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and

PROCEEDINGS OF THE GEMMOLOGICAL ASSOCIATION OF GREAT BRITAIN

GEMMOLOGICAL ASSOCIATION
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GEMMOLOGICAL ASSOCIATION OF GREAT BRITAIN

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

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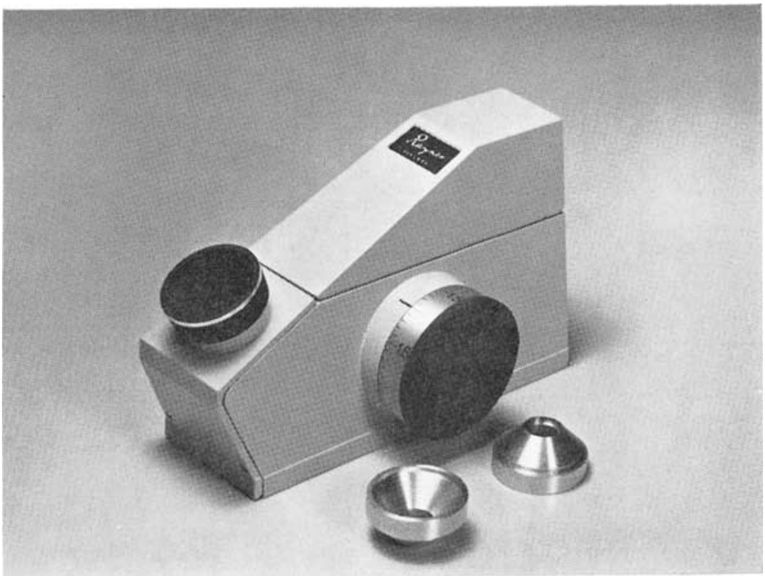
THE NEW RAYNER DIALDEX REFRACTOMETER

SINCE W. H. Wollaston suggested that measurement of the critical angle of a substance in contact with a glass block of higher refractive index would allow the refractive index of the substance to be determined there have been many different designs of apparatus made to do this. They all depended upon the projection of the shadow edge of the critical angle onto either an ocular fitted with crosshairs, which is fitted to a "telescope" attached to a scale of angular measurements so that the critical angle can be measured, and from this the refractive index of the substance can be calculated, or the shadow edge of the critical angle can be projected onto a scale of arbitrary numbers, or a scale calibrated in refractive indices. Such latter instruments are the well-known jewellers' refractometers.

The new DIALDEX refractometer, the latest in the range of Rayner instruments, has a newer approach in that there is no scale in the field of vision seen through the eyepiece. What is seen is a plain screen upon which the shadow edges are seen, measurement of these edges being made by a sliding *ribbon*, the bottom edge of which can be placed in line with the shadow edges. This *ribbon* is coupled to a drum dial marked in refractive indices from 1·40 to



The new Rayner DIALDEX Refractometer

1·81, the divisions, in common with the standard Rayner instruments, increasing in width as the refractive indices increase. The scale on the drum covers a length of about 11 cms, whereas the projected scale on the older instruments, after eyepiece magnification, covers about 3 cms length, hence the second-place decimal marks are much wider apart and this allows for easier estimation of the third place of decimals.

The new instrument has a harder and less dispersive glass for the prism, and this not only makes for a better durability, but it also allows for the two edges of doubly refractive stones to be clearly seen in white light observation. This is due to the fact that the dispersion of the glass prism is nearer to the dispersions of the stones being tested.

A prototype DIALDEX refractometer has been examined for its performance under all conditions of illumination—with white light, with white light in conjunction with a "monochromatic" filter, and with polarizing filters. Tests were also made using sodium light, and the "distant-vision" and "bright-line" techniques were explored. Given below is a report of this examination and an assessment of the value of this radically different refractometer.

The white light tests were made on some 40 stones of different species, ranging from fluorspar to an almandine garnet with index of 1·797, so as to cover the whole range of the scale. The shadow edges were found to be fairly sharp and with birefringent stones having a double refraction of 0·005 or more the two shadow edges were clearly separated and could be measured with some accuracy, but with stones having a birefringence less than 0·005 the edges were less well defined. The calibration of the dial was found to be very accurate for the whole scale. For the next test a "monochromatic" filter was used over the eyepiece in conjunction with a fairly strong light source—a 60 watt tungsten electric lamp seemed eminently satisfactory—and this showed results which were to a great extent comparable to the use of sodium light, and, in many cases, double refraction less than 0·005 could be measured.

The question of stones with small birefringence, with particular reference to the synthetic emerald, was studied. Four small synthetic emeralds and an apatite were used for this test. In none of these cases was a convincing separation of the shadow edges seen, but this may, in part, be due to the small size of the stones or their bad polish. This may be significant for in one case an agate showed "form birefringence" when so examined. The use of sodium light allowed clear double edges to be seen and measured on all these small stones. Tests with sodium light on a number of doubly refractive stones whose two edges could be clearly seen in white light, or monochromatic filtered light, showed the shadow edges to be sharp, but, in common with all types of refractometers, the shadow edges when sodium light is used are less readily seen, and it is usually wise to spot the position of the shadow edges by using white light first.

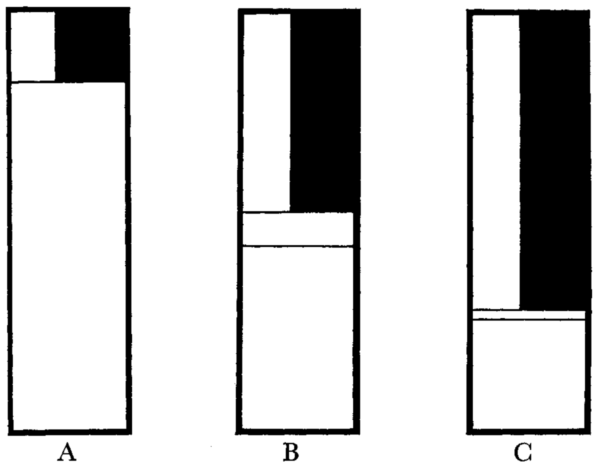
The use of a polaroid filter to separate the edges may assist in some observations but seems to be less necessary with the new DIALDEX refractometer, for any shift of the shadow edge on turning the stone is readily apparent in relation to the indicator strip.

The admittedly difficult "distant-vision" method for cabochon stones and stones with other curved surfaces seems to be more easily carried out with the DIALDEX instrument, despite the pronounced parallax between the shadow edge and the indicator strip when the head is held away from the eyepiece as is necessary for this technique. Some dozen cabochon stones were tested by this method and the results were most encouraging. Quite good values were obtained and there appeared to be less error than when the conventional instrument is used. This may well be due to the fact that one does not need to "leave" the eyeview of the shadow edge to see the scale, for the strip indicator, even if somewhat out of focus, is sufficiently well seen in the field at the same time.

