and 192.

Extracts from an article under the same title published in the Queensland Government Mining Journal. A similar article extracted from the same source was published in the Australian *Gemmologist* (Abstracts; Journ. Gemmology 1967, 10, 6, 206). This extract discusses the location and occurrence of the Anakie fields of Queensland. A list of associated minerals—those which give an indication of the presence of sapphire—are given. The methods of recovery and tools used for the mining are discussed.

R.W.

CROWNINGSHIELD (R.). *Developments and highlights of the gem trade laboratory in New York.* Gems and Gemology, 1967, XII, 6, 179-182.

Psilomelane has been used as a substitute for hematite, and it can be detected by the fact that a drop of concentrated hydrochloric acid dissolves the area of the surface upon which it is placed and releases chlorine gas which can be smelt. Sintered synthetic corundum of pink colour and the staining of lapis-lazuli are discussed. Other items mentioned are an emerald doublet made of a flawed beryl crown and a green glass pavilion, green-dyed quartzite as a jade substitute, and the fluorescence of a black cultured pearl.

5 illus. R.W.

LIDDICOAT (R. T.). *Developments and highlights at the gem trade laboratory in Los Angeles.* Gems and Gemology, 1967, XII, 6, 183-190.

Discussions on unusual diamonds comprise most of this article and include mention of "sugar-cube" and needle-like inclusions, odd types of facets on a cut stone, Ghanaian crystals and an extraordinary cylindrical crystal produced by elongated growth along an octahedral direction. A canary-coloured diamond bathed in a beam of blue light from a copper sulphate filter showed a rather bright red. It is stated that the effect had not been seen before. (The London laboratory has a natural canary diamond which behaves similarly.—ED.). Other items mentioned are kinked striae in a synthetic garnet-red coloured corundum, andradite garnet from Arizona, a scapolite catseye, chrome-rich chalcedony, synthetic rubies made by the flux-fusion process, and a snuff bottle made out of white serpentine.

17 illus. R.W.

MCLEAN (E. M.). *Chrome chalcedony.* Lapid. Journ., 1967, 21, 9, p. 1188.

A translucent material similar to chrysoprase is considered to be chrome chalcedony. Sample analyses show 0·2% and 0·3% chromium. The mineral occurs at the north-western limit of the Great Dyke which runs through the centre of Rhodesia.

S.P.

ASSOCIATION NOTICES

HERBERT SMITH MEMORIAL LECTURE

The 1967 Herbert Smith Memorial Lecture was held at Goldsmiths' Hall, London, on 16th November. Mr. Norman Harper, chairman of the Association, who presided reminded the large audience about the valuable work that Dr. Herbert Smith had done for the Association and the cause of gemmology. He was the author of the standard text *Gemstones*, which first appeared in 1912, and he had also been President of the Association. Mr. Harper welcomed Dr. Max Hey, Senior Principal Scientific Officer at the British Museum (Natural History) in the Department of Mineralogy.

Dr. Hey spoke about meteorites and began by discussing the various disbeliefs that had persisted for a long time about meteorites and tektites. Although much more was now known, the study of meteorites still produced its problems and controversies. His lecture was illustrated by many interesting pictures. One particularly showed the falling of a meteorite, with ball of fire head and a whip-like tail. There were still doubts about the origins of some meteorites, though the reasonable theory that they arose from a breaking up of heavenly bodies, commanded considerable support.

After a series of interesting questions, mainly about tektites, Mr. B. W. Anderson thanked Dr. Hey for an extremely informative lecture.

GIFTS TO THE ASSOCIATION

The Council of the Association is indebted to Mr. S. P. Barnett, F.G.A., who has presented the gemmological diploma presented to his father in 1913. The diploma is numbered D.1 and the Council is grateful to have the document for its records. Mr. Barnett also gave the Association a part-coloured corundum showing well-defined blue and red zones.

Mr. R. Webster has kindly presented specimens of stichtite, grossular garnet and sodalite from South Africa and Rhodesia.

A specimen of Australian opal was kindly presented to the Association by Mrs. B. E. M. Barkle of West Australia.

A gift of £10 has been received from Mr. Toyoji Kato, of Tokyo.

SCOTTISH BRANCH

On the 31st October, 1967, a record audience of Scottish Branch members heard Mr. Norman Harper, Chairman of the Association, talk on "A Hundred Years of Diamonds".

