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and

PROCEEDINGS OF THE
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ASSOCIATION
OF GREAT BRITAIN

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OF GREAT BRITAIN
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NOTES FROM THE LABORATORY

By B. W. ANDERSON

THE modern vogue for decorative mineral crystals has led to a marked increase in the number and variety of uncut crystals which are submitted to the Laboratory for identification. The most unusual of these consisted of a handsome group of crystals, apparently growing naturally from a piece of granular rock. This group had been offered for sale to a West-end jeweller as a specimen of the mineral Bieberite, which is a hydrated sulphate of cobalt having a rose-red colour. Being water-soluble, bieberite is of rare occurrence, but it is found as stalactites and crusts in certain old cobalt mines, where it is derived from the oxidation of cobalt sulphide ores.

However, fragments scraped from the specimen gave negative results for cobalt or for sulphate reactions. To save further time and effort in a field outside our own we sought the expert advice of Dr. Max Hey of the Natural History Museum, whose skills both as a mineralogist and as a chemist are second to none. Dr. Hey at once identified the crystals as being **potassium ferricyanide,** a substance well-known as a chemical reagent, but not as a natural mineral. Though certainly an artefact and fraudulently offered for sale, the price asked was so low that this did not constitute a very serious misdemeanour.

This curious incident is perhaps hardly worth relating; but it does serve to underline the fact that the laboratory gemmologist of to-day must be prepared for almost anything to be thrown at him

for identification. In such cases the friendly co-operation of scientists who are skilled in other disciplines is of enormous value, and may often save one from a time-consuming struggle on a matter of very small commercial importance. Such friendly aid is a two-way process: we as gemmologists are often able to provide specimens and advice to pure scientists who are impinging upon our own special field of knowledge.

Synthetic rubies are so cheap and so readily procurable, that one hardly expects other artefacts to be used where **substitutes for natural ruby** are concerned. It was surprising therefore in a hoop ring recently tested which was set ostensibly with calibré rubies, to find the specimens giving rise to a strong didymium spectrum. Pastes coloured by didymium are not uncommon, but they are usually a rather pale pink in colour. It was interesting to note how near to ruby red this material could get when strongly enough "doped" with the two rare earth molecules. Another good imitation of poor-quality ruby was provided (again unexpectedly) by quartz which contained enough natural flaws and fissures to enable it to absorb a suitable red dyestuff and make it decidedly deceptive to the eye.

One of the few **sinhalites** we have officially tested came to hand some months ago. This was an attractive golden brown specimen weighing more than five carats: the asking price, we understand, was twenty pounds per carat. For the record, the density of this stone was 3·48 and its refractive indices 1·669-1·704.

An intriguing problem (which was mentioned by the writer in a recent talk to the Gemmological Association) was posed by the request to test and sort a large number of rough blue transparent mineral pieces which were said to consist of a mixture of **blue zoisite** and **iolite.** A preliminary trial showed iolite to be the preponderant material, and it was further found that the quickest and easiest positive test for this was provided by examining the absorption spectrum of light transmitted through the specimens in their yellow direction. Two bands in the yellow at 5920 and 5860 Å., together with a narrow band at 5350 Å. in the green formed an unmistakeable pattern. The few zoisites failed, of course, to show these bands and showed their own most characteristic absorption band in the orange-yellow at 5950 Å. Just by way of variation the bluest piece of all gave a rich cobalt spectrum, showing it to be a roughed-up piece of cobalt glass.

Not long ago, we were privileged to test the largest specimen of **pink scapolite** we have ever seen. This was a magnificent step-cut stone of possibly 70 carats, mounted with a pink beryl as a brooch pendant. Positive identification was provided by a careful reading on the spinel refractometer, which showed the stone to be uniaxial negative, with 1·570 for the ordinary and 1·549 for the extraordinary index. A further proof was provided by the apricot glow shown by the stone under long-wave ultra-violet—a glow which characteristically revealed a banded structure when viewed through the spectroscope, proving the fluorescence to be due to traces of uranium.