Another technique, not too easy to do but valuable in certain cases, is the "bright-line" technique when the normal light aperture is "blocked off" and the light source directed at grazing incidence to the dense glass table. To do this with the DIALDEX instrument the "cover" must first be removed and then the light aperture at the front end be "blocked off" with a suitable object—a matchbox on end is admirable. The light source is then directed parallel to the table of the instrument. Tests showed that this method can be carried out satisfactorily despite the probability of some disturbing phantom bands.

The DIALDEX refractometer is somewhat larger than the standard Rayner instrument. It is 13 cms in length (12 cms in the standard Rayner refractometer); it has a base width of 4·1 cms (4·0 cms), or if the side dial be included the width is 5·9 cms; the dial, which is 4·1 cms in diameter, protrudes from the right hand side for a distance of 1·8 cms. The height of the instrument is 8·4 cms (6·5 cms). The casing, unlike the heavy casting used for the standard Rayner refractometer, is a pressure die-casting approximately 2 mm thick. It is this difference in construction which makes the DIALDEX instrument slightly lighter in weight at approximately 12¾ oz. avoirdupois, or 361·47 grams as against approximately 13·5 ounces avoirdupois, or 382·75 grams for the earlier cast models. The glass prism is larger than in the standard Rayner refractometer, being 5 × 10 mm (4 × 10 mm), and the eyepiece focuses by a "push-pull" action, and not by helical screws. The cover slides off to the right on a horizontal pin with a spring-loaded friction stud to prevent the cover "flopping". The cover does not pull off vertically as in the earlier instruments.

From the tests made the DIALDEX refractometer has several advantages over the conventional refractometers. The more open divisions of the drum dial make the estimation of third place of decimals easier; the edge of the "ribbon indicating strip" set on a shadow edge is stationary and any change in the movement of the shadow edge would be immediately apparent; thus, if the edge was not at its maximum (or minimum) position any further turning of



Appearance of the "field" in the DIALDEX refractometer showing the "ribbon" brought down to be in juxtaposition with shadow edges.

A.—Fluorite (singly refractive with index 1·434).

B.—Peridot (doubly refracting; 1·66 and 1·69. Indicator edge on the 1·66 reading).

C.—Sapphire (doubly refracting; 1·76 and 1·77. Indicator edge on the 1·76 reading).

the stone would show the shadow edge movement against the fixed edge of the *ribbon*. It is quite common to miss, or not be sure, of the maximum or minimum position of the required shadow edges, particularly in the case of biaxial stones, when the conventional instruments are used. The use of a less dispersive glass for the prism allowing readings of double refraction to be measured makes, to a great degree, the use of sodium light unnecessary.

R.W.

NOTES FROM THE LABORATORY (FOURTH SERIES)

By B. W. ANDERSON

Dangers of Ultra-sonic Cleaning

Those who use ultra-sonic cleaning apparatus should think carefully before subjecting gem-set jewellery to this drastic process. In some cases the damage is mechanical, being induced by the intense vibration—blue zoisite (tanzanite) being a prime example. In other cases there may be chemical damage caused by the solutions used, one alkaline and one acid. Samples of these shown to me appeared to consist of weak ammonium hydroxide and weak sulphuric acid, respectively. The alkali acts as a vigorous de-greaser and oiled emeralds, for instance, emerge from the bath looking very much the worse for wear. A sufferer from the acid bath recently brought to our notice was a small plaque of lapis-lazuli the appearance of which had been effectively ruined by the leaching of some of its mineral content, particularly of the calcite particles. A handsome specimen of my own was subjected to the same treatment and the appearance ruined in a similar way. There was a loss in weight of several points. The stone did regain its handsome appearance after extensive repolishing, but the weight-loss was then quite considerable.

Pink Manganese Quartzite

Bracelets and ear pendants set with polished stones described as "pink jade" were recently examined in the Laboratory. From their granular appearance and hardness our first guess was that the stones were stained quartzite, and this seemed to be confirmed by a "spot" refractive index check, which gave a quartz reading. The spectroscope, however, gave the lie to this plausible theory, not only failing to show the expected dyestuff band in the green, but revealing instead very typical manganese bands in the blue and violet, the most powerful being centred at 4150 Å.

Since we know manganese minerals to be appreciably magnetic, a test was then carried out on our aperiodic balance, and a specimen of the pink mineral "in poise" was in fact found to be sensibly affected by the approach of a small pocket magnet. Finally one cabochon piece was eased from its setting and a careful density test carried out. The resulting figure of 2·97 indicated a major adulteration, and assuming the manganese to be in the form either of rhodochrosite or of rhodonite there would have to be some 35% present to raise the density to such an extent.

Though no effervescence was observed when a drop of acid was applied to the surface, rhodochrosite would seem the more likely constituent since its softness would ensure that the upper levels of a polished surface would be formed of quartz prominences alone, thus accounting for the misleading refractometer reading.

A startling feature of this little investigation was that X-ray powder photographs taken and examined by experts in one of the museums showed a clear quartz pattern and nothing else whatsoever. Another "score" I would say for the powers of absorption spectroscopy in revealing the nature of gem materials. No reference to manganiferous quartzite of this nature could be found in the literature. The fittings of the bracelet, by the way, were of nine carat Chinese gold and the jewellery had been manufactured rather crudely in Hong-Kong.

Transparent Petalite from Brazil

As with so many "collector's items" for which quite high prices can be obtained, the claim of transparent petalite to be considered as a gemstone depends mainly on the last (and least important) of the well-known trilogy "beauty, durability, rarity". Colour is virtually lacking, hardness is a bare 6½, lustre low and fire missing.

Nevertheless, cut petalites of important size are sufficiently rare to be notable, particularly when they come from a new locality, and we were very glad to have an opportunity to examine two faceted petalites from Brazil which were recently submitted to us by Mr. E. A. Thomson.

These stones were exceptionally large (26 carats for the two), virtually colourless, and demonstrated the "constancy" of this silicate of lithium and aluminium in having almost exactly the same density (2·394) and refractive indices (1·504, 1·510, and 1·517) as those for a petalite from Australia sent to us by Dr. F. H. Pough many years ago. My young colleague Mr. Frank Hird, who worked on the stones, noticed a weak mauve fluorescence under

X-rays. This contrasts with the bright orange glow (with phosphorescence) noted by Mr. Robert Webster on the Australian material.

Dr. Hermann Bank, in the Zeitschrift der Deutschen Gesellschaft für Edelsteinkunde, describes very similar specimens of petalite from Brazil, indicating that the new source may be quite an important one for collectors of such curiosities.

Kashan synthetic rubies

Amongst the man-made gemstones produced in the past few years, "Kashan" rubies have a high reputation and a correspondingly high price. These are of "flux-fusion" origin—that is, they are crystallized from a suitable melt under normal atmospheric pressure. It is said that they are no longer in production, and they have not been exploited in this country, but we studied with interest samples of rough and cut "Kashans" kindly lent to us recently by Mr. M. J. O'Donoghue. The crystals were not of natural habit, being flattened rhombohedra with partially re-adsorbed surfaces. A surprising feature of these specimens was the paucity of chromium, as evidenced by their weak absorption and fluorescence spectrum and the rather subued red of their colour.