Mr. Harper stressed the difficulties in discovering how diamonds occurred orginally in nature and how to reproduce them in a laboratory. Even now after years of extensive study nobody can say exactly how or why diamonds occur where they do in the world. After a short résumé of his work in aid of gemmology and how he organized the postgraduate diamond diploma course in Birmingham, which is now available in London, he presented two copies of his notes and challenged the Scottish Branch to start it in Glasgow.

Mr. Alastair Cairncross proposed a vote of thanks to Mr. Harper. Consequential upon Mr. Harper's talk the Scottish Branch has circularized local members to ascertain whether they would be interested in attending classes in connection with a Gem Diamond Course.

MIDLANDS BRANCH

Mr. F. S. H. Tisdall, F.G.A., was the speaker at a Meeting of the Midlands Branch of the Association held on the 29th September, 1967. His subject was "Natural and Synthetic Emerald" and he described some easy methods in which the synthetic could be differentiated from the natural gem. In his talk Mr. Tisdall said:

It all depends what is meant by 'easy'; but for the purpose in hand the apparatus required consists of a high intensity lamp; or other concentrated source of white light; a blue filter, or flask filled with copper sulphate solution (as illustrated in colour in 'Gem Testing' by Mr. B. W. Anderson); a deep red filter; an emerald, or 'Chelsea' filter; a refractometer; a small tube of heavy liquid blended to a definite, and rather critical density; and, of course, the usual ever useful 10 × loupe. A microscope is a very useful accessory but not absolutely essential as will be shown. Indeed it often happens that a 10 × loupe in skilful hands, coupled with an experienced eye, will enable an emerald to be classified with certainty, either as synthetic or natural.

So for discriminative purposes the first approach, as with any gem, is to subject the stone to a careful optical examination with a good hand lens. And let it be said at once that nothing, nothing can be a substitute for experience. Patient and prolonged examination of many stones is essential in order correctly to interpret the significance of what is seen in them. Excellent photomicrographs showing clearly the types of inclusions to be met with in both synthetic and natural emeralds are to be found in many books, and with care one learns to correlate the illustrations with what is seen in an actual specimen. If a microscope is available, giving a degree of magnification of some 30 ×, not only can a stone be identified as real or synthetic, but, if real, its provenance may be determined. However, the present purpose is concerned chiefly with deciding whether a stone is natural or synthetic; and in many synthetics (not all—especially the more recent products)—in many synthetics the curved, wispy feathers, which when seen, serve absolutely to identify them, can be discovered with nothing more than a 10 × loupe. Mention must also be made of the phenakite crystals

which occur in many synthetics (again, not in all), but as their detection needs a microscope and as their appearance is not so highly characteristic of the synthetic as that of the feathers, and, moreover, as the emphasis in this talk is on the word 'easy', this passing reference is all that will be said of them.

Should an optical examination not lead to any very definite conclusion that well-tried and most useful piece of apparatus, the refractometer, should next be called into service.

Emerald is a doubly refracting gem and the R.I's of the natural stone have a fairly wide range extending from 1·568 to 1·590 for the extraordinary ray, and from 1·573 to 1·598 for the ordinary ray; the lower figures being those for pale stones from Brazil, and the higher those for emeralds from Pakistan. Between these extremes are a series of R.I's corresponding to stones from other localities. The amount of birefringence varies from ·005 to ·008. The variation in these figures is accounted for by the presence of impurities, especially iron and the alkali metals, which tend to raise them. On the other hand the constants characteristic of synthetic emeralds, on account of the purity of the ingredients from which they are manufactured, vary scarcely at all.

For the present purpose it is necessary to take account only of the lowest indices possessed by any natural emerald, which are 1·568 to 1·573, for ε and ω respectively, and that the minimum birefringence is ·005. These figures are very important, for careful use of the refractometer reveals that the R.I's for Chatham & Gilson synthetics are not only perceptibly lower than those of the natural stones, but also that the amount of double refraction is only about half. Chatham & Gilson stones read 1·560 to 1·563, or very, very close thereto.

For accurate determination of these figures monochromatic light or a deep yellow filter is required. A spirit lamp upon the wick of which a pinch of salt has been placed will provide the former if care be taken to shield the flame from air currents. However the Anderson-Payne spinel refractometer is ideal for the purpose in hand as accurate readings may be made by ordinary electric lighting without having recourse to filters or spirit lamps. And, as is the case with the observation of characteristic inclusions, so with careful determination of R.I's—the result can be quite definitive. But although this *is* so, reliance should not be placed upon one test only; especially where considerable sums of money may be involved; always make at least two, or, preferably three tests.