A rough translucent specimen, of which both the green colour and the absorption spectrum resembled emerald rather closely, proved, after investigation, to be **tremolite,** in a form which was new to us. As this showed little variation under crossed polars it was thought at first to be multi-crystalline: but the refractive indices shown when a flat was polished revealed it to consist of a single crystal, or crystals in strictly parallel growth. The indices were as follow: α1·608, β1·624, γ1·636. The density was 2·98, and the absorption bands in the red, due to chromium, were found to be at 6840, 6500 and 6280 Å. These were not so sharp as those seen in emerald: the band at 6840 was quite strong and represented an unresolved doublet.

Mention may also be made of a surprise to all of us when a colourless cabochon stone mounted as the centre piece of a rather elaborate brooch of oriental design was identified as **fluorspar.** This was part of a suite of jewellery, all of which featured centre-pieces of this quite unsuitable mineral, which had no colour or lustre to charm the eye, and must be accounted extremely vulnerable in wear.

A **pale blue spodumene** weighing 35 carats caused us a little trouble, since the colour, combined with the refractometer readings 1·660-1·675 added to a red glow under crossed filters led us to think in terms of euclase or fibrolite. A density figure of 3·185 put us right, and the accurate figures α1·660, β1·668, γ1·675 fitted perfectly for spodumene. The red colour under crossed filters was not the chromium fluorescence that can be seen with both euclase and fibrolite, but an orange-yellow glow of the type emitted by kunzite, as modified when seen through the "spectrum red" filter

used. Our records for the refractive indices of fibrolite are α1·658, β1·659, γ1·676, as against euclase α1·656, β1·660, γ1·675.

These figures serve as a warning that refractometer readings by themselves, even when accurate, do not always provide an easy answer to the identity of a gemstone.

ARRANGING GEMSTONES

By D. G. KENT

IT may be of interest to readers to know how "the other chap" arranges his collection of cut gemstones or crystals.

I remember Sir James Walton, during the time when he was a member of Mr. B. W. Anderson's Post Diploma evening class at Chelsea Polytechnic, bringing his collection of jade and jade-like minerals to show us (about 50 specimens, which incidentally astonished many of the class; I have never been happy with jades since that time!). He had made beds of plaster-of-Paris, about 25mm square, with the stone indented whilst the plaster was wet; the squares were then fitted into a tray—this was very effective, but somewhat heavy to carry.

I keep the majority of cut stones in my modest collection as follows:

A piece of hard wood 34cm × 26cm × 2cm deep, with 130 drilled "cups" of 2cm and 12mm diameter in alternate rows. The whole is painted white and each cup numbered with Indian ink. A piece of 3-ply wood, stained black, of the same size, is hinged as a lid, with catches (from old jewellery cases) fitted to the sides and front to close it down tightly. This enables the box to be transported without any loss. For display purposes a retaining strap is used to hold the lid open at 90° and a card, same size, is laid against it, numbered in the corresponding positions to the cups with the name of the stone above the number. Have Fellows any other ideas?

INCLUSIONS IN THE PANNA DIAMONDS OF INDIA

By SUDHA PHUKAN

ABSTRACT

The study of 200 diamonds from Panna shows that they are essentially characterized by primary solid and gaseous inclusions, *viz.* (1) chromite, magnetite, ilmenite, (2) graphite, (3) olivine, (4) diamond, (5) garnet, (6) diopside and (7) gaseous CO_2, arranged in order of their abundance. Secondary inclusions include hematite and limonite. These inclusions mainly occur as discrete individual crystals; only spinel minerals and olivine-chromite occur at places in aggregates. The physical characteristics and nature of inclusions show that diamonds of primary pipe rock and secondary conglomerate are markedly homogeneous and have a common source. Graphite-CO_2-diamond perhaps maintained a critical P-T condition to form together, but the significance of other inclusions found in Panna diamond is yet to be worked out.

INTRODUCTION

The only productive primary deposit of diamond in India is at Majhgawan (24°38′N:80°4′E) in Panna district, Madhya Pradesh, and its geology has been dealt with by Sinor (1930), Mehr and Dubey (1949), Mehr (1952), Mathur (1953, 1961) and Mathur and Singh (1963). Recently a number of papers appeared in the unpublished symposium volume on "Diamonds" and one of the contributions contained therein is on the mineralogy of altered pipe rock at Panna (Das Gupta and Phukan, 1969). But characteristics of diamond occurring in Panna are little known excepting those given by Sinor (op. cit.). Phukan (1968) studied the inclusions of Panna diamond from both primary pipe rock and secondary deposits associated with conglomerate horizons at Ramkheria (24°49′N: 80°27′E), where large-scale mining operation is being conducted by the National Mineral Development Corporation.