Specimens of "Kashan" rubies were extensively studied and described some years ago by workers in the laboratories of the Gemological Institute of America, who referred particularly to what they described as "paint-splash" inclusions of flux material. And in the stones we examined these curiously characteristic flat inclusions were found, though on quite a small scale. These are elongated, with parallel sides and rounded ends, rather like the footprint made by a moccasin, and are arranged in parallel formation in parallel groups. There are also visible twisted lace-like feathers, which are common to most flux-grown stones and, very significantly, there are no included foreign minerals.

Ruby doublets

As a sequel to my notes on natural-on-synthetic sapphire doublets, in which the crown is of natural Australian sapphire and the base of synthetic sapphire, I must now mention a further development in which the natural sapphire crown is based on synthetic ruby—yielding a surprisingly effective ruby substitute.

The blue or greenish upper layer provides the appearance of natural "silk", and the red in the base of synthetic ruby is quite enough to swamp its blue-green colour. The wise and the wary may note that the crown does not fluoresce under crossed filters or ultra-violet light while the base shows a bright red glow. And the same wary observer will not be satisfied with the composite stone's appearance under the microscope: but unless this warning is widely noted and repeated these audacious fakes will undoubtedly deceive many people. I am grateful to the Gemmological Association for sending me samples to examine.

Stained lapis-lazuli

There have for some time been warnings from the U.S.A. that objects cut from genuine lapis-lazuli are liable to have had their colour "improved" by the surface application of suitable blue dyestuff. We have therefore been careful, when objects in this attractive rock have been submitted for test, not only to search for pyrites inclusions and other signs, but also to rub the surface with clean cotton wool dipped in acetone or amyl acetate—available in most households as nail varnish remover. Quite recently our industry was rewarded, when a Chinese carving of very vivid ultramarine blue showed a distinct blue stain on the wool when applied. No great difficulty in this test, but just one more thing for the unfortunate jeweller to watch out for.

Tailpiece

The wording of the little notes or requests accompanying goods sent in to the Laboratory for testing sometimes cause us some quiet amusement. The other day a very obvious and ordinary brilliant-cut diamond in a single-stone ring arrived with the request: "Please state exact chemical composition". No textbooks were consulted.

THE LAKE-MANYARA-EMERALDS OF TANZANIA

By RUDOLF E. THURM

WITH exception perhaps of the benitoite, many types of gemstones have been found up to now in Tanzania. Diamonds, rubies and sapphires of all colour-shades, chrysoberyl, green beryl, deep blue aquamarine and aquamarine with blood-red dendritic inclusions, colourless grossular of the purest water that may be cut and polished as a diamond substitute, golden grossular and emerald-green grossular. There are the rhododendron-red rhodolites and the alexandrite-type garnets with distinct colour-change, which are left *in situ* by the local gemstone miners, as they are mistaken for poor colour grade rhodolite. There are the fine emerald-green chrome tourmalines from Landanai, the chrysoprase and the prase-opal. Last, but not least, the emerald-green zoisite, and not alone the fine crystalline "anyolite" with ruby inclusions from the famous Mundarara-mine, 18 miles off Longido in the bush, but also the emerald-green "tanzanite" from Merelani-Hills. Unfortunately, to the ordinary customer a tanzanite has to be blue. Therefore, the green tanzanites are heat-treated and become a rather pale blue. By my personal opinion, this is not an improvement!

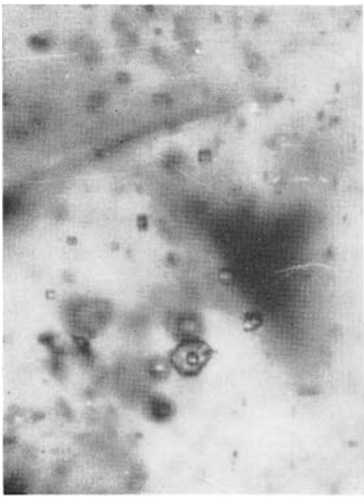
The green stones that were first seen by the gemstone miner, Mr. Khanji, in Arusha, January 1969, were definitely emeralds. The location of the deposit was unknown, the indicated direction usually wrong.

The right direction to the emeralds was known by the Mzee of Babati and the gemstone prospector Hans Peter Kristen struck lucky and found Tanzania's largest emerald deposit in February 1970 at the south coast of Lake Manyara, near the village of Maji Moto (meaning "hot water" because of the hot sulphuric springs in this area).

The emeralds are found, together with alexandrite, in a biotite mica schist and partly in pegmatite.

The emerald deposit is worked now by about 120 mine workers, with bulldozers, washing plant and everything that is necessary for large scale gemstone mining. The output is up to three kilograms per day. The colour of the Manyara-Emeralds is a fine

Manyara-Emerald, × 120



Three phase inclusion and cubic and rectangular crystals.

Liquid filled negative crystals parallel to the prism.

grass-green, some of them show a warm yellowish tinge like the Sandawana stones, others are deep bluish-green. Well developed hexagonal crystals up to 100 grams are not a rarity, but these species are only translucent and suitable for cutting cabochons. Fine, clear emeralds come up to eight carats only and are compared with the finest Colombian emeralds. The three-phase inclusions of the Manyara-Emerald are not of a jagged shape, but more stubby. The cubic and rectangular crystal inclusions are interesting, with a higher R.I. than the host crystal and the liquid-filled negative crystals parallel to the prism.

The dichroism is distinct and the chromium spectrum is the typical emerald-absorption spectrum with chromium absorption lines at 6830, 6806, 6620, 6460 and 6370 Å.

Manyara-Emeralds found in pegmatites do not exhibit a red residual colour under the Chelsea filter, while the very chrome-rich stones from the mica schist show a colour change to pink.

PRECIOUS OPAL MINING IN THE SNAKE RIVER PLAIN RHYOLITES, IDAHO

By PAUL L. BROUGHTON

Department of Mineral Resources, Regina, Saskatchewan

IN north-western United States the Snake River Plain and Yellowstone Plateau resulted from intense Pliocene and Quaternary volcanism. The resulting basalt and rhyolite flows, which molded the Idaho topography, have several occurrences of common and precious opal. In the United States the Idaho opal deposits probably rank second only to the famous Virgin Valley, Nevada, opalized wood deposits.

The very fine precious opal in Idaho has a quality that has been likened to that of the famous Hungarian opal. The body colors incline toward misty whites of high translucency in which medium size color patches of fire brilliance and clarity are observed.