A very simple test—the simplest of all—relies for its efficacy upon the difference between the S.G's of natural and synthetic emeralds. Just as the R.I's of synthetic emeralds are lower than those of the natural stone, so, obligingly enough, are the S.G's lower. It is, of course, necessary that stones be unmounted to carry out this test, which is a very useful and convincing one. Again, no doubt owing to the presence of various impurities, the S.G's of natural stones have a fairly wide range, varying between 2·68 for those from Brazil, and 2·77 for those from Pakistan; it is only the lower figure which is of interest. The S.G. of Chatham & Gilson synthetics is constant at 2·65. Thus, if a heavy liquid be prepared, such as a mixture of bromoform and toluene, in which a known synthetic will just float, then in this same liquid all natural stones will unfailingly sink.

We have now dealt with tests involving inclusions, R.I's, and S.G's, any one or all of which can yield information which will lead to a definite conclusion

one way or the other. What is, perhaps, the most interesting and spectacular test has been left until last—that depending upon fluorescence. It is a well established fact that the cause of the beautiful velvety green hue of a fine emerald —natural or synthetic—is the presence of minute quantities of chromium, which replace aluminium in random positions in the crystal lattice. It is also an element the presence of which, unless inhibited by the dampening influence of iron, gives rise to fluorescence, which can be a most helpful property when a diagnosis is to be made.

This seemingly mysterious property is not really difficult to understand even though the explanation now offered is somewhat over-simplified; light of short wavelength, such as X-rays, ultraviolet light, or even visible light at the violet end of the spectrum is possessed of high energy. On its passage through a transparent, fluorescent crystal some of this energy is absorbed by the atoms which compose it—in this particular case by the chromium intruders—which then become activated, or excited. When these excited atoms revert to normal they do not do so all at once, but in small stages or 'jumps'. At each jump a light impulse is given out which must have less energy, or, what comes to the same thing, a longer wavelength than the original exciting radiation. This explains why radiation of a wavelength too short to be within the range of vision. can give rise to light of a wavelength long enough to be visible. Hence we have fluorescence.

Fluorescence in emerald can be observed in three easy ways:

The simplest is to view a brightly illuminated stone, held, for instance, close to a 100-watt bulb, through a Chelsea filter. Most natural emeralds of good colour will appear red, or at least pinkish. Synthetics will appear a bright red, which is a very useful indication of their true nature, though it must be borne in mind that fine Colombian stones are reputed to approach closely to this colour; although the present speaker has yet to encounter a natural emerald of any kind that shows as bright a red through the filter as a synthetic.

Parenthetically it may be noted that a filter should not be used like a loupe with both stone and instrument held close to the eye. Place the loupe, held usually in the right hand, close to the eye, and hold the stone to be examined at arm's length close to the source of illumination. From personal observation, the writer has noted that not all jewellers, or even gemmologists, appear to be aware of this technique.

Natural emeralds from the Transvaal and India will still look greenish through the filter as they contain iron in their composition, the presence of which inhibits fluorescence. Mr. Anderson also states that some soudé emeralds look red through the filter, so obviously this simple piece of apparatus must not be relied upon implicitly. It is, nevertheless, still true that bright red through the filter is strong evidence of synthesis, and any such stone must be the subject of further scrutiny.

A second method of exciting fluorescence is to expose emeralds to the rays from an ultra-violet lamp in a darkened room. Synthetics will fluoresce more brightly than natural stones, those from the Transvaal and India remaining almost inert.

The most satisfactory and convincing results are to be obtained by the third method, which is what is known as the crossed filter technique. This

method of observing fluorescence was first devised by G. G. Stokes over a century ago.

The stone for test is placed on a dark background, together with one or two stones of known origin to serve as controls and illuminated by a beam of light that has been passed through a blue filter or a flask filled with copper sulphate solution. They are then observed through a deep red filter. For this experiment the room need not be in absolute darkness providing it is only dimly lit. The reaction of the synthetics is very striking; they will fluoresce a bright red. A fine Colombian, or other emerald of good colour (except African and Indian stones) will also fluoresce, but none to the same extent as the synthetics, which seem actually to glow.

