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and

PROCEEDINGS OF THE
GEMMOLOGICAL
ASSOCIATION
OF GREAT BRITAIN


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OF GREAT BRITAIN
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# THE TOWNSHEND COLLECTION OF PRECIOUS STONES IN THE VICTORIA AND ALBERT MUSEUM: NOTES ON GEMSTONE PRICES OF THE MIDDLE NINETEENTH CENTURY

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

THE Reverend Chauncy Hare Townshend was born in 1778 and was educated at Eton and Trinity Hall, Cambridge. He took orders but owing to persistent ill-health, resigned them early and took up a life of collecting and writing poetry. Few of his poems are read today, although one called "Burning of the Amazon" was the best-known. His will, dated 6th August, 1863, named Dickens as one of the executors and in it he left his collections of pictures, drawings and water colours along with the collection of precious stones to the then South Kensington Museum, now the Victoria and Albert Museum.

Many of the stones in the Townshend Collection, now placed in the jewellery room at the museum, came from the celebrated collection formed by Henry Hope—readers will be well acquainted with the blue Hope diamond—of which a catalogue was published in August 1839, "A Catalogue of the Collection of Pearls and Precious Stones formed by Henry Philip Hope, Esq., systematically arranged and described by B. Hertz". A copy of this work in the Victoria and Albert Museum has the prices paid by Townshend for many of the items entered in manuscript, and thus forms one of the few records of the time of the prices of good quality gemstones.

Although the Townshend Collection contains 154 items, only

those stones which were brought from the Hope sales are mentioned below; a catalogue of the whole collection giving the dimensions was last issued by Sir Arthur Church in 1913. It has, unfortunately, not been possible to do more than give the weights quoted in Hertz for some of the stones, as the collection is sealed in a security case.

The stones are set in gold rings; some of them are arranged to swivel in order to display the backs of the stones.

## Diamond

A circular lemon-yellow brilliant-cut stone, displaying considerable fire, 5/12″ in diameter, weight 16 grains. Hertz plate 6, p. 27, no. 19. *Price paid £250.* Museum accession number 1177-69.

A green square brilliant-cut stone, closely resembling aquamarine in colour. Deeply cut. 5/16″ by 1/4″. 6½ grains. Plate 7, p. 28, no. 24. *Price paid £85.* Museum accession number 1176-69.

A small brilliant-cut stone, of almost a red spinel colour according to Hertz. 3/16″ by 1/8″, 1½ grains. Plate 7, p. 27, no. 15. *Price paid £30.* Museum accession number 1178-69.

## Sapphire

An octagonal white sapphire with a very bright pale bluish-grey hue. 17/32″ diameter, 47¾ grains. Plate 11, p. 40, no. 19. *Price paid £25.* Museum accession number 1257-69.

An oblong sapphire, pale blue-grey in the centre and straw at the ends, 1/2 by 3/8″ and 3/8″ thick, 39 grains. According to Hertz the yellow is seen at the front and the blue-grey at the back. Plate 11, p. 40, no. 13. *Price paid £40.* Museum accession number 1256-69.

An oblong step-cut apricot-yellow sapphire (listed by Hertz under Ruby Spinelle). 7/16″ by 5/16″, 7¾ grains. Plate 9, p. 36, no. 13. *Price paid £18.* Museum accession number 1260-69.

A long oval cabochon sapphire, lavender-blue in colour. Spectrum colours caused by an internal flaw. 13/24″ by 3/8″, 26 grains. Plate 12, p. 42, no. 31. *Price paid £18.* Museum accession number 1238-69.

A faceted oval sapphire of violet colour. 7/16″ by 3/8″, 20 grains. Plate 12, p. 39, no. 10. *Price paid £52 10s.* Museum accession number 1247-69.

An oval cabochon brown corundum with grey chatoyancy showing iridescence from a flaw. Partly transparent and partly opaque. 2/3″ by 7/12″. Plate 12, p. 42, no. 27. *Price paid £31 10s* Museum accession number 1258-69.

An oval cabochon wine-coloured corundum (listed as Ruby Spinelle by Hertz), 3/8″ by 5/16″. Plate 9, p. 37, no. 15. *Price paid £15.* Museum accession number 1259-69.

### Topaz

A yellow oblong topaz, showing reddish at the ends. 1¼″ by 2/3″, 5/12″ thick. Plate 26, p. 65, no. 5. *Price paid £25.* Museum accession number 1311-69.

An oblong deep claret-coloured topaz. 5/8″ by 13/24″. Plate 26, p. 67, no. 16. *Price paid £180.* Museum accession number 1309-69.

### Tourmaline

An oval rich-brown tourmaline, sherry-coloured according to Hertz. 19/24″ by 7/12″. Plate 28, p. 71, no. 19. *Price paid £50.* Museum accession number 1275-69.

An oblong deep green tourmaline, wrongly classed as zircon by Hertz. 13/24″ by 5/12″. Plate 19, p. 52, no. 2. *Price paid £8.* Museum accession number 1321-69.

An oblong step-cut deep green tourmaline. 1″ by 3/4″ by 5/12″. Plate 30, p. 70, no. 3. *Price paid £80.* Museum accession number 1323-69.

### Garnet

A nearly circular crimson almandine garnet, from Syria according to Hertz. 17/24″ by 5/8″. Plate 24, p. 61, no. 13. *Price paid £16.* Museum accession number 1271-69.

A cabochon almandine garnet engraved with a faun. 5/8″ by 1/2″. Plate 25, p. 62, no. 24. *Price paid £15.* Museum accession number 1272-69.

An oblong hessonite garnet (wrongly classed as zircon by Hertz). 1/2″ by 5/12″. Plate 19, p. 53, no. 6. *Price paid £15.* Museum accession number 1318-69.

## Peridot

A nearly circular leaf-green engraved peridot. (The subject is hermaphrodite, tree and Greek inscription). 2/3″ diameter. Page 84, no. 7. *Price paid £7.* Museum accession number 1300-69.

## Emerald

An oval emerald of fine colour, engraved with Persian characters. 27/32″ by 21/32″. Plate 14, p. 45, no. 7. *Price paid £45.* Museum accession number 1283-69.

A circular emerald with 6-rayed black star. The face and back are centrally flattened. 1/2″ diameter. Plate 14, p. 46, no. 9. *Price paid £12.* Museum accession number 1285-69.

## Aquamarine

A round sea-green aquamarine with a large table. 1 5/6″ diameter, 1 1/6″ thick, 7 oz. 7 dwt. 10grs. Plate 16, p. 49, no. 6. *Price paid £60.* Museum accession number 1286-69.

An oval yellowish-green aquamarine with a large table. 1 7/12″ by 1 1/3″ and 11/12″ thick, 1 oz. 5 dwt. 8 grs. Plate 18, p. 49, no. 4. *Price paid £30.* Museum accession number 1287-69.

An oval sea-green aquamarine with a large table. 1 5/8″ by 1½″ and 1″ thick, 1 oz. 17 dwt. 15 grs. Plate 16, p. 48, no. 3. *Price paid £300.* Museum accession number 1288-69.