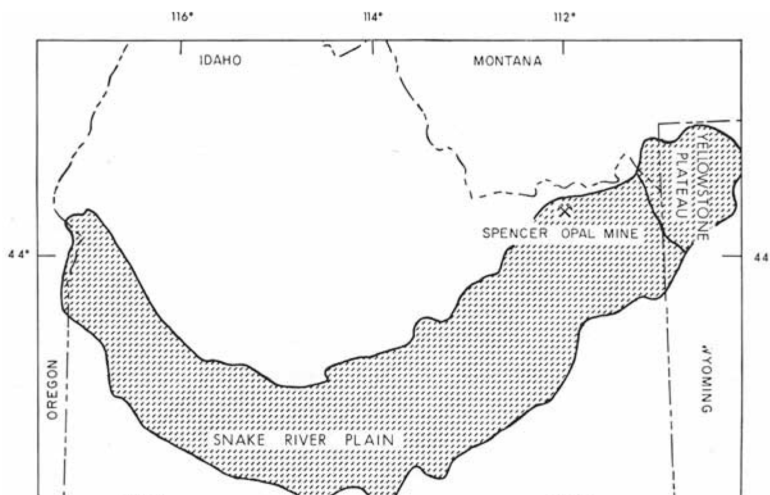


FIG. 1. Location of the Spencer Mine.

FIG. 2. The Spencer Opal Mine at Spencer, Idaho.

Since the late 1890's precious opal fields have been worked in Idaho with varying, but usually poor, commercial success. At the surface the rhyolites tend to disintegrate making it easier to extract the opal, but deeper down where fresher material is exposed, the opal is virtually impossible to remove on an economic basis.

Today, the main opal interest in Idaho centers on a cluster of small mines east of the village of Spencer, near the north-eastern corner of the state (fig. 1). The largest and most productive mine is the Spencer Mine (fig. 2), operated by M.L. Stetler. The mine was once known as the Lost Deer Hunt claim, and was originally discovered, as the name implies, by a party of lost deer hunters two decades ago.

The Spencer Mine is at an elevation of 7,000 feet on the south slope of the Continental Divide, five miles east of Spencer, Idaho. The mine is operated open pit style, and is essentially a bulldozer and dynamite operation on the mountain slope. The mine is in a light gray to light purplish gray rhyolite flow of Pleistocene to Recent-age volcanism. The best opal occurs as nodular masses and as layers forming the bottom of gas cavities. The nodular masses undoubtedly represent completely filled gas cavities. It also occurs as thin seams, veinlets and crack and joint fillings. In thin section the rhyolite is a highly silicic rock containing phenocryts of orthoclase pseudomorphs after sanidine (fig. 3). No

FIG. 3. A large phenocryst of orthoclase alteration of the original sanidine, adjacent to a spherulite, and trains of smaller spherulites.

0.5 mm

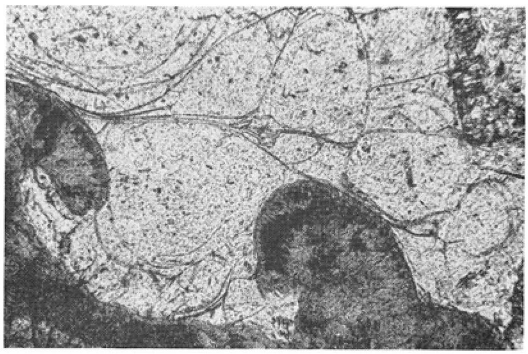


FIG. 4. Perlitic structures in the groundmass of the rhyolite.

0.5 mm

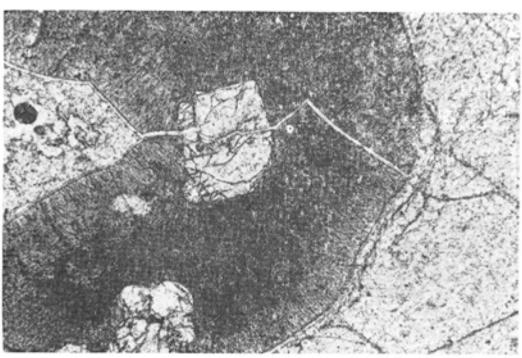


FIG. 5. A spherulite composed of radiating fibres of cristobalite and orthoclase, with a phenocryst of orthoclase pseudomorph after sanidine, penetrated by a veinlet of chalcedony.

0.1 mm

mafic minerals in more than trace amounts have been observed. The most common were a few green augite crystals. Euhedral crystals of magnetite are rare but sometimes associated with the groundmass, which is completely glassy and often perlitic (fig. 4). This groundmass is essentially a micro-crystalline quartz and alkali feldspar mixture in hazy intergrowths, characterized by flows of microlites.

A specimen of precious opal from a gas cavity was analysed for trace elements by use of a Jarrell Ash 3·4 spectometer with Ebert Grating applied to a direct current arc. Of the 60 elements tested for, the following were present: aluminium, boron, calcium, copper, lithium, lutetium, magnesium, silicon (major), titanium and vanadium.

The upper zones of the rhyolite lava flows exposed at the mine are characterized by variable devitrified and spherulitic black obsidian which forms abundant blocks in the agglomerates at the top of the flow. The devitrification spherulite's fibrous radiating structure is usually a mixture of high quartz, cristobalite and orthoclase. Phenocrysts of sanidine have been recrystallized into aggregates of orthoclase and sometimes high quartz (fig. 7). The phenocrysts occur within the spherulites (fig. 5) as well as in the groundmass (fig. 3). Films of chalcedony usually form an outer margin (fig. 6) on the spherulites. Recrystallization of this chalcedony film into micro-crystalline quartz is rare. Phenocrysts range in abundance from one to ten per cent of the bulk volume, but usually around six per cent.

The nodular opaline masses, one of the two forms common in the mine, are formed in the upper black obsidian zones, that area approximately above the bulldozer in fig. 2. Below this the rhyolite is prolific with gas vugs up to six inches in diameter. The opal forms a secondary deposition in the basin portion of the cavities. Bladed aragonite crystals, additional films of amorphous silica, and malachite green stained alunite laminations are frequently associated with the late-stage secondary deposition. Most of the cavities are either empty or full of common opal. Precious opal is present in roughly ten per cent of the cavities, usually as paper-thin seams amid common opal layers. The thin seams are well suited for manufacture into triplets. Rarer pieces in vari-coloured reds, blues and green are found upward of an inch thick.

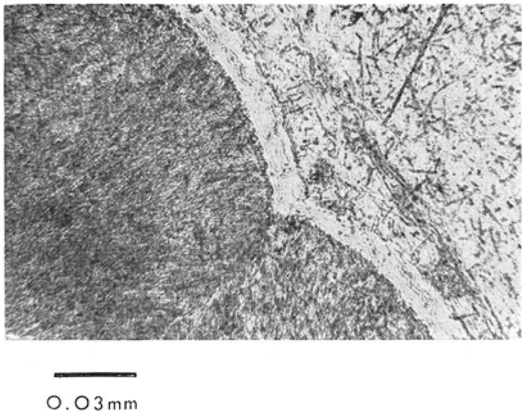


FIG. 6. Contact zone between a spherulite and the rhyolite groundmass. The contact margin is emphasized by a film of chalcedony. Note the microlites in the groundmass.

The overwhelming majority of the opal has a translucent white background, but the prized dark gray-black variety is periodically uncovered.