In this talk I have not mentioned the Lechleitner synthetic emerald coated beryls as the primary object is the detection and differentiation of synthetics, and the general appearance of these stones is likely to deceive no one who has had any experience of emeralds at all. Furthermore, the speaker understands that the vogue for these stones, never very great, is now, for practical purposes, over. The market for synthetics is now adequately supplied by Chatham & Gilson stones. Indeed, to give credit where it is due, the degree of clarity and beauty of colour achieved by some recent examples seen by the writer seem to constitute for practical purposes what must be regarded as perfection in the art of synthesis.

Linde emeralds, though extensively marketed in America, have so far not reached this country as a commercial product. A Linde crystal has been examined and reported on in a recent article by Mr. Webster, appearing in the *Retail Jeweller;* he concludes his article by stating the Linde stones 'will be readily identified by their strong luminescent characters, and by the nature of their inclusions'.

The Zerfass emerald also has not yet reached England. I do not expect any particular difficulties in differentiating it from the natural stone should it do so. The only Zerfass stone the speaker has so far seen contained many of the highly characteristic wispy feathers. So far our problem in this country lies in distinguishing between the natural stones on the one hand, and Gilson & Chatham synthetics on the other. It may not always, or even for long, be so. It behoves the gemmologist perpetually to be on the *qui vive.*

Summarizing what has been said we may say that the first approach, as with *any* stone, is to give it careful scrutiny with a 10 × loupe, and/or a microscope. In many cases this will prove to be all that is necessary when once the observer has familiarized himself with the types of inclusions to be expected.

Next, if unmounted, the simplest test is the heavy liquid one, provided the operator is careful to ensure by means of a control stone that his liquid is of the correct density, which is critical.

Whether mounted or unmounted a careful R.I. reading will provide positive evidence. A spinel type refractometer is recommended.

Finally, a fluorescence test between crossed filters will add to the cumulative evidence of the other tests, and in conclusion, the speaker maintains that an emerald, natural or synthetic, which reacts in an anomalous or inconclusive manner in all four tests described does not (so far, at any rate) exist.

JOURNAL OF GEMMOLOGY

Readers of the *Journal* are invited to submit suitable articles for publication, which will be paid for. Upon request up to 25 reprints of any article published are available to the author.

COUNCIL MEETING

At a meeting of the Council of the Association held on Thursday, 16th November, 1967, the following elections took place:—

FELLOWSHIP

Arps, Charles Edward Samuel, Netherlands, Holland
Astley-Sparke, Jeremy Peter, London
Beck, Cyril Anthony, Manchester
Blacklock, Ralph Ellis MacRae, Sunderland, Co. Durham
Bodenham, John Edward, Halesowen, Worcestershire
Bodes, Reginald, Voorburg, Holland
Borrmann, Bjorn, Fjullhamar, Norway
Bowers, Norman, Heywood, Lancs.
Brown, Janet Irene (Miss), Congleton, Cheshire
Buchanan, Alistair McKenzie, Edinburgh
Bytheway, Keith Leonard, Walsall, Staffs.
Chan, George K. L., Kowloon, Hong Kong
Clifford, Geoffrey Roy, Maidstone, Kent
Collier, Alan, Burscough, Lancs.
Cowbourne, Elizabeth Mary (Miss) Bingley, Yorks.
Croydon, Robert William, Old Catton, Norwich
Cuss, Christopher Jude, London
D'Arcy, Michael Stephen, Peterborough, Northants.
Doughty, Mary Forbes (Mrs.), Birkenhead, Cheshire
Earnest, Robert A., California, U.S.A.
Edrisinghe, Barbara (Mrs.), Colombo, Ceylon
Frost, Frank Roger, Upper Wolvercote, Oxford
Fuller, Robert George, Chesham, Bucks.
Gay, Alan Leslie, Birmingham
Goodman, Brian John, Walsall, Staffs.
Gregory, David George, Waterloo, Liverpool
Gunnar, Baugerod, Porsgrunn, Norway
Hamnett, Norman, Radcliffe, Lancs.
Johnson, Cyril Alan, Rugby, Warwicks.
Jones, Sylvia Margaret (Miss), London
Lorimer, Barry Anthony, Keighley, Yorks.
Mechlin, Wilmer, Maryland, U.S.A.
Neary, Geoffrey, Huddersfield, Yorks.
Parkes, Frederick, Stanmore, Middx.
Priestman, Arthur, Manchester
Evans, Royston Thomas, Timperley
Rees, Dietlinde Maria Augusta (Miss), London
Renfrey, Eric, Ormskirk, Lancs.
Rickenberg, Robert E., Los Angeles, U.S.A.
Schnieden, Harold, Bramhall, Cheshire
Spohn, Winfried, Cologne, Germany

Stokes, Timothy David, Birmingham
Strack, Elizabeth, London
Warren, Philip Arthur, Hest Bank, Lancs.
Wilson, Geoffrey Alexander, Urmston, Lancs.