The geological setting of the diamondiferous horizon is quite simple but interesting. The pipe rock at Majhgawan is intruded into the piles of orthoquartzites of the lower Vindhyan System of late Precambrian age. The primary pipe rock is very much altered and

compositionally consists mainly of various types of serpentines, clay minerals, hematite and calcite. Petrographically the rock seems to have been derived from some ultrabasic rock intermediate in composition between peridotite and carbonatite. Diamonds also occur in the two conglomeratic horizons of the Vindhyan System but the conglomerates are younger than the pipe rock. The frequency of occurrence of diamonds in pipe rock is rather constant, whereas in conglomeratic horizons it is quite erratic. Recent transported sediments, mainly along the course of rivers and rivulets, also carry diamonds, but their occurrence is minor and infrequent.

The diamonds show quite a few interesting physical features in shapes and sizes and are characterized by a host of mineral inclusions. The distribution of the mineralogically complex inclusions is in excellent agreement with the inclusions described from diamonds of the other parts of the world, notably South Africa. It is the purpose of the paper to present the characteristics of hitherto unknown features of Indian diamonds with particular reference to their inclusions. About 100 diamonds have been studied from each of the two types of deposits and their sizes vary from 0·10 to 2·50 carats.

Since all the inclusions in diamonds appear black in inadequate light, a powerful source of transmitted and reflected light has been used for examination of diamonds after immersing them in α-Bromonaphthaline ($n = 1{\cdot}66$). The minerals and other inclusions in diamonds have been identified from the colour, shape, habit, form, relief and other morphological features. However, precise determination of the mineralogical composition of inclusions has not yet been possible for want of suitable instruments: but even so the features observed under the microscope are quite intriguing and demand careful study. The result of such observation is given in the following paragraphs.

Morphological Features

Most of the diamonds are colourless, but some of them show a wide range of delicate shades of blue, green, yellow, brown to deep brown. Carbonado or opaque black diamonds have not been found in India.

The surface of most of the diamonds is quite smooth and shows adamantine lustre. Occasionally crystals with rough and pitted

surface are also noted. Rarely is the surface frosted. The surface features are present in all the varieties irrespective of the colour of the crystal. Webster (1962) suggested that the frosty surface of the crystal is due to wearing out of the flaky graphite coated on the surface of diamond. Graphite is found as inclusion in Panna diamonds but not as coated graphite on the crystal faces. Here in Panna the frosty diamond present in the pipe rock is presumably formed by the corrosive action of fluids present in the parent magma.

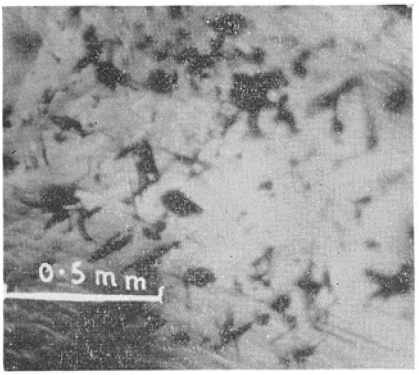
Crystallographically most of the diamonds have simple octahedral forms while quite a few of them show additional dodecahedral faces. In addition to the normal octahedral forms, complex forms such as hexakisoctahedron, tetrakishexahedron and hexakistetrahedron are also frequent. Simple twins on (111) are also noted. Cubic crystals, so common in South African deposits, are conspicuously absent from the present area.