A nearly square step-cut pale greenish-grey aquamarine, wrongly classed as zircon by Hertz. 1/2″ by 11/24″. Plate 19, p. 53, no. 4. *Price paid £15.* Museum accession number 1293-69.

## Opal

A Mexican fire opal of deep amber colour with red and green flashes, shaped as a long oval. 2/3″ by 5/12″. Plate 33, p. 79, no. 26. *Price paid £24.* Museum accession number 1226-69.

An oval Hungarian opal, golden with fine play of colours. 11/16″ by 9/16″. Plate 33, p. 79, no. 28. *Price paid £15.* Museum accession number 1228-69.

An oval pinkish Hungarian opal with play of colour. 3/4″ by 7/12″. Classed as hydrophane by Hertz. Plate 33*, p. 81, no. 42. *Price paid £4.* Museum accession number 1230-69.

An ovate liver-coloured Hungarian opal with purple flashes. 1/2″ by 1/3″. Plate 33, p. 81, no. 39. *Price paid £8.* Museum accession number 1231-69.

An oval Hungarian opal, one third white, two thirds brown with play of colour. 1/2″ by 3/8″. Plate 33, p. 80, no. 34. *Price paid £12.* Museum accession number 1232-69.

An oval deep brown Mexican opal with play of green light. 13/16″ by 5/8″. Plate 32, p. 78, no. 22. *Price paid £70.* Museum accession number 1233-69.

A triangular Hungarian opal with black dendrites and greenish-blue flashes. 1/2″ across. Plate 32, p. 80, no. 33. *Price paid £30.* Museum accession 1234-69.

## Quartz

A straw-yellow cairngorm. 5/6″ by 3/4″ and 5/6″ thick. Plate 35, p. 86, no. 9. *Price paid £5.* Museum accession number 1182-69.

A Ceylon twin stone, part smoky, part purple, each half a long oval and 17/24″ by 1/3″. Plate 36, p. 86, no. 10. *Price paid £10.* Museum accession number 1186-69.

A heart-shaped rose-cut amethyst, Siberian. 11/12″ by 11/12″. Plate 36, p. 89, no. 29. *Price paid £7.* Museum accession number 1189-69.

A rich-coloured striped amethyst. 1 1/12″ by 23/24″ and 1/2″ thick. Plate 36, p. 87, no. 19. *Price paid £15.* Museum accession number 1191-69.

A piece of chalcedony on amethyst, the upper layer cut to represent a panther, the convex back of amethyst engraved with a Bacchante. Plate 35, p. 86, no, 5. 5/62″ by 7/12″. *Price paid £15.* Museum accession number 1208-69.

An oval grey mocha stone with black dendrites, classed as opal by Hertz. 1″ by 3/4″. Plate 33*, p. 81, no. 40. *Price paid £15.* Museum accession number 1215-69.

## Turquoise

A nearly circular greenish blue turquoise cut with a female head in relief. 5/12″ in diameter. Plate 41, no. 5. P. 91, no. 7. *Price paid £9.* Museum accession number 1261-69.

# GEMMOLOGY AND TEETH

*By W. G. CROSS, M.B., M.S., B.D.S., F.G.A.*

FOR centuries man has striven to repair the ravages of dental decay and extracted teeth with various materials, and in most cases he has endeavoured to match natural teeth as regards colour, hardness and contour. Thus long ago replacements for missing teeth were carried out in various species of bone or ivory, and in recent times in plastic (methyl methacrylate) or porcelain. Cavities have been filled with silicate cements, plastics and porcelain, all of which can give reasonably acceptable aesthetic results, silver amalgam or gold, and teeth may be crowned with acrylic, porcelain, stainless steel or gold crowns.

In general there is a preference for materials which are inconspicuous, but there are many parts of the world where a display of gold or stainless steel is customary. In the past, however, some peoples submitted themselves to decoration, by means of gem materials, of teeth which were free of decay, such materials including gold, diamond, jadeite, haematite, turquoise, rock crystal, obsidian. In Central and South America the Mayas and the nhabitants of Ecuador used to decorate their teeth in this manner; it is probable that decorative filing of the teeth preceded the insertion of inlays. The teeth involved were usually the upper incisors: the crowns of these teeth, especially the central incisors, are normally fairly wide and long, and are usually visible to others, especially

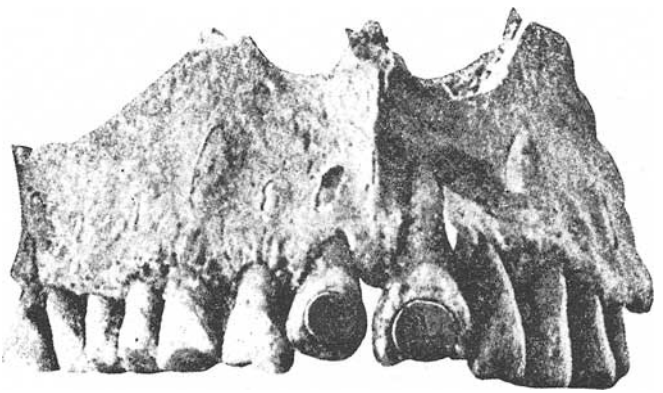

FIG. 1. *Maxilla and teeth of skull with two hardstone inlays.*

when laughing and smiling. Less frequently the palatal surfaces are involved.

The inlays consist, in the main, of one or more circular discs inserted into prepared cavities; in some cases a transverse groove has been formed, with undercuts, so that the inlay is slid into position from one side. In some instances, with the inlay removed, a raised central boss can be seen at the bottom of the cavity, indicating the use of a hollow trephining instrument. This may have been a bone or cane drill, used with an abrasive (sand); chewing of coca may have helped to make the operative procedure bearable (Figs. 1 and 2).

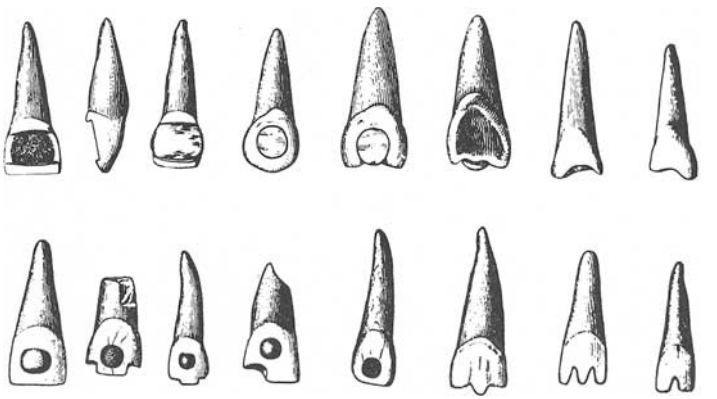

FIG. 2. *Types of decorative inlays and tooth filing found in incisor teeth of the Mayas.*

I was recently asked by Mr. J. A. Donaldson, L.D.S., R.C.S., now Editor of the *British Dental Journal* and at the time the Honorary Curator of the Museum of the British Dental Association, to examine a tooth which had been presented to him by Dr. Brodny, an American physician, who in turn had obtained it from a friend in Mexico. The tooth came from a Maya tomb excavated near the town of Teapa, 30 miles from Palenque, State of Tobasco. The skull had seven teeth, said to be inlaid with turquoise. Its date, late Maya Empire, is about 1000 A.D. Many mutilations and decorations of teeth were found including inlaying with jade, malachite, turquoise, obsidian, pyrites and serpentine.