ORDINARY MEMBERSHIP

Amli, Reidar, Oslo, Norway
Balkind, Michael, London
Barr, Charles J., Texas, U.S.A.
Beck, Russell Joseph, New Zealand
Brown, Ernest Kennedy, Angus, Scotland
Brown, Kenneth John, Australia
Campbell, Ian Colin Cecil, Rhodesia
Cheong, Choong Boo, Penang, Malaysia
Clarke, D. P. (Mrs.), Camberley, Surrey
Cook, Arthur, Hendrik Ido Ambacht, Holland
Dacremont, Roger, Belgium
Donahue, Jack Northcutt, California, U.S.A.
Fischer, Clarence S., New Jersey, U.S.A.
Fryer, Douglas John, Lewes, Sussex
Giles, Roy, New South Wales, Australia
Glover, James J., Ontario, Canada
Gosbee, Roger Fred, Havant, Hants.
Grange, Doreen Mary (Mrs.), Sherborne, Dorset
Hammersley, Gordon John, Michigan, U.S.A.
Haralambides, John A., Florida, U.S.A.
Harris, Gerald, London
Hayhurst, Christopher Edward, Glasgow
Heathcote, Frederic Roger, Birmingham
Holmes, Kenneth, London
Hubble, Leslie Albert, New Guinea
Jewell, Patricia May (Miss), Whitby, Yorkshire
Kaneko, Masao, Tokyo, Japan
Kato, Toyoji, Tokyo, Japan
Kitayama, Shigeru, Kyoto City, Japan
Lapworth, Patricia Barbara (Miss), Guildford, Surrey
Leitch, Thorburn Alexander Thomson, Kuala Lumpur, Malaysia
Liep, Tjan Hok, Surabaja, Indonesia
Maas, Geerlof D., Rotterdam, Holland
Marschner, Helga (Mrs.), Berlin, W. Germany
Maruyama, Hayashi, Tokyo, Japan
Mertens, Rudolf, Buchenbusch, Germany
Monger, John, Great Tey, Essex
Morgan, Alfred Douglas, Birmingham
Marsland, William Woodworth Bourne, Horncastle, Lincs.
Murphy, Ronald Patrick, Custon, Kent
Onojeghuo, Clement J. O., London
Pala, Anantray Ratilal, Lourenso Marques, S.E. Africa
Parker, Laurence K., Lagos, Nigeria
Paul, Lloyd G., Quebec, Canada
Pezie, Louise, Netherlands, Holland
Potts, Lawrence Donald, Tennessee, U.S.A.
Raisin, Daniel, Geneva, Switzerland
Reed, Brenig, London, N.12
Roth, Leo N., Zurich, Switzerland
Rowley, Gwendoline Mary (Mrs.) Glam.
Sakamoto, Fujio, Japan
Saluja, Narinder Singh, Thailand
Sato, Toshiji, Tokyo, Japan
Turner, George Maurice, Airdrie, Lanarkshire