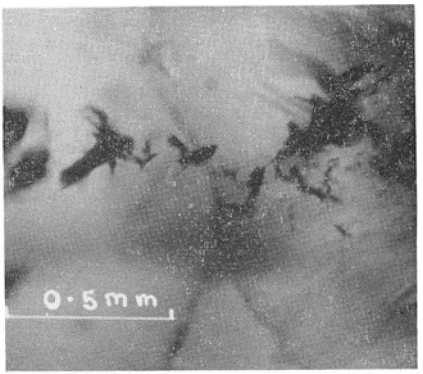
Some of the octahedral faces and faces of a few complex forms are characterized by surface markings of trigonal shapes—"*trigons*" —the edges of which are parallel to the octahedral planes; the triangular markings often produce an impression of elevations and depressions on the crystal faces.

INCLUSIONS

Most of the diamonds contain one or two types of solid inclusions of different shapes and sizes. The following inclusions which are prominently developed are arranged in order of their decreasing abundance: (i) opaque ore minerals, (ii) graphite, (iii) olivine, (iv) diamond, (v) garnet, (vi) diopside, (vii) gaseous CO_2, (viii) hematite and (ix) limonite.

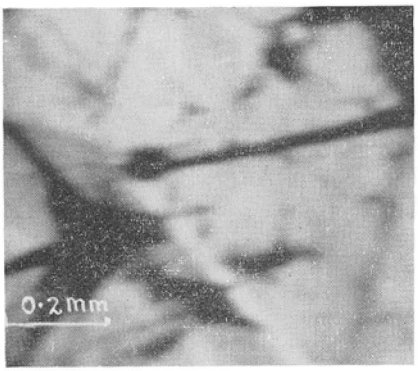
Opaque ore minerals: Dark opaque inclusions, commonly termed "carbon spots" in the gem trade, are the most common inclusions in diamonds. They occur either as little specks, sprinkled throughout the stone, or as irregular bodies. Such stones are locally classified as "Chhitandar", meaning sprinkled. The specks are commonly taken as carbon, but carbon is likely to be unstable under conditions of diamond formation, and according to Gübelin (1952) carbon is rarely present in diamonds. These carbon inclusions also occur as shapeless, irregular lumps, often with jagged or spiky outline, scattered randomly in the interior of diamonds, sometimes so densely that the entire crystal appears almost black. These irregular dark inclusions, which mainly belong to the spinel group, are crystals of

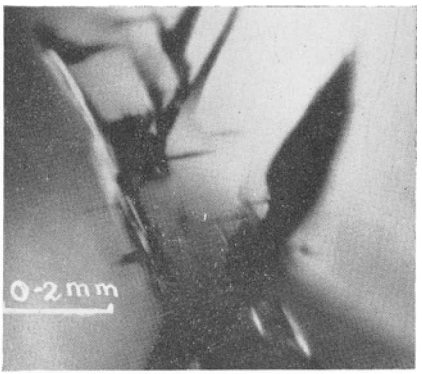




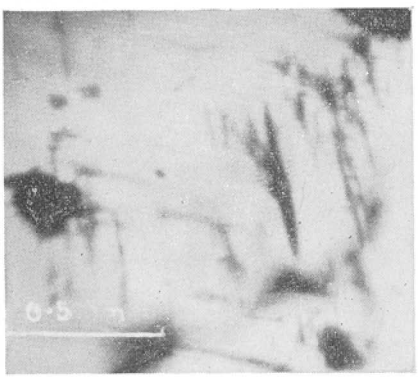
1a 1b

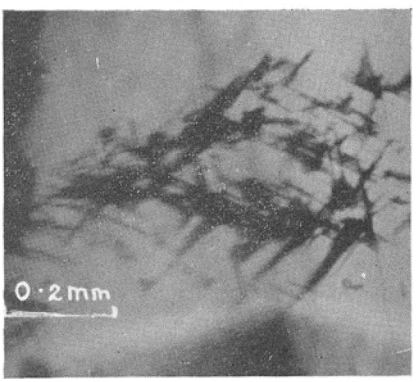
FIG. 1a and b: Bars and rhombs of ilmenite, triangular octahedral plate of magnetite and sub-rounded chromite in diamonds; grains are partly crystallographically oriented by host.