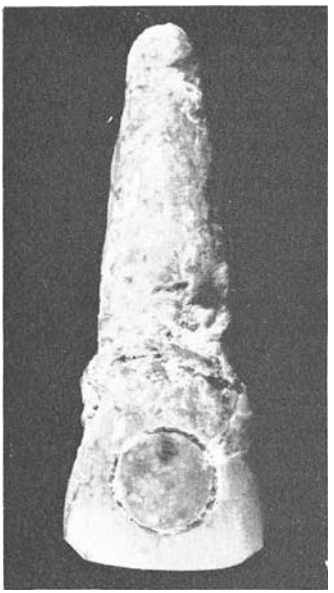

FIG. 3. *Late Maya tooth with jadeite inlay.*

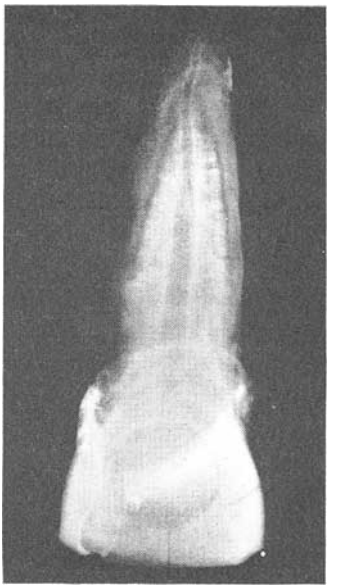

FIG. 4. *Antero-posterior radiograph of tooth in Fig. 3.*

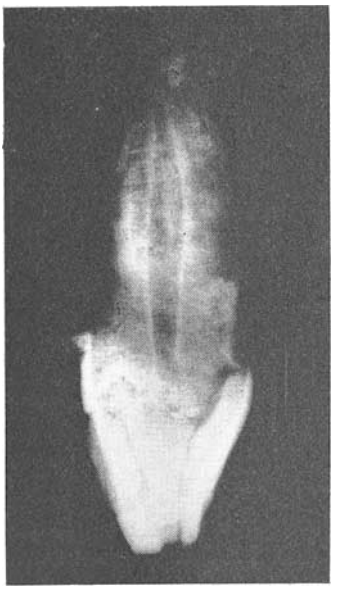

FIG. 5. *Lateral radiograph of tooth in Fig. 3.*

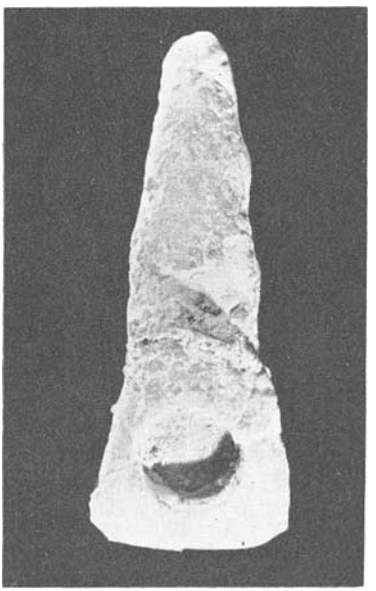

FIG. 6. *Late Maya tooth without jadeite inlay.*

The tooth was an upper central incisor, 25 mm. long and 9 mm. wide at the incisal edge, with encrustations of calcified material on the root surface. The front, or buccal, surface contained a circular greenish-blue disc in a prepared cavity, and it measured 4 mm. in diameter, 2 mm. in thickness, being lenticular in section. It appeared to be jadeite, or perhaps turquoise (Fig. 3). Radiographs, both antero-posterior and lateral, were taken, and from these several additional features could be noted (Figs. 4 and 5).

The root canal, normally rather narrow, was broad through much of its extent: the pulp chamber was nearly missing and there appeared to be an irregular mass of radiopaque material in the place of most of the coronal dentine, being rather more radiopaque than the dentine of the root. One or two cracks suggested that a fracture had taken place and been repaired at some stage with a dental cement.

This was confirmed by an accident which took place while the tooth was being examined. The tooth had been photographed, and whilst being replaced in an envelope dropped to the floor, where much of the crown shattered into a number of pieces. This accident, while unfortunate in respect of the damage to the specimen, did at least permit positive indentification of the material.

An x-ray powder diffraction examination was made in the Department of Mineralogy, Natural History Museum, and the material was found to be an impure jadeite. A further photograph of the tooth, showing the cavity in which the jade disc was cemented, was taken (Fig. 6).

Many teeth subjected to this form of decoration must have suffered from pulpal necrosis due to exposure of the pulp chamber, and thus become a non-vital tooth which in many cases would have to be extracted. The skill, however, with which the operator carried out the trephining procedure must be admired.

I would like to thank Mr. P. Embery of the Mineralogical Department, Natural History Museum, for undertaking the x-ray diffraction picture, and the Photographic Department staff, Eastman Dental Hospital, for the photographs numbers 3 to 6. Photograph numbers 1 and 2 are from Weinberger's work *History of Dentistry*, Volume 1, 1948.

# TUGTUPITE

*By OVE DRAGSTED, F.G.A.*

IN 1960, a new mineral of an intense cyclamen-red colour was described from two localities, far from each other but with close resemblance, Southern Greenland and the Kola peninsula. It was described by the Russian petrologist E. I. Semenov, who had found it as embedded grains of pinpoint size, and by the Danish geologist, Professor Henning Sørensen, who had found somewhat larger, but still quite small, spots in a vein in nepheline-syenites.

The mineral, although close to sodalite, was found to belong to the tetragonal system of crystal symmetry. It is a beryllium-mineral corresponding to the chemical formula $Na_8\ Al_2\ Be_2\ Si_8\ O_{24}\ (Cl_2, S)$. When the mineral is pure, the specific gravity is 2·36, but it may vary from 2·30 to 2·57 owing to contents of chkalovit, albite, analcime, hochmanite, pyrochlor, aegirine, etc. The refractive indices for yellow light are, for the ordinary ray 1·496, and for the extraordinary ray 1·502, with a birefringence of 0·006. There is a marked dichroism, a darker somewhat bluish red and a lighter more orangy red shade.

The colour is mostly mottled in lighter and darker parts, the lighter ones fading into white in darkness and regaining their hue when again exposed to sunlight. Some of the white spots may also be tugtupite. The fluorescence is most remarkable. Under the long ultraviolet excitation a glowing apricot colour is developed: under the shorter rays a weaker salmon red is observed.