Van Deijl, Wilhelm Jacobus Ernst, Bellville, S. Africa
Valberg, Christopher Harold, Johannesburg, S. Africa
Waker, J. Wolfgang, Pullach, Germany
Watanabe, Kojiro, Tokyo, Japan
Webb, William James Ellison, Guildford, Surrey
Widdup, Kenneth, Lancaster, Lancs.
Wilson, Stella Grafham (Miss), London
Westphal, John C., Illinois, U.S.A.
Yamamoto, Noboru, Tokyo, Japan
Vaughan, Alan John, Invercargill, New Zealand
Gardner, William Fraser Thomson, Bo'ness, West Lothian, Scotland
Aoki, Ryo, Tokyo
Aso, Yoshio, Hiroshima Pref., Japan
Eto, Hiroyuki, Fukui Pref., Japan
Fukuda, Jutaro, Aichi Pref., Japan
Hasegawa, Yoshio, Ehime Pref., Japan
Hyodo, Toyosaku, Tochigi Pref., Japan
Ishigami, Michizo, Hyogo Pref., Japan
Ishikawa, Shizunori, Ibaragi Pref., Japan
Ishita, Nobuo, Gunma Pref., Japan
Ito, Toshio, Saga Pref., Japan
Iwaori, Takashi, Aomori Pref., Japan
Izumi, Isao, Tokyo
Kaido, Yahichi, Fukui Pref., Japan
Kitaoka, Toshitaka, Mie Pref., Japan
Kiyota, Sukeo, Kumamoto Pref., Japan
Mikan, Misao, Yamaguchi Pref., Japan
Mitchell, Mrs. Joyce, Leven, Fife, Scotland
Niita, Yoshihisa, Shimane Pref., Japan
Naito, Jiro, Aichi Pref., Japan
Nakamura, Hideo, Ibaragi Pref., Japan
Nakaoka, Takuzo, Hiroshima Pref., Japan
Nemoto, Yoshio, Fukushima Pref., Japan
Nishijima, Tokimitsu, Oita Pref., Japan
Ochiai, Yoshiharu, Tottori Pref., Japan
Ohya, Syoichi, Niigata Pref., Japan
Okubo, Toshiharu, Tokyo
Piederiet, J. J. M., Breda, Netherlands
Presser, Clement Alfred, Victoria, Australia
Sato, Seizo, Shizuoka Pref., Japan
Shimada, Masahiko, Ishikawa Pref., Japan
Stewart, Reginald William, Bickley, Kent
Singh, Mrs. Surjit J., Bangkok, Thailand
Uchihara, Mrs. Sumi, Osaka, Japan
Usui, Kazumasa, Toyama Pref., Japan
Watanabe, Ryoichi, Hokkaido, Japan
Watanabe, Shigenobu, Tokyo
Yamazaki, Soichi, Nagano Pref., Japan
Green, John Ralph, London

Probationary Membership

Baker, Ruth Margo, Ontario, Canada
Bird, Anthony Thomas, Heath, Cardiff
Epstein, Stephen Ivan, Edgware, Middx.
Fischer, Marianne (Miss), Stellenbosch Cape, S. Africa
Gowen, Michael Richard, St. Leonards-On-Sea, Sussex

Hallam, Gerrard Heathcliffe, Whitby, Yorkshire
Harris, Martin Peter, Epping, Essex
Harris. Nicholas Adrian, London, W.11
Hoogendoorn, Frits, Holland
Ingber, Ronald Max, London, N.W.4
Jackson, Della Ann (Miss), Prestbury, Cheshire
Jefferis, Marcia Nicoletta, Aldenham, Herts.
McCann, Stephen James, London, N.W.10
MacNeill, Stewart, Bushey Heath, Herts.
Myers, Brian Lawrence, London, N.21
Parrott, Wayne, London, W.2
Peters, Anthony Gayton, Exeter, Devon.
Pitman, Ronald, London, S.E.9
Preece, Frank Robert, Beaconsfield, Bucks.
Renwick, Stuart Hamilton, Bury, Lancs.
Revan, Michael Lawrence, N. Wembley, Middx.
Samuel, Christopher John, Ilford, Essex
Samuels, Sarah Lena (Miss), Portrush, N. Ireland
Shepherdson, Alice Ann (Miss), Whitby, Yorks.
Stewart, David Nicholas, London, W.C.2
Taylor, John, Glam., S. Wales
Van Kleef, Petrus Johannes Maria, Den Haag, Holland
Vaughan, Susan Josephine (Miss), London, W.14
Williams, Barrie Anthony Mark, London, W.2.
Whittaker, Roy, London, N.5
Wood, Hugh Richard, Ifield Rectory, Kent
Zarobabely, Aron, Tehran, Iran
Fraley, Robert J., Carolina, U.S.A.
Saleh, Zurairul-Ameen, Colombo 10, Ceylon
de Meillon, Laura (Miss), Pietermaritzburg, S. Africa