2a 2b





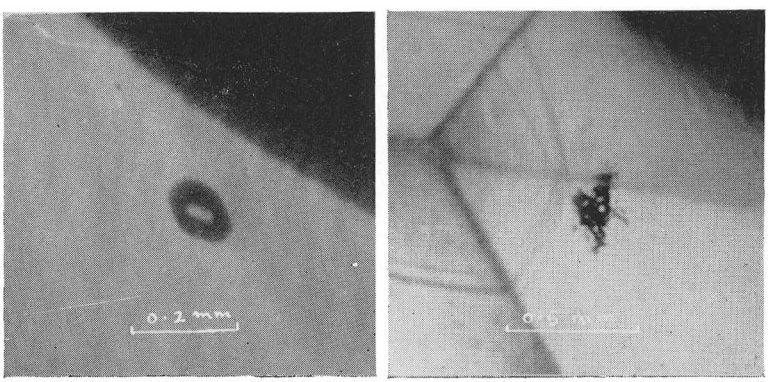
2c 2d

FIG. 2a, b, c and d: Spiky, angular stalked crystals and idiomorphous flakes of graphite in diamonds. Note growth of graphite flakes partially controlled by crystallographic direction of diamonds (FIG. 2c and d).

magnetite, chromite and ilmenite. In Fig. 1a and 1b triangular octahedra of magnetite, fine granular to compact octahedrons of chromite, and bars and rhombs of ilmenite are clearly visible. Some of these crystals have preferentially grown along the octahedral direction of the diamond crystal. These three minerals are intimately intergrown and possibly magnetite and ilmenite are exsolved from chromite. One of the characteristics of this group of minerals is that they occur together in aggregates.

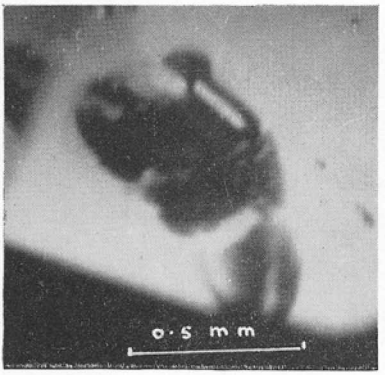
Graphite: Graphite occurs either as thin flakes or as angular grains. Dark-coloured spiky or angular stalked crystals of graphite (Fig. 2a and 2b) are the next most common group of inclusions in these diamonds. But no perfect idiomorphous crystals of graphite, as found in South African diamonds, are present herein. In Fig. 2c and 2d flakes are preferentially controlled by octahedral planes of diamonds.

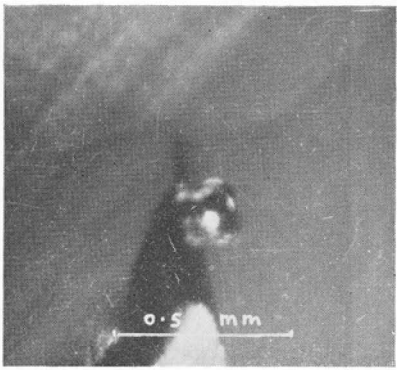
Olivine: Euhedral olivine crystals are quite frequent in Panna diamonds. They are usually well defined but sometimes rounded too; usually they are oriented relative to the diamond. At places olivine crystals are surrounded by the radial tension cracks formed during metamictization of the crystals. Notably dark haloes are formed around some of these crystals. Unlike other minerals olivine occurs either singly or in aggregates (Fig. 3a, 3b and 3c); occasionally aggregates are associated with inclusions of chromite.



3a 3b

FIG. 3a, and b: A single crystal of olivine (FIG. 3a); aggregates of sub-rounded olivine crystals with tension cracks (FIG. 3b);





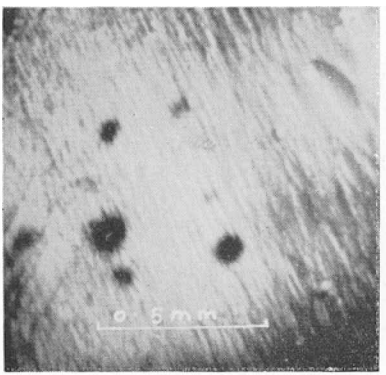
3c 4

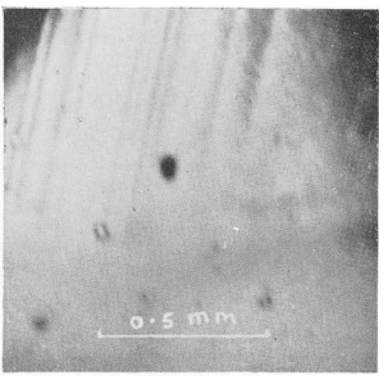
(Fig. 3c). Euhedral crystal of olivine surrounded by dark altered haloes.