The hardness is between 6 and 7 on Mohs' scale. The material is somewhat porous. The cleavage is parallel to the faces of a tetragonal pyramid. The mineral hitherto found is marred by cleavage cracks and fissures, resulting in a considerable cutting waste. But the cabochons hitherto cut have been admired for their beautiful colour. They take a good polish. Most cabochons are mottled cyclamen and white with occasional greenish black needles of aegirine and gypsumlike, but hard, spots of yellow pyrochlor.

After one of the geologists in Greenland had described tugtupite as "much rarer than diamond", the local population have visited the drill holes made by the research teams and broken away the remainder of the material with hammer and chisel. Before this a minor portion had been sent to Denmark for cutting. The tug-

tupite shows up beautifully when set in gold, and production of tugtupite jewellery is going on on a small scale. It is expected that small occurrences of tugtupite will come to light now and then during the prospecting work of the geologists.

Tugtupite was one of the end products crystallized in the Ilímaussaq intrusion in Greenland. The magma filling a big hole perhaps two or three kilometers below the surface started to solidify 1,400,000,000 years ago, and the end products containing beryllium, niobium, uranium, thorium, etc. did not crystallize until 1,000,000,000 years ago.

The name tugtupite, which was suggested by Professor Sørensen in 1960 and approved by the I.M.A. Commission on New Minerals and Mineral Names, was derived from a small promontory where it was first found in Greenland, named Tugtup agtakôrfia, meaning "reindeer fall-off", and the "fall-off" includes the antlers shed as well as the manure. The first part of the name, tugtup, is reindeer, so tugtupite means reindeerstone.

# TESTING TIMES

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

FREEDOM is nothing if it has no bounds. We often feel a little irritated at the niggling restrictions with which bureaucracy rings us today. Gemmologically, routine testing of ordinary goods can diminish the enthusiasm of the keenest gemmologist.

In Britain, the Trade Descriptions Act, 1968, serves further to pin-prick inadvertently by causing concern over virtually worthless goods. The law can now be invoked in favour of the trifling customer, and a retailer needs to be a pedantic purist pursuing perfection.

Among the more humdrum routine tests we are asked to carry out, some give more trouble than others. Typical of such tests can be a suite of inexpensive Ceylon jewellery—usually blue or red-colour centre-stones in colourless cluster-surround rings, pendants, earrings etc. A glance would suffice any competent jeweller to inform him that the centre stones were synthetic sapphires and synthetic rubies and that the colourless cluster-surrounds were *not* diamonds.

Fortunate are we in being able to test these, very often, rubbed centre-stones despite their setting or backing. My particular "bête noire" is to be asked to test the white or colourless stone surrounds as well. These, variously, have been proved to be synthetic spinels, synthetic sapphires, pastes, zircon, natural colourless sapphires, topaz or quartz. When, as sometimes has happened, most varieties have been present in various permutations and the stones average about 12 to the carat, one wonders why it is necessary to be so precise. How much or little can one charge for tricky work in smelly liquids in the height of summer whilst suffering a bout of hay-fever? Monobromonapthalene is a great irritant to the nostrils and is not advisable as an immersion liquid for sufferers from hayfever. When the result is found to be synthetic spinels, or some such similar stones, one wonders—does it matter since they obviously are not diamonds?

However, to lift us from our despair at such mundane matters, something of interest comes along.

A very good friend of mine, an eminent gemmologist, uses his refractometer first and foremost—an advocate of refractometry!

I like to sight test first (decide without testing—solely by look, heft, cut and colour). Afterwards, I try to decide by lens, DR, inclusions, dichroism, lustre, patina and polish. Finally, I opt for the microscope, then the spectroscope and then the refractometer. Obviously, if the stone purports to be quartz or topaz I do not use microscope or spectroscope; similarly, for obvious aquamarines or tourmalines. I do not scorn the refractometer; I use all three as needed—spinel, standard and diamond.

Quite recently a 9 ct. ruby was sent to be tested. Doubts were expressed by merchant and shop—both experts in their own field. It was decided a laboratory test was essential.

9 ct. rubies are somewhat rare these days and it is a pleasure to handle such goods after a routine of synthetic red samples. The customer requested permission to wait for the test to be completed—not conducive to cool, calm, collected conditions to have someone literally waiting for you to raise your eyes from the microscope, and, hey presto, it is a ruby!

Looking at the stone in its packet by unaided eye, it looked like a fine, rather dark red spinel. First examination by a 10X lens with a 60 watt bulb bench lamp, showed multitudinous bubble-like crystals similar to diopside crystals seen in hessonite garnets. Since, however, I could see the edges or perimeters of some of the crystals sharply in focus to be doubled, I knew the host material must be doubly refracting, which immediately eliminated spinel and garnet. Spectroscopic examination gave clear cut evidence of a bona fide ruby spectrum.

Since doubts had been expressed by a knowledgeable wholesaler, it seemed commonsense to do a treble check and take the refractive indices. I was taken aback to get a clear single edge reading of 1·76. I have often in the past had poor readings of one of the two shadow edges. This is usually improved by use of a polaroid disc; in this instance, however, it only served to emphasize the single edge of 1·76. After more than routine double checking, it was felt that some form of repeated twinning of the structure caused this unusual reading. Unanimous agreement was that the stone was in fact a natural ruby.

It is only fair to say that the inclusions seen in this stone were not typical of Burmese or Siamese stones. Since most of the trade sell on colour, it is not unknown for a chrome-rich dark red Burma stone to pass as being from Siam. Therefore it is possible that, since

the stone did look like a spinel (failing which, a garnet) a refractometer reading could have given a wrong direction. Even though one's gemmological crest should bear the legend "Leave no stone unturned", on such an occasion it would be more profitable to become more absorbed—gemmologically speaking!

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## WORLD MAP OF GEMSTONE DEPOSITS

*By H.-J. SCHUBNEL*

THIS map (36 × 24 inches) specifies, on a 1/40,000,000 coloured background, the distribution of about 150 deposits or mining districts over the whole surface of the globe. The gems are symbolized by plain or variegated bright coloured marks showing the locations.

The relative importance of the deposits is revealed by the size of the marks. The types of primary deposits are specified by the outer shape of the marks. It was necessary to point them out, for some deposits which were thought to be worked out, were in fact only partly exploited (superficial gathering, sorting of eluvial deposits . . .).

The following types were distinguished:

 - Deposit enclosed in basic volcanic rocks and their vents (sapphire, olivine, pyrope, zircon).

 - Decay deposit of volcanic rocks (opal, agate, amethyst).

 - Pegmatite deposit (beryl, topaz, tourmaline and many other gems of granitic pegmatites: emerald of pegmatites injected in mica-schists).

 - Lode deposit (amethyst, rhodochrosite, etc.).

 - Metamorphism deposit (almandine, cordierite, ruby, etc.).