For the last three years the mine has been open for public collecting at a moderate fee.

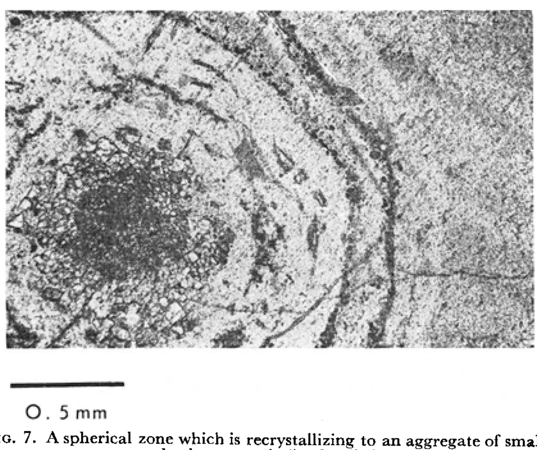


FIG. 7. A spherical zone which is recrystallizing to an aggregate of small orthoclase crystals (in rhyolite).

Gemmological Abstracts

BANK, (H.) *Transparenter weiss-farbloser Grossular aus Tansania.* Zeits. deutschen Gemmologischen Gesell., **20,** 22–25, 1971.

A colourless transparent grossular from Tanzania first described by the author in 1968 was found to have *n* 1·732–1·736, sp. gr. 3·65, *a* 11·851 ±0·002 Å. E.H.C.R.

BANK, (H.) *Durchsichtiger blassgelblicher Plagioklas aus den U.S.A.* Zeits. deutschen Gemmologischen Gesell., **19,** 134–136, 1970.

A new pale yellow bytownite from a pegmatite at Plush, Oregon, with α 1·565, γ 1·574, sp. gr. 2·73 ±0·02, is described.

E.H.C.R.

BANK, (H.) and NUBER, (B.) *Durchsichtiger Skapolith aus Moçambique.* Zeits. deutschen Gemmologischen Gesell., **19,** 47–54, 4 figs., 1970.

Data for a gem quality yellow scapolite from a pegmatite east of Entre Rios (map) are given and compared with those from other localities; ω 1·554–1·556, ε 1·540–1·541; *a* 12·071, *c* 7·588 Å.

E.H.C.R.

BANK, (H.) & NUBER, (B.) *Zu den Gitterkonstanten von "Edelaktinolith".* Zeits. deutschen Gemmologischen Gesell., **19,** 55–60, 1 fig., 1970.

X-ray *d*-values are tabulated for a transparent green actinolite from Tanzania. It has *a* 9·848, *b* 17·996, *c* 5·272 Å, β 104·85°; H. $5\frac{1}{2}$; perfect cleavage {110}; α 1·619–1·622, β 1·632–1·634, γ 1·642–1·644; sp. gr. 3·03–3·07. XRF shows Ca, Si, K, Ti, Fe, with some Cl and Al. E.H.C.R.

EULITZ (W. R.). *A new design for brilliance plus dispersion.* Australian Gemmologist 1971, XI, 2, pp. 28–32, 5 figures.

The author comments on the validity of Suzuki's formulae given in an article in the Australian Gemmologist, 1970, X, 10, pp. 13–24. (Abstracted Journ. Gemmology XII, 5, p. 180), and compares the submissions with the author's (Eulitz) own work. (Gems and Gemology, 1968, XII, 9, pp. 263–271). S. Suzuki replies to this criticism in Australian Gemmologist, 1971, XI, 4, pp. 25–27, 2 figures. R.W.

FANDER (H. W.). *Mineralogy and metallurgy of gold.* Australian Gemmologist, 1971, XI, 2, pp. 3–4.

Report of the Presidential address to the Australian Gemmological Association. Gold is found in many geological situations from hydrothermal to alluvial and usually occurs as native metal, although in some deposits it is in combination with tellurium. South Africa produces about 40% of the world's total, some 1,000 tons annually. In this locality the metal is finely disseminated in a conglomerate and may be hydrothermal in origin, although some workers suggest a "fossil" placer origin. Gold is not rare and is widely distributed in small quantities, but, as in sea water, in too small concentrations to be recoverable. Because of its fine dissemination throughout the rocks extraction is difficult, on the other hand, due to its reluctance to combine with other elements, it is easily smelted and refined. R.W.

HUDSON (D. R.). *Key for identification of common cut and uncut gemstones.* Australian Gemmologist, 1971, XI, 3, pp. 6–7.

Details a system for the rapid testing of gemstones and was devised mainly for student use. By the use of "crossed polars" the optical character of the stones is found and they are separated into two groups—singly and doubly refractive. Each group is then further divided into smaller groups by the densities assessed by heavy liquids. Finally the refractive index is ascertained by use of a refractometer (for cut stones) or by immersion methods for uncut material. A "graph-chart" provides the final reference. This chart, made on graph paper, has the refractive indices to the first place of decimals marked along the top edge at every heavier ruled fifth line. The names of the stones are written up the left margin in order of ascending R.I. and the R.I. of each named stone is depicted by a horizontal line covering the range of R.I's for that stone. This is similar to the graph-chart published for densities by Professor Karl Chudoba in the *Gemmologist* for June 1936. R.W.

JONES (J. B.) and SEGNIT (E. R.). *The nature of opal. I. Nomenclature and constituent phases.* Journ. Geol. Soc. Australia, 18, 57-68, 6 figs. 1pl.

Natural hydrous silica may be subdivided into three well-defined structural groups: opal-C (well-ordered γ-cristobalite), opal-CT (disordered α-crist instobalite, α-tridymite), and opal-A (highly disordered, nearly amorphous). Lussatite from the original locality is identical with opal -CT; lussatite thus appears to be a legitimate name for this class of opal. Although the main criterion used is the X-ray diffraction pattern, supplementary information from IR absorption, dilatometer, and thermal techniques supports the three-fold classification. The terms opal and opaline silica may conveniently be applied to natural hydrous silica for which there is insufficient information to place the material in one of the three above categories. R.A.H.

LANG (C). *Photomicrography without a camera.* Australian Gemmologist, 1971, XI, 4, pp. 7–12, 8 illus.

A well-written article on the photomicrography of gem stones using the minimum of equipment. There is an interesting paragraph on the optics of a microscope. R.W.

LAPWORTH (P. B.). *The myth of the Geierstein opal.* Australian Gemmologist, 1971, XI, 2, pp. 27–32.

A cogent study of the "bad luck" story in Sir Walter Scott's novel *Anne of Geierstein* which has been suggested as being the cause of the unpopularity of opals. A number of references, other than that of the novel itself, have been examined, but a completely clear decision has not been reached. R.W.

LIDDICOAT (R. T.). *Diamond prices of a century ago.* Gems & Gemology, 1971, XIII, 10, pp. 325–327.

A copy of *The Jeweller's Guide and Handy Reference Book* published by W. Redman in Bradford during 1883 has been presented to the Gemological Institute of America. In the article Mr. Liddicoat discusses the prices of gemstones given in Redman's book. R.W.