Fig. 4: Octahedra of guest diamond in well crystallized host diamond. Apparently no crystallographic control.

Diamond: Crystals of diamond are at times embedded within a large crystal of diamond. They are not parallely grown and often the guest crystal is octahedral in form (Fig. 4).

Garnet: Inclusions of rounded to subrounded spots of earthy green mass are very frequent in diamonds. They occur usually as circular spots and rarely do they show an irregular outline. These crystals have been identified as garnet (Fig. 5a and 5b).





5a 5b

Fig. 5a and b: Earthy green-coloured rounded inclusions of garnet.

Diopside: Anhedral crystals of pale green colour with moderate relief are observed in a number of cases. Their exact mineralogical composition as to whether diopside or enstatite has remained indeterminate (Fig. 6).

FIG. 6: Anhedral crystal of diopside (or enstatite) in diamond.

Gaseous inclusion: These are noted in a few crystals and they occur as minute clouds of dust (Fig. 7) resembling CO_2 inclusions studied by Roedder (1965) in olivine. Sometimes these gaseous

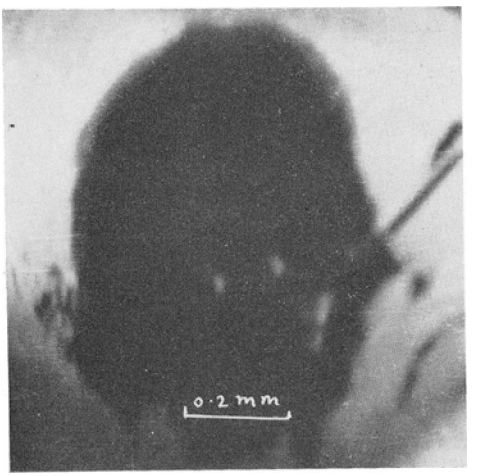
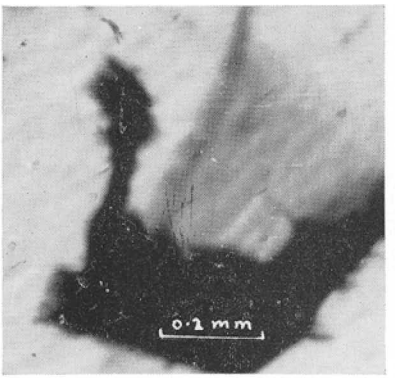


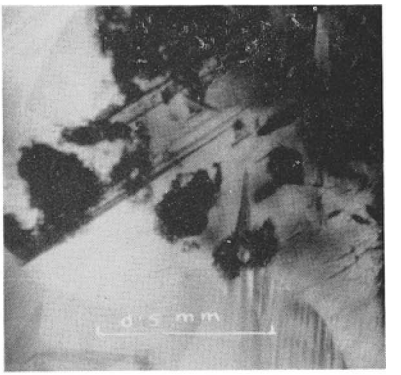
FIG. 7: An inclusion of CO_2 resembling a clot of dusty cloud having irregular periphery.

inclusions have a very pale greenish tinge.

Hematite: It occurs usually in tablets and also as irregular lumps (Fig. 8a and 8b). When observed under reflected light it shows bright internal red reflection. These are secondary products formed after magnetite. When minutely observed, octahedral faces of magnetite are still clear even in the aggregates.



8a



8b

FIG. 8a and b: Tablets of hematite (FIG. 8a); and irregular lumps of hematite (FIG. 8b), developed pseudomorphously after magnetite.

Limonite: These are secondary in origin and they occur as fillings along cracks in the diamonds (Fig. 9). These inclusions are, however, more than superficial.