 - Endomorphism deposit:

- alkaline rock in contact with an ultrabasic rock (jade);
- alkaline rock in contact with a magnesian marble (lapis lazuli).

- Weathering deposit (malachite in copper deposits; turquoise in some aluminous rocks in dry climate).

- Other types of deposits: such a mark shows peculiar modes of formation: fossilization of resins (amber); silicification of fibrous minerals (tiger-eye) or plants (fossil, wood, etc.).

Diamond is represented by an octahedron. The deposits where it is mined in the parent-rock ◆ (kimberlite) are differentiated from the secondary deposits ◇ (precambrian conglomerates, marine terraces, alluvial deposits, etc.).

The worldmap meets a double use: for jewellers, the possibility of exhibiting a map illustrating the distribution of the main mines of diamonds and coloured stones, while being attractive enough to use decoratively; and for specialists, a document summarizing a large number of useful data referring to their work concerning geology, geography and economy.

The map was prepared according to the most modern techniques in mapping and to the method used for the execution of

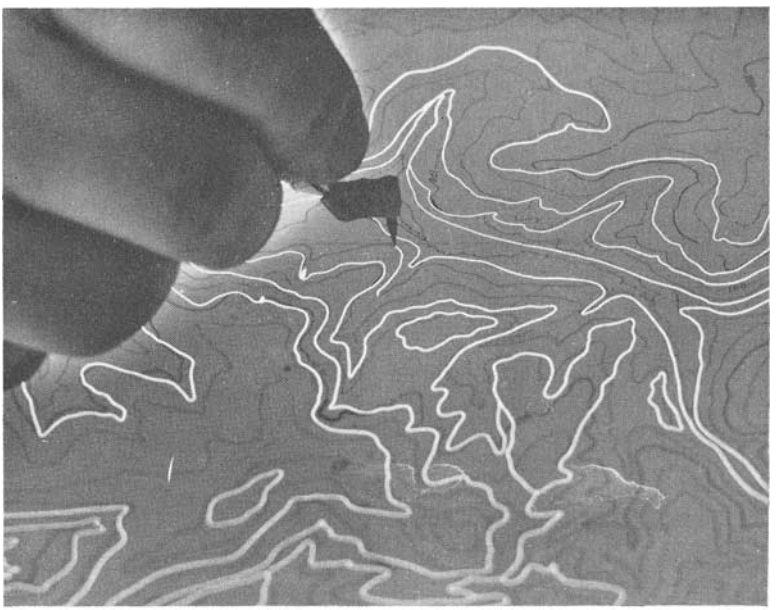

FIG. 1. *The outlines of geological areas are drawn in blue-print.*

geological maps. Such a process relies largely upon the photo-mechanical techniques which allow, thanks to the stability of plastic supports, an accurate placing of colours in the surrounding outlines.

"Registering", the main care of printers, is thus practically resolved.

Here is a concise description of the printing process.

The cartographical drawing proper (outline projection of coasts, etc. . . .) was rapidly drawn on a stable semi-transparent plastic support which was of the same kind for all the plates needed.

The picture obtained was transferred, through a diazoic process, onto a second transparent support coated with an opaque red emulsion, soft enough to be penetrated by a special point, sized to the thickness of the desired line. The tracing thus obtained was clear of the support, which formed a kind of negative from which, through mere contact, a positive film was drawn.

FIG. 2. *Negative of coloured spaces to be covered. The thin cut-out film is stripped from its plastic support.*

This provided the basis for the following:

(1) Achievement of colour plates.
(2) Execution of printing plates.

These colour plates were achieved through the "stripping layer" method. Such a layer was made of a transparent plastic support over which was poured, when heated, a thin film of alcohol-soluble poly-vinyl. Through a photomechanical process, the picture of the positive film was transferred and appeared, after development, as a hollow groove in the thin film. Then it was easy to "peel off" the surfaces of the plate dealt with. A negative of each area corresponding to the various printing values was thus obtained. It was enough to interpose, for each printing plate, the different plates, while getting together those which occurred in the same colour.

Parallel to these operations, the text-plate was achieved through photocomposing on stripping film. Such texts were put in their place on plastic support by mere pasting.

A checking test was carried out by multicolor process, using photomechanical means to obtain a colour-proof on a plastic support.

Conventional offset printing was used to produce the final map.

The map and its brief explanatory account are available in three languages: German, English and French. The English version is available from the Gemmological Association price 35s. 0d. and the French and German versions from the "Department de Documentation" of Bureau de Recherches Géologiques et Minieres, B.P. 818, Orléans (France), price 24 francs (post free—sea mail).

# Gemmological Abstracts

NISHIYAMA (S.). "*Victoria-stone*". Lapid. Journ. 1969, 23, 5, p. 696.

Details of a man-made chatoyant stone consisting of a radially developed crystalline mass of fibrous aggregate structure similar to the nephrite of the amphibole group. It contains an excess of the actinolite particles and exhibits chatoyancy when cabochon or bead-cut. The material is produced in various colours and is the result of the work of Dr. S. Iimori of Tokyo. A material called "Meta-made", with properties close to those of natural jade, has also been produced.

G.A.

VISWANATH (N.) *India's diamond industry*. Lapid. Journ. 1969, 23, 5, p. 722.

A review of the diamond industry in India. There are two major fields, one at Panna, in Central India, and the other at Golkonda in Andhra Pradish, Southern India. Both areas are being commercially exploited. Cutting and polishing are also carried on, but the industrv has to depend upon imported material.

S.P.

MALES (P. A.). *Microtextures of Australian Chalcedony, Chert and Jasper*. Australian Gemmologist, 1969, 7, pp. 9-14.

X-ray analyses of chalcedony prove it to be merely a cryptocrystalline variety of the common silica mineral, quartz. Thermal analyses of chalcedony give different patterns from samples of ordinary quartz, due to the very fine grain size of the chalcedonic particles. Very often the name chalcedony is restricted to the cryptocrystalline variety of quartz that shows, under the microscope, a definite microfibrous structure; but microgranular forms that do not show distinct quartz features under the microscope can also be included, owing to their similarity to the microfibrous forms under other tests.

The term jasper is normally used for red, opaque varieties of chert, although it has often been extended to include any strongly coloured chert, whether yellow, brown, or even green or black.

In most cases, however, the colouring is due to iron compounds, and is a distinctive departure from the normal dull greyish varieties of chert. The term jasper should be reserved for the red and reddish-brown varieties of chert to avoid confusion.

There is an anomaly in limiting the term jasper to describe chert deposits of the required colour. Some Australian agates, and the centres of some odd local "thunder eggs" present the typical opaque reddish brown colour of a jasper, and these of course should be regarded as forms of the mineral chalcedony.

S.P.

DUYK (F.). *L'émerande artificielle de synthèse.* Technica, 1969, 279, p. 539.

A brief survey of the methods used to produce synthetic emerald.

S.P.

CRONSTEDT (K.). *The great Australian amethyst mine.* Aust. Gemm. 1969, 10, 7, p. 23.