McColl (D.). *More confusion with synthetic yellow sapphire.* Australian Gemmologist, 1971, XI, 3, pp. 3–5, 2 tables. A graph, 1 illus.

Investigation by the author shows that there are three types of synthetic yellow sapphire. They are referred to as Type A, which is coloured by iron and manganese and is generally a pale yellow in colour and Type B coloured by manganese and chromium and which has a warmer and more orangy colour. Lastly, Type C, in which iron and vanadium are the colour producing metals. These produce hues of yellow. A Type C stone is reported upon and a table, arranged by J. H. Oughton, is given showing the absorption and luminescent characters of the three types.

R.W.

Milyuvene, (V. A.) and Varshavskii, (A. V.) *Distribution of luminescence centres in diamond crystals.* Soviet Physics—Crystallography, **16,** 157–159, 3 figs., 1971. Transl. from Kristallografiya, **16,** 197–199, 1971.

Examination of about 1000 Yakutian diamonds has shown that luminescence in UV light and birefringence have either a zonal or a sectoral distribution within a diamond crystal. Sectoral distribution in accretion pyramids is related to (100) or (111) faces. The constant nature of the structure of the blue component of the luminescence spectrum and its sectoral distribution show it to be connected with a definite impurity adsorbed only on (111) faces. [Following abstract].

A.P.

Trubin, (V. I.) *Distribution of luminescence centres in diamonds.* Soviet Physics—Crystallography, **16,** 201–204, 5 figs., 1971. Transl. from Kristallografiya, **16,** 244–247, 1971.

A large lot of natural diamonds from various mines was examined [preceding abstract]. Crystals with zonal luminescence are most common, sectoral luminescence is encountered much less often. Among crystals with zonal luminescence blue is most common, while green and yellow are substantially less common. Crystals with several luminescence bands of different colour are quite rare. The optical absorption spectrum of a diamond in the portion showing blue luminescence is contrasted with the spectrum of the portion not showing such luminescence. A.P.

OUGHTON (J. H.). *Fakes and frauds—Caveat emptor.* Australian Gemmologist, 1971, XI, 4, pp. 17–22, 3 illus.

A report on the natural greenish-yellow sapphire topped/ synthetic blue sapphire-based doublet. Some yellow sapphires which presumably have had their colour enhanced by X-ray treatment are discussed. The atomic bombardment of large diamonds is commented upon. The "removal" of "silk" in some sapphires is mentioned and there is reference of two synthetic rubies which fluoresced blue when bathed in short-wave ultra-violet light.

R.W.

SANDERS (J. V.) and DARRAGH (P. J.). *The microstructure of precious opal.* Min. Record, 1971, 2, no. 6, pp. 261-268.

Studies of gem opal have established that the spectral colours are due not to chemical impurities or selective adsorption but to optical diffraction from a randomly faulted, close-packed structure of minute, transparent silica particles. The play of colours depends on the size and uniformity of the particles and on the extent of faulting. In the best gem-quality opal the particle size is at least 0·25 mμ diameter. The article is abundantly illustrated by 18 electron micrographs of fractured or etched surfaces of opal showing the lines of silica particles. Gem opal appears to be restricted in occurrence to horizontal layers in or near a bentonitic horizon.

R.A.H.

SHEPHERD, (G. F.) *The story of opal.* Rocks & Minerals, **46,** 363–370, 1971.

An account is given of the history and properties of precious opal. Occurrences in Australia, Czechoslovakia, Mexico, India and Honduras are summarized.

R.S.M.

WEBSTER (R.). *A problem in diamonds.* The Criminologist, 1971, VI, 20, pp. 28–31, 3 illus. (repeated Australian Gemmologist 1971, XI, 4, pp. 5–6).

Illustrates the use of X-rays when it was needed to know whether a stone in a sealed packet was a diamond or not.

P.B.

BOOK REVIEWS

SWEENEY (J.). *Gemmology*, Bundu series. Longman Rhodesia (Pvt) Ltd., Salisbury, 1971, pp. 112, some colour plates. $1.75.

Despite the title this is in no sense a gemmological textbook, although the author gives brief descriptions of some of the standard gemmological tests. The book is rather a guide to the gemstones of Rhodesia and is to be welcomed on that score, since there is no comparable monograph, although various species are described in Geological Survey reports. The author is too inaccurate when dealing with gem testing for the book to be of use to the serious student; the figure described as a cube and showing axes of symmetry is not a cube. Mohs' scale, said by the author to be internationally accepted, is quoted in a version which places apatite at 4, dioptase at 5 and epidote at 6. There are also too many slack phrases and loose definitions. Streak is given for 36 examples but of those given 26 show a white streak.

However, the book is welcome as a guide to the locations in which Rhodesian gemstones may be found. For a book reasonably priced the coloured illustrations are quite acceptable. There are chapters on synthetic and imitation gemstones and on fashioning and inclusions. Some text figures in black and white would have been useful in this section. The book concludes with a short glossary and index.

M.O'D.

LÜSCHEN (H.). *Die Namen der Steine.* Ott Verlag, Thun, 1968, pp. 383, Sw. fr. 34.80.

This is an exhaustive survey, with glossary, of the origin of the names given to minerals and gemstones, including those of legend. A glossary lists 1,200 names and there are numerous black-and-white illustrations of minerals and text figures illustrating woodcuts from early printed books. Chapters of introductory material include an account of the development of mineral names from earliest times through the middle ages to the present day, names met in alchemical treatises, names derived from personal names of discoverers and others.

The glossary contains most of the names familiar to gemmologists, although taaffeite and painite are regrettably absent. There is no attempt to list all the varieties of agate nor do the entries attempt to include scientific data. The material called topaz by Pliny has correctly been listed as peridot.

This is a book which fills a serious gap in mineralogical literature. The gemmologist may not wish to purchase it, although the price is reasonable, but he will be pleased to know that it will be available in libraries for consultation.

M.O'D.

SCHWEGLER (E.), SCHNEIDER (P.) and HEISSEL (W.). *Geologie in Stichworten.* LIEBER (W.). *Mineralogie in Stichworten.* Verlag Ferdinand Hirt, Kiel, 1969, pp. 160 and 244. Both DM 9.20.

These two books form part of the series Hirts Stichworterbücher and are intended as introductory guides to their respective subjects. The geology text covers first geology in general and then gives a regional geology of Germany. A particular feature is the series of relief diagrams and cross-sections which are clearer than in any other comparable book, notable examples including Alpine structures and illustrations of ice age conditions. A useful bibliography lists works of very recent date.

The mineralogy text from the illustrations alone stands very high among similarly-priced books. Even a reader with no German can profit from a study of the diagrams of the crystal systems, which show the crystallographic axes and also, for each system and class, the way in which full symmetry is attained. Illustrations of other mineralogical details are similarly graphic and the book ends with a list, in traditional order, of major minerals listing crystal system, chemical formula, a diagram of the crystal form, habit, colour, hardness, streak and SG. These details spread over a whole opening so that all can be seen together. A bibliography lists, among other books on mineralogy, a number of German gemmological texts.