TRANSFERS FROM ORDINARY AND PROBATIONARY MEMBERSHIP TO FELLOWSHIP

Dudek, Clelan Francis, Oregon, U.S.A.
Harding, James Norman, Northwood Hills, Middx.
Hayes, Lillian Eveline, London
Hopkins, Norman Barton, Bowie, U.S.A.
Trenholme, Russell Shannon, Tokyo, Japan
Arbeid, Martin Jolis, London
Benthal, Richard Pringle, Walton on the Hill
Berwick, Keith James, Portsmouth
Bosch, Hilmar Dirks, Salisbury, Rhodesia
Bowley, Malcolm Anthony, Bukuru, N. Nigeria
Brown, Judith Audrey, Altrincham
Buchanan, Kenneth Ray, Tulsa, Oklahoma, U.S.A.
Bull, Rudolf, Sorengo, Switzerland
Chartier, Henri Paul, Esher
Cherns, Jack Jacob, London
Cutts, Michael James, Surbiton
Franks, Ivor Selwyn, London
Gay, Phillip G., S. Miami, Florida, U.S.A.
Gillon, Mary, Glasgow
Hartley, Donald Wilson, E. Detroit, U.S.A.
Hartmann, Carolus Johannes, Dentlaag, Holland
Levy, Marion David, Atlanta, Georgia, U.S.A.
McLachlan, Catherine, Boksburg, Transvaal, S. Africa

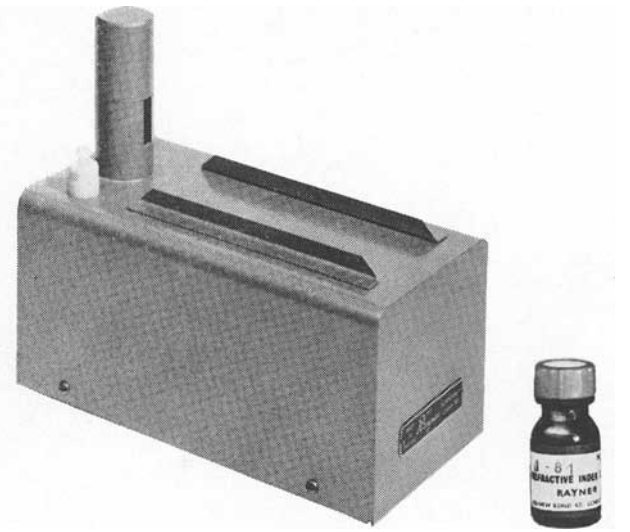
McTeigue, Walter J., New York, U.S.A.
Mendis, Cynthia Marguerite, Colombo, Ceylon
Mumford, Ronald Broughton, Sunningdale
Newham, Frank Edward, London
Newman, Brian Anthony, Cape Town, S. Africa
Nixon, Rolf Thorp, Washington, U.S.A.
Ozolins, Nikolajs, Sao Paulo, Brazil
Porter, Graham Stanley C., Birmingham
Russell, Madeleine, Ilford
Sanderson, Clare, Romford
Sasaki, Edwin, Tokyo, Japan
Sutton, Robert Michael, Bramley
Swain, Marilyn Janice, London
Talbot, Peter Ernest, Crayford

The Council re-affirmed that it was essential that all scripts written in the examinations must remain the property of the Association. The Council also considered representations that had been made by a few members for a tie for men and a brooch for women who were Fellows of the Association. It was decided that designs and estimates should be obtained. (Any Fellow who may have a design to suggest, not necessarily based on the Association's Arms, should communicate with the Secretary by the 31st March 1968).

The holding of national or local conferences was also considered, possibly involving hotel residence at a week-end. Members are invited to indicate if they would be willing to take part in a one or two-day conference.

RAYNER

COMPACT SODIUM SOURCE



A monochromatic light source with slide fitting for the Rayner refractometer. The use of light of a single wavelength eliminates white light spectrum and gives readings of greater accuracy.

The ballast choke, starter and switch are housed in a metal casing measuring $6\frac{3}{4} \times 3\frac{1}{2} \times 3\frac{3}{4}$ inches, and the lamp hood enclosing the lamp measures $2\frac{1}{2} \times 1$ inch diameter. The lamp hood has two apertures measuring $1 \times \frac{1}{16}$ inch. Once switched on, the lamp strikes immediately and after a few minutes the lamp gives an almost pure sodium emission.

Suitable for direct connection to 110/130 or 210/240 volts a.c. State voltage required.

Cat. No. 1270	Rayner compact sodium source complete ...	**£19 14 0**
Cat. No. 1271	Rayner compact sodium source spare lamp ...	**£7 0 0**
Cat, No. 1100	Rayner standard refractometer, complete with case	**£21 17 0**
Cat. No. 1105	Rayner 1.81 R.I. Liquid	**£1 6 3**

GEMMOLOGICAL ASSOCIATION

of Great Britain

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