The great Australian amethyst mine is situated at Wyloo Station in the Ashburton district of W. Australia. There is an abundance of crystal clusters and terminated crystals are common. The colour range is from pale lilac, through purple to a blackish-blue. Often the crystals are only coated with a layer of colour.

S.P.

WIN (U. SOE.). *The application of geology to the mining of jade.* Union of Burma Journ. Sci. Techn., 1968, 1, 445-456, 3 figs.

The mineralogy, genesis, and mode of occurrence of jadeite and the methods of mining it in the Hpakan-Tawmaw tract of Burma are described. Jadeite occurs in albite-jadeite dykes intruding fissures in serpentinites and as boulders in Tertiary conglomerates. At Mawsitsit, the dark green variety locally known as mawsitsit kyauk is mined: uvarovite here occurs with chrome-jadeite. In the Hpalai Hills, 6 miles NE of Mawsitsit, swarms of unexplored jadeite-bearing dykes are known.

R.A.H-

EPPLER (W.). *Das Edelsteinbild.* The gem photograph. Gold. schmiedezeitung, Vol. 67, 11/1969, pp. 1325-1327.

Collection of various photomicrographs and their description.

(*a*) Sandmeier-Plato-striation. Three photomicrographs, one of a German synthetic star-sapphire, one of a ruby from the Umba mine in Tanzania and the same ruby under crossed nicols. The striation is not often illustrated, but maybe this is because it is only rarely shown in such details as in the published photomicrographs. The striation has a thickness of about 0·07 mm and can only be seen in polarized light and only in the direction of the optical axis. This phenomenon was first noticed by D. Sandmeier, Lugano, in 1920 and then confirmed by Dr. Plato in 1949. It has proved to be a characteristic of lightly coloured synthetic corundum, although it has now been shown that this striation is also present in the rubies found in Tanzania.

(*b*) Two beautiful photomicrographs show aquamarines, from Madagascar, with ilmenite inclusions, which form a kind of skeleton as an inclusion.

(*c*) Bronzite is an iron-rich enstatite. The first photomicrograph shows a bronzite with a diamond octahedron inclusion, which is enlarged in the second illustration showing surrounding stress fissures.

E.S.

HURLBUT (C.S., Jr.). *Gem zoisite from Tanzania.* Amer. Mineralogist, vol. 54, pp. 702-709, 1969.

Twenty-six crystals were examined, the largest being 260 ct., 40 forms were identified, 17 of them new for zoisite. A full chemical analysis is given and includes $V_2O_3$ 0·20, $Fe_2O_3$ 0·04, SrO 0·05; the blue colour is attributed to vanadium. Refractive indices for sodium light are $\alpha$ 1·6925, $\beta$1·6943, $\gamma$1·7015; pleochroism X = *b* red-violet, Y = *c* deep blue, Z = *a* yellow-green.

R.A.H.

KAGAYA, B. *Application of goniometry to gemmology.* Journ. Mining Coll., Akita Univ., 1968, A 4, no. 3.

The author considers that two-circle goniometric measurement for cut stones over 1 carat is as useful as the fingerprint measurement for individuals. The probability of the occurrence of equal goniometrical data is considered to be $9{\cdot}58 \times 10^{-41}$.

S.P.

# BOOK REVIEWS

SCHLOSSMACHER, K. Edelsteine und Perlen. Precious stones and pearls. E. Schweizerbart'sche Verlangsbuchhandlung. Stuttgart, Germany, 1969, 387 pp., 115 illustrations, 1 map, 18 photomicrographs, 2 colour-plates, index. 5th edition. In German.

Schlossmacher's book is of course a "must" for the German gemmologist. The additions to previous editions lean to the scientific side, but as before the book caters in the first instance for the practical gemmologist, the jeweller, the merchant, the lapidary and the student of gemmology. A trained mineralogist will find useful information enabling him to widen his field of applied science.

Interesting additions to previous editions are references to two new microscopes; the diamond microscope allowing the investigation of inclusions in a dark field and the Universal diamond and precious stone microscope which allows for immersion, polarization and binocular vision.

New scientific developments relating to diamond are reported such as the influence of nitrogen on the crystal structure.

For the practical gemmologist a concise description of the influence of the "make" i.e. the quality of cutting and polishing of the diamond on the valuation seems of importance.

Newcomers in the field of synthetics are carefully listed, such as the Linde synthetic emerald with high refractive index, synthetic alexandrite and opal.

Small irrelevant inaccuracies contained already in previous editions may irritate the careful reader, but do not detract from the value of the new publication.

W.S.

VARGAS (G. & M.). Faceting for amateurs. 1969, La Mesa, Calif., U.S.A. Published by the authors.

A comprehensive book about faceting, with details of many styles of cutting and how to achieve them. An appendix of species descriptions gives useful information about cutting angles, lap speeds and polishing agents.

S.P.

# ASSOCIATION NOTICES

## PRESENTATION OF AWARDS

OFTEN called a girl's best friend, diamonds were fast becoming a very good friend to the technologist, said Professor Samuel Tolansky, F.R.S. to members of the Gemmological Association, in Goldsmiths' Hall, London, on 19th November, 1969, after presenting gemmological examination awards to nearly 100 successful students.

Professor Tolansky, author of books and many papers on diamond, its history and structure, expressed surprise and pleasure at the number of overseas candidates present and spoke of the indirect links he had with many of them through former students of his from their countries.

He said he was very much an outsider in the company he found himself as he was not a gemmologist but a crystallographer. His interest in diamond sprang from something he read in the Old Testament. One passage in that stated, "The sins of Judah would be inscribed on the horns of the altar with a diamond". He knew the horns of the altar were of bronze, a hard material, and realized that the prophet to whom the verse was attributed knew also of the hardness of diamond.

Some of the references to diamond he had found surprised him. From a manuscript published in 1450, and which was now in a monastery in Bologna, he learned that even in those far off days people were using diamond to cut glass. Although the drilling of rock was looked upon as a modern development, he discovered from an encyclopaedia published in 1750 a very accurate and full description of the technique of drilling rock with diamond.

Professor Tolansky said he met many technologists and scientists in the course of his work—many who knew diamond—but he had a great respect for the diamond polisher who considered the scientist a thorough idiot and who said his father had taught him to polish diamonds, and his father before him, and all knew a great deal more about diamonds than the scientist; they knew that a diamond was harder in one direction than another by experience. The scientist knew why it was.

He went on to say that he was discussing the subject of diamond with G. A. Secretary, Gordon Andrews, earlier in the evening and they had got round to testing diamonds by the use of instruments in a laboratory. There was a very simple testing method and one he often used. He would transfer a diamond from a table or bench on which it was lying—making sure that he did not touch the stone with his fingers or other warm object—to the tip of his tongue and if it felt ice cold he knew the stone was a diamond. No other gem gave the same

impression. Diamond was a very good conductor of heat and at the same time was an insulator. The test he had described could not be repeated for, perhaps, a couple of hours.