M.O'D.

DOHRENWEND (DORIS). *Chinese jades in the Royal Ontario Museum.* Toronto, 1971, pp. 135. Illustrated in black-and-white and in colour. £4·55.

This is a descriptive catalogue of the jades acquired by the Museum since 1910, with illustrations of a large proportion of the collection. Introductory chapters cover provenance, the nature of the material, problems of dating and early sources of information.

The introduction closes with chapters on the types and uses of Chinese jades, their fashioning and the styles adopted for particular purposes. The catalogue proper gives good descriptions, with dimensions, of the collection and the standard of the black-and-white illustration is high enough to enable the reader to distinguish details of ornamentation, but the coloured plates, though adequate, are not of quite such high quality. It is interesting to note, under the heading of ritual jades, how some shapes have still not had a definite use assigned to them, particularly the pi disk which has aroused many colourful speculations over the years. Some items, noted in the catalogue, have been tested by X-ray diffraction analysis. A useful bibliography lists the major works necessary to further study.

M.O'D.

PLATE (W.). *Wörterbuch der Perlenkunde.* Ruhle-Diebener-Verlag KG, Stuttgart, 1957, pp. 60. DM5.80

A useful glossary of terms relating to pearl issued with a table of weights. Some disconcerting absences are *Pinctada* from its expected alphabetical position, and any illustrations, but on the whole the book is a useful quick guide to the commoner terms for the German reader.

M.O'D.

CAVENAGO-BIGNAMI (SPERANZA). *Gemmologia,* Third edition, 1972 Ulrico Hoepli, Milan. Illustrated in colour and black-and-white, 2 vols. pp. 1526. L.40,000.

In preparing this, the largest and most comprehensive work ever to appear on gemmology, the author has doubled the size of the previous editions. The work is divided into sections of unequal size covering basic mineralogy, the gem species, the techniques of gem testing, and tables. The section on gem testing covers only 100 pages which is one-thirteenth of the work. With a book of this degree of comprehensiveness perhaps more space could have been given to this section and less to the mineralogy. The standard of the colour plates, though variable, is exceptionally high at its best, in particular those illustrating inclusions and polarization effects. The diagrams in the text are also clear and the black-and-white plates, again those depicting inclusions, set a new level of clarity. One wonders whether the paper, which began to discolour at the edges quite early after the publication of the previous edition, will again do so. The bibliography, covering a mere two pages, is quite inadequate for a work of this importance.

These general points covered, a detailed review of the book throws up material which one would hardly have expected to see in a book whose preface is dated 1972. There are illustrations of the General Electric synthetic gem diamonds and of the American flux-grown ruby. The Gilson synthetic turquoise is mentioned and its surface structure illustrated. There appears to be no mention, however, of the work done by Dr. F. A. Raal and his associates on the presence of nitrogen in diamond and its effect on colour and behaviour, though Lonsdaleite (a hexagonal form found in meteorites) is quoted. The sections covering the individual gems are exhaustive and the more important gems have their locations depicted in clear maps. A particularly happy feature is the provision, also for the more important stones, of a table of other stones whose identification could be confused with the stone under review, though, inexplicably, double refraction figures are not given. Some of the materials have no gem use, though moon rock (which is illustrated in colour) may attain a desirability of a kind. In the gem testing section I was particularly pleased to see the greatest prominence given to the location and identification of inclusions—surely the most important test for the future. Absorption spectra are given in black and white with a coloured spectrum for comparison purposes at the top of the page. I should have liked to see details of the work done using the electron-microprobe, such as that described by Gübelin in his paper "On the nature of mineral inclusions in gemstones". However, the inclusions are so well illustrated that the loss will only be felt by advanced gemmologists and those as yet new to the study.

This is indeed a fine production, fit to stand with the other giants of gemmology, Bauer and Webster. It may be that the day of the encyclopaedic work is slowly drawing to its close, at least in so far as science is concerned. No book has been so exhaustive and to repeat much of the detail in later books, in whatever language, will be unnecessary. As gemmology advances as a science, its literature will take the form of the photo-copied laboratory reports and offprints, which now characterize other branches of the earth sciences. If this is indeed the last work on gems of this magnitude, it is the best that could have been contemplated.

M.O'D.

ASSOCIATION NOTICES

GIFTS TO THE ASSOCIATION

The Council of the Association is indebted to the following for gifts to the Sir James Walton Library:

Snr. Elio Rosso, Sao Paulo, Brazil, for two almandine garnet tablet stones containing attractive inclusions.

Third revised edition of *Gemmologia* (2 vols.) from the author, Signora Speranza Cavenago-Bignami, Director of the State Gemmological Laboratory of Valenza and Milan.

John R. Fuhrbach, Texas, U.S.A., for a collection of Brazilian tourmaline specimens, some of which are capped with blue tourmaline.

Mrs. Alice Millard, Liverpool, N.S.W., for Australian opal specimens.

Mr. Dean Field, Toronto, Canada, for a booklet entitled *Jade and its Substitutes.*

FORTHCOMING MEETINGS

On Tuesday, 17th October, a talk will be given by Professor S. Tolansky, D.Sc., F.R.S., entitled "Speaking at Random". This will be held at Goldsmiths' Hall, Foster Lane, London EC2, and will commence at 7.00 p.m.

A Reunion of Members will be held on Monday, 27th November, at Goldsmiths' Hall at 6.00 p.m., followed at 7.00 p.m. by the Presentation of Awards gained in the 1972 examinations.

MEMBERS' MEETINGS

London

A large attendance of gemmologists heard Mr. E. A. Jobbins, B.Sc., of the Institute of Geological Sciences, South Kensington, give a talk on "Jade and Pseudo-Jade", at Goldsmiths Hall, Foster Lane, London, on the 18th of April.

Mr. Jobbins said that members of the Association would see his talk as a petrological one rather than a gemmological one, and started with a coloured slide of aventurine quartz, which he described fully, both as an uncut and as a cut stone.

The slides included thin specimens, which illustrated the colours and structures one found in jades. Magnification on the screen was between 300 and 400 ×.

For the purist looking for true colour in photographs of gemstones, Mr. Jobbins described his experiences with Ektachrome and Agfa colour film and illustrated the differences in colours when specimens were photographed on both makes of film.

During question time Mr. Jobbins described the Geological Museum's definition of jade and near jade.

In a vote of thanks, Mr. Robert Webster said that members had been treated to a stimulating lecture and one which he had not been quite expecting. In the past the Gem Testing Laboratory of the London Chamber of Commerce had experienced a lot of trouble with jade and had been pleased to call upon Mr. Jobbins and his colleagues to undertake tests the Laboratory was not competent to carry out in relation to petrology.

Midlands

The Annual General Meeting of the Midlands Branch of the Association was held on Thursday, 11th May, at the Auctioneers Institute, St. Philips Place, Birmingham.