The ability of diamond to conduct heat was becoming of considerable technological importance and during the last few years it had been put to use in small instrumentations which had been devised to give out very energetic radio waves. As the instruments heated up in use the radio waves diminished and it had been found necessary to introduce something to absorb this heat, and diamond had provided the answer.

There were other diamonds which were more transparent and more sensitive to heat rays. This was being used in what was known as an image converter, an instrument which enabled an image invisible to the naked eye in the dark to be seen.

Professor Tolanksy then turned to the work he was undertaking with a sample of moon dust from the Apollo 11 mission and told of the many hours he had pored over it with a microscope to discover any sight of gems. He had been rewarded at last, he said, by the sight of a minute blue particle, which he described as being of a sapphire-blue colour.

The Association's Chairman, Mr. Norman Harper, who presided, said that the Association was pleased to welcome successful candidates from W. Germany, Canada, Japan, Holland and Spain. He specially welcomed the President of the Spanish Gemmological Association, Sr. M. Masso, and Professor M. Font and Dr. Bosch, of Barcelona University. He mentioned that there had been a record number of candidates for the examinations, 460 sat for the preliminary and 307 for the diploma.

Basil Anderson, director of the gemmological laboratory of the London Chamber of Commerce, thanked Professor Tolanksy for presenting the awards and for what he described as the most interesting talk they had heard in many a year. He hoped it would not be long before Professor Tolansky was invited back for the members to hear further interesting aspects of his work as a crystallographer.

## MIDLANDS BRANCH

A meeting of the Midlands Branch was held at the Auctioneers' Institute, Birmingham, on the 21st November, 1969. Mr. P. Spacey, Chairman, presided.

The meeting divided into four groups, and members examined gemstones and items of jewellery brought by members of the trade. They were then invited to estimate the weight and retail value of the specimens. The idea of the meeting was to assist members in achieving some form of uniformity in connection with valuations.

## GIFTS TO THE ASSOCIATION

The Council of the Association is indebted to Mr. Paul W. Johnson, California, for a copy of his book "A Field Guide to the Gems and Minerals of Mexico".

James E. Glover, of Scarborough, Ont., Canada, has presented a group of good quality Canadian hessonite garnet crystals together with a cut stone of the same material.

## COUNCIL MEETING

At a meeting of the Council of the Association held on the 24th September, 1969, the following were elected to membership:

FELLOWSHIP

Ferneyhough, Miles Howson, Solihull, Warwickshire. D.1969

Grey, Alan Peter, Weybridge, Surrey. D.1969

Hancock, Peter John, London. D.1969

Jenkinson, Herbert Arnold, Bromley, Kent. D.1948

Kerfoot, Charles, Barnsley, Yorkshire. D.1969

Kutchinsky, Roger Nicholas, London. D.1969

Walker, Patricia Joan, London. D.1969

TRANSFERS FROM ORDINARY MEMBERSHIP TO FELLOWSHIP

Arbunies Andreu, Manuel, Barcelona, Spain

Armengol Abril, Emilio, Barcelona, Spain

Bajo Ortiz de Apodaca, Julian F., Pamplona, Spain

Baxter, James, Edinburgh

Brooking Grassy, Alberto, Madrid, Spain

Brown, Kenneth J., Gymea, Australia

Castro Ferrer, Jaime, Barcelona, Spain

Chang, Felix S. Y., Taipei, Republic of China

Clarke, Doreen P., Camberley, Surrey

Collingridge, James W., Tonbridge, Kent

Deeks, Noel W., Luton, Beds.

Estrada Mollet, Federic I., Barcelona, Spain

Farras Sole, Jose, Barcelona, Spain

Fischer, Marianne E., Stellenbosch, S. Africa

Glover, James J., Scarborough, Canada

Hammersley, Gordon J., Adrian, U.S.A.

Harral, Benjamin D., Barnsley, Yorks.

Hawthorn, Graham, Solihull, Warwicks.

Hoberg, Gunter, Idar-Oberstein, W. Germany

Holmes, Kenneth, London

Ingber, Ronald M., London

Jackson, Della A., Prestbury, Cheshire

Jefferis, Marcia N., Watford, Herts.

Karolus, Martin, Mannheim, Germany

Kennedy, William, Baltimore, U.S.A.

Lang, Lorna M., Reservoir, Australia

Luder, Johan Gerard, The Hague, Holland

McCormick, Wendy L., Kew, Australia

Marschner, Helga, W. Berlin, Germany

Matsuzaki, Shigeru, Tokyo, Japan

Mirwald, Gerhard M., Tokyo, Japan

Mitchell, Terence, Salisbury, Rhodesia

Morgan, Alfred D., Birmingham, Warwicks.

Mosey, Irene, Lancaster.

Perera Bravo, Alberto, Madrid, Spain

Pfeiffer, William v., Warrarrdyte, Australia

Pienaar, Herbert S., Stellenbosch, S. Africa

Pitt, Nicholas C. H., Stourport-on-Severn, Worcs.

Rae, Francis C., London
Russell, Lionel H., London
Sancho Canto, Jaime,
Barcelona, Spain
Sancho Canto, Ma Pilar,
Barcelona, Spain
Schnetz, John V. P.,
Kriens, Switzerland
Tamai, Shyojiro, Tokyo, Japan
Tenhagen, Joseph W.,
Miami, U.S.A.
Turvey, Jane, Rye, Sussex
Van Deijl, Wilhelm J. E.,
Parow, S. Africa
Vaughan, Alan J.,
Invercargill, New Zealand
Vaughan, Susan J., London
Villegas Sanvicens, Cesar,
Barcelona, Spain
Wasilkowski, Wanda K.,
Miami, U.S.A.
Widdup, Kenneth N., Lancaster.
Wilkes, Ronald, Blackpool, Lancs.
Winder-Toole, Angela B.,
Penzance, Cornwall