Mrs. Siglinde Hiscox, F.G.A., was re-elected as Chairman and Mr. John Marshall was re-elected as Vice-Chairman. The Committee included one new member, Mr. Douglas Morgan, who joined Mrs. Susan Spence, Mr. Maurice Kirkpatrick and Mr. Graham Porter. Mr. Peter West was re-elected as Secretary.

In her summary Mrs. Hiscox was able to report a very successful year's activity culminating in the day's outing to Amsterdam, and mention was made of the success of the experiment of appointing a committee member as Press Officer. His duties included informing gemmological students of branch meetings as well as liaising with the trade and public press.

The meeting was fortunate in having present the National Vice-Chairman, Mr. D. King, F.G.A. He was pleased to hear of the vigorous state of the branch, and spoke of the growing interest being shown all around the world in gemmology.

After the formal business had been concluded the members were given a fascinating illustrated talk by Mr. John Salloway of Lichfield on his recent visit to the diamond and gold mines of South Africa.

The annual dinner and dance of the Midlands Branch was held on Wednesday, 19th April, at the Bank Hotel, Knowle. Forty-two members and their guests attended.

The Branch also arranged a day trip to Amsterdam. This was held on Sunday, 7th May, and included a visit to the Diamond Polishing Exhibition and a cruise around the canals of Amsterdam.

Scotland

The Annual General Meeting of the Scottish Branch of the Association was held on Thursday, 20th April, at the North British Hotel, Glasgow. Mr. D. Hill, the retiring Chairman, presided, and in his report mentioned particularly the success of the "World of Gems" exhibition and the summer outing to Dunure. Thanks to Mr. Wallace Allan, there had been a very large turn-out for a meeting at Ayr.

Mr. Alastair Armstrong was elected Chairman and Mr. G. M. Turner re-elected as Secretary. The Committee now consists of Messrs. D. Hill, I. McKenzie, A. McRae, P. Neil, C. Wade and H. Whitehead.

The 1972 summer outing was held on Sunday, 4th June, when members of the Branch visited Killin (Loch Tay).

IMITATION ZOISITE

In connexion with Mr. B. W. Anderson's note on a blue zoisite imitation (*Journal of Gemmology*, January 1972), Professor I. S. Loupekine of the University of Nairobi has reported that he recently encountered an example of an imitation in a parcel of five cut stones purchased as Tanzanite. Four stones, ranging from 3·35 to 19·50 cts. were blue-mauve, but differing slightly in hue and strongly resembled fired tanzanite; but the fifth stone—of only 3·30 cts.—was brownish. The blue-mauve stones proved to be synthetic spinel doublets and the little companion was smoky quartz and was undoubtedly added to give a natural feel since off-colour brown zoisite is only too common.

COUNCIL MEETING

At a meeting of the Council of the Association held on Wednesday, 17th May, the following were elected to membership:

Fellowship

Adams, Michael E., Middlesbrough. D. 1971
Clark, John G. A., Lewes. D. 1970
Gelaberto Vilagran, Enrique, Barcelona, Spain. D. 1971
Solé Barneda, Domingo, Barcelona, Spain. D. 1971

Ordinary

Altman, Jack E., Savannah, Georgia, U.S.A.
Arch, Boaz Y., Salisbury, Rhodesia
Beebe, Roxanne, Woodside, Calif., U.S.A.
Bella, Carlo, Rome, Italy
Bernard, David A. W., Carshalton, Surrey
Biremberg, Hector y Juan, Mar del Plata, Argentina
Brou, Nicole, Mouscron, Belgium
Brown, William H., Andover, Hants.
Chapman, Ross N., Mackay, Queensland, Australia
Constable, John, Birmingham
Dabaghi, Khalil, Beirut, Lebanon
Del Monico, Anneliese, West Haven, Conn., U.S.A.
Drake, Marvin E., St. David's, Bermuda
Du Pont, Willis H., Coconut Grove, Florida, U.S.A.
Eagle, John P., Fayetteville, Ark., U.S.A.
Eatough, Gerard D., Bolton, Lancs.
Elliott, Gordon, Ottawa, Ont., Canada
Fearman, Frederick C., Palos Verdes Est., Calif., U.S.A
Geeson, Denis L., Surbiton, Surrey
Gillman, Neil, London
Goodger, W. Donald, Don Mills, Ont., Canada
Green, John G., Brighton, Sussex
Hemans, David A., London
Hilal, Mohamed A. M., Colombo, Ceylon
Hubrecht, Julien, Brussels, Belgium
Ishikawa, Motohiro, Chiyoda-ku, Tokyo, Japan
Issacharoff, Abraham, London
Jhaveri, Mangalchand, London
Kan, Eishi, Shibuya-ku, Tokyo, Japan
Kerrigan, William, London
Kohjima, Michinaka, Nerimaku, Tokyo, Japan
Korevaar, H. J., Amsterdam, Holland

Kumegawa, Naotaka, Toshima-ku, Tokyo, Japan
Leek, Janet S., Oversley Green, Warwicks.
Oipschitz-Wachsberg, Elisabeth, Amsterdam, Holland
Lucas-Booth, Harry, Nairobi, Kenya
Majeed, Hajamohideen A., Kowloon, Hong Kong
Malin, Kathleen M., London
Maruyama, Keiko, Shibuya-ku, Tokyo, Japan
Matsumura, Shuichi, Inashi Nagano-ken, Japan
Melacon, Lloyd C., New Orleans, Louisiana, U.S.A.
Pappas, John, Harrison, New Jersey, U.S.A.
Pease, Belinda A. G., Geneva, Switzerland
Pellet, Pierre, Geneva, Switzerland
Ponniah, Lionel F. W., Colombo, Ceylon
Poole, Frederick L., Otatara, Southland, N. Zealand
Reynolds, Walter E., Cuffley, Herts.
Sarkin, Roy, Johannesburg, S. Africa
Smith, Ian J., Aberdeen, Scotland
Soper, John W. M., London
Stevenson, Charles L., Takapuna, Auckland, N. Zealand
Tanaka, Masami, Nada-ku, Kobe, Japan
Tanaka, Michio, Suginami-ku, Tokyo, Japan
Umezawa, Yoshiyuki, Edogawa-ku, Tokyo, Japan
Van Silburn, John, Burntwood, Staffs.
Van Starrex, Hans A., Colombo, Ceylon
Wang, Raphael Y., Kowloon, Hong Kong
Waterhouse, Philip A., Auckland, N. Zealand
Wills, John W., Durban, Natal, S. Africa
Winter, Colin H., Dorking, Surrey
Yang, Jinhua, Shinjuku-ku, Tokyo, Japan

1972 EXAMINATIONS

As the Gemmological Examinations have been held a little later this year, results will be delayed.

The final date for enrolment of *new* preliminary correspondence course entrants is the 31st August. Places, however, will be reserved for successful preliminary correspondence course candidates if the notification of the results has not been made by that date. Results will be issued as soon as possible.

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