ORDINARY MEMBERSHIP

Aizawa, Naoshi, Akita-Ken, Japan
Akutagawa, Koichiro,
Nagasaki-Ken, Japan
Aloy, Richard N., U.S.A.F.
Aoki, Seishiro, Kanagawa-Ken, Japan
Asano, Yoshio, Tokyo, Japan
Ayton, James, London
Bader, Kushal Chand,
Jaipur, India
Berry, Philip Adrian,
Johannesburg, S. Africa
Biehler, Rudolf, Munich, Germany
Blackwell, James Robert,
Birmingham, Warwickshire
Boyce, Anthony James,
Doncaster, Yorkshire
Brumann, Hans R.,
Makati, Philippines
Bunjapamai, Montri,
Bangkok, Thailand
Callaway, P. C.,
Melbourne, Australia
Chiba, Shinako,
Kowloon, Hong Kong
Chlupacek, Joseph M., Gary, U.S.A.
Coker, James Darden,
Ft. Belvoir, U.S.A.
Comely, Christopher Norman,
Dorchester, Dorset
Daitoh, Yasuki, Tokyo, Japan
Delange, Elizabeth,
Stellenbosch, S. Africa
Dewey, Thomas Norman,
Bromley, Kent
Differenz, Gabriele Monika,
Bad Homberg, W. Germany
Donald, James, Falkirk, Stirlingshire
Eik, Van, Jac J., Utrecht, Holland
Ellis, Suzanne Jean, Watford, Herts.
Eric, Delarue, Geneva, Switzerland
Eto, Motowo, Hyogo-Ken, Japan
Fransein, Eldon E.,
West St. Paul, U.S.A.
Furumiya, Iwao, Osaka, Japan
Futagawa, Nobuzo,
Ibaragi-Ken, Japan
Gandlgruber, Walter H.,
Sao Paulo, Brazil
Ganster, Doris Erlene,
Pico-Rivera, U.S.A.
Gerryts, Petronella,
Stellenbosch, S. Africa
Glover, James David,
Chicago, U.S.A.
Goode, Robert,
Johannesburg, S. Africa
Green, Adrienne, Wembley, Middx.
Green, Arnold, Wembley, Middx.
Goto, Satoko, Ibaragi-Ken, Japan
Hamanaka, Noboru, Tokyo, Japan
Hanaoka, Eichi, Ishikawa-Ken, Japan
Hanna, Neil Randle,
Remuera, New Zealand

Harada, Yasuyuki,
Shimane-Ken, Japan
Hirohata, Tomoko,
Osaka-Prif, Japan
Homma, Hisako, Tokyo, Japan
Hongo, Toshio, Miyagi-Ken, Japan
Ikeda, Uematsu, Tokyo, Japan
Iwata, Teruhiko, Gifu-Ken, Japan
Jain, Narendra Kumar, Delhi, India
Jackson, Lilian Isabel,
Reynella, S. Australia
Jevons, Francis Byron,
Goudhurst, Kent
Jogia, Pravinkumar,
Coventry, Warwicks.
Johannes, Biesbroek,
The Hague, Holland
Kameoka, Takeyoshi,
Ehime-Ken, Japan
Kashimi, Kazuhisa,
Ishikawa-Ken, Japan
Kashiwagi, Hideo, Chiba-Ken, Japan
Katsuyama, Mitsuro,
Amsterdam, Holland
Katsuyama, Mitsutoshi,
Osaka, Japan
Kawamura, Masamichi,
Kochi-Ken, Japan
Kimizuka, Yoshitada, Tokyo, Japan
Kon, Helen, Alexandria, U.S.A.
Koyama, Mosao, Tokyo, Japan
Krantz, Ian L. D.,
Johannesburg, S. Africa
Kripalani, Kishan Lal, Delhi, India
Kuge, Georges, Ghent, Belgium
Kurita, Masahiko,
Shizuoka-Ken, Japan
Landa, Brian Malcolm,
Leeds, Yorkshire
Mac Neil, Hugh Allan,
District Heights, U.S.A.
Mamada, Seiji, Tokyo, Japan
Markar, Mohamed S. M.,
Colombo, Ceylon
Martin, Nancy Jean,
Heidelberg, Australia
Matsui, Haruko, Tokyo, Japan
Mimura, Masahiro,
Nagano-Ken, Japan
Murata, Katsusuke,
Aiichi-Ken, Japan
Musselman, Charles D.,
Englewood, U.S.A.
Nagano, Chiyoko,
Kagoshima-Ken, Japan
Nakajima, Shingo,
Nagano-Ken, Japan
Narasimhan, Vankadari Krishnaiah,
Frankfurt, Germany
Nishibayashi, Yoshiharu,
Kyoto, Japan
Nittel, Lothar, Graefelfing, Germany
Norton, Charles Leslie,
Marion, U.S.A.
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Kanagawa Prefecture, Japan
Okuzumi, Hiroyuki, Tokyo, Japan
Omura, Toichi, Tokyo, Japan
Pasha, Mohamed I.M.M.S.,
Rajagiriya, Ceylon
Penfold, Cecil Edward,
Nairobi, Kenya
Petsinger, Barbara,
Islamorada, U.S.A.
Phillips, Kelley W., Wichita, U.S.A.
Pichon, Jean-Daniel,
Geneva, Switzerland
Pol, Van Der, Maria Johanna,
Utrecht, Holland
Power, John J., Rosemere, Canada
Rensburg, Van, Christina,
Stellenbosch, S. Africa
Ruckli, Robert
Lucerne. Switzerland
Sanbongi, Gen, Hokkaido, Japan
Sanbongi, Hiroshi, Hokkaido, Japan
Schipper, Hilda,
Rotterdam, Holland
Senti, Yves-Andre,
Geneva, Switzerland
Shono, Yoshihiro, Tokyo, Japan
Silverthorne, Richard Leigh,
Johannesburg, S. Africa

Smith, Thomas J.,
Milwaukee, U.S.A.
Takaki, Mitsuo, Hokkaido, Japan
Takaki, Shizuo, Miyag-Ken, Japan
Tarr, Warren T., Delmont, U.S.A.
Thompson, Roger Deane,
Hopewell, U.S.A.
Thomson, Ian, London
Trossarelli, Carlo, Torino, Italy
Tsunoda, Toshimi,
Nagano-Ken, Japan
Tsuno, Syoji,
Yamaguchi-Ken, Japan
Uchida, Sumiko, Nagano-Ken, Japan
Webb, Michael William,
Newcastle under Lyme, Staffs.
West, Kenneth James,
Hove, Sussex
Wijayanayaka, Nihal,
St. Albans, Herts.
Wood, George Douglas,
Stroud, Gloucester
Wycoff, Wesley Frecerick,
Ottawa, Canada
Yamada, Wadachi, Tokyo, Japan
Yamada, Yukihiro,
Aichi-Ken, Japan
Yamashita, Hisao,
Yamanashi-Ken, Japan
Yasuda, Michio,
Saitama-Ken, Japan
Yuasa, Noriko, Ishikawa-Ken, Japan

## TRADE DESCRIPTIONS

The Trade Descriptions Act, which became law in the United Kingdom in 1968, has already produced convictions in Magistrates' Courts concerning the misdescription of gemstones. A synthetic emerald sold as a natural emerald, a quartz sold as topaz, synthetic corundum as alexandrite, paste as topaz and synthetic blue spinel sold as aquamarine, have all been regarded as misdescriptions under the Act.

There is no doubt that in the U.K. there has been a marked improvement in the description of gemstones. Now that the description of quartz as topaz has been found to be false under the Act in a Court of Law, it is to be hoped that overseas suppliers selling faceted quartz will desist from the practice of invoicing goods as "quartz-topaz". There is still a limited number of uneducated traders who use gem names to indicate colour. It is a thoroughly bad and misleading practice.

In one case two Fellows of the Association were involved in giving evidence. It was at the instigation of one of them that the Weights and Measures Department of the Board of Trade, responsible for enforcing the regulations, acted with praiseworthy promptness in bringing seven instances of misdescription before a Court.

Vol. 12
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# CONTENTS

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