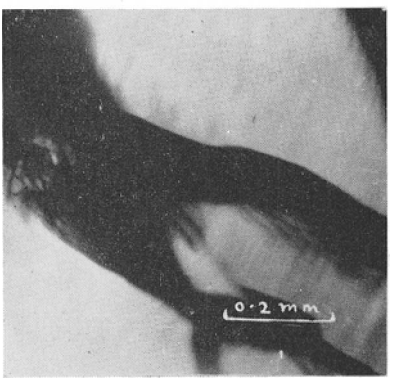


FIG. 9: Secondary limonite along a fracture in diamond crystal.

Discussion

Diamonds are reported to contain inclusions both solid and gaseous, but in Panna mainly solid inclusions are present; only infrequently gaseous CO_2 inclusions are recorded. Excepting hematite and limonite all other inclusions are of primary origin. The presence of primary inclusions and absence of xenomorphous or resorbed inclusions suggests that the Panna diamonds are "first born" diamonds i.e. they crystallized in the magma-chamber much before their intrusion.

In most of the crystals examined only one type of inclusion is present, but in some more than one type are present. Inclusions occur either as discrete single grains, or in aggregates. Some of the opaque minerals, olivine and graphite are crystallographically the opaque minerals, olivine and graphite, are crystallographically oriented by the host diamonds. So far as inclusions of diamonds are concerned there is no difference in the diamonds of pipe rock and conglomerates occurring in Panna. This therefore indicates that conglomeratic diamonds are derived from pipe rocks.

The unaltered crystal inclusions, which are protected by the diamond host against re-equilibration during the course of their journey from their depth of formation to the present site of emplacement, are the only clues for understanding the original composition of the melt from which diamond crystallized. In the present area the presence of graphite and CO_2 inclusions suggests that carbon in the form of diamond maintained a critical pressure-temperature condition for the formation of these three phases rather simultaneously (*cf.* Das Gupta and Phukan, 1969). Phase-equilibria data combined with geotherm for Precambrian shield and theoretical considerations give an idea about the possible temperature-pressure condition of formation of diamond (Meyer and Boyd, 1969). Meyer (1968) and Meyer and Boyd (1969, 1970) studied the inclusions in diamond in detail and suggested how these can be used as clues for understanding the formation of diamond and the nature of earth's mantle. The mineral inclusions which are found in diamond also form the major constituents of diamondiferous host rock—kimberlite and peridotite but the exact composition of the phases found in the Panna diamond are not known. This information will be of valuable aid as to whether diamond and its

associated altered kimberlite were formed under the same P-T conditions or inclusions in diamond, having been protected by diamond, remained chemically inert to participate in sub-solidus equilibration.

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THE SCANDINAVIAN DIAMOND NOMENCLATURE

By H. TILLANDER, C.G., F.G.A.

DURING recent years a large amount of work has been done in several countries by organizations acting in close co-operation with the jewellery-trade to draw up correct and practical designations regarding the colour, clarity and cut of diamond. The Scan.D.N. contains terms which appear to be fairly universally accepted. It states a "diamond language" based on the development which has hitherto taken place and attempts at the same time to contribute to the clarification of the problems. A uniform terminology—not only in the Scandinavian countries, but also in places all over the world where jewellers may gradually start using the Scan.D.N.—will no doubt be of invaluable benefit to the legitimate diamond trade, as well as a protection for the public.

In the first instance Scan.D.N. is intended to serve the retail jeweller, who alone is responsible towards his customers, the ultimate diamond consumers. Something of this kind had to be produced, since neither the cutting industry nor the specialized diamond wholesalers and exporters have shown any signs of establishing a universal terminology. In addition the several national nomenclatures and grading standards have either been restricted to membership in the respective organization or provided other barriers, such as expensive travel to tuition centres and language problems.

During a visit to Copenhagen in 1967 the author of this article was shown a draft for a Danish Diamond Nomenclature and found this to be an excellent basis for further development. It was immediately decided to form a Scandinavian committee and to meet for an initial conference in Helsinki in January 1968. Full agreement on an improved draft was achieved. The work was further considered in Sigtuna in October 1968, in Copenhagen in March 1969 and concluded in Oslo in November 1969.

The final draft in English was subsequently submitted to the various Jewellers' Organizations in Denmark, Finland, Norway and Sweden and officially approved as standards in those countries.

In March 1970 the official version—also in English—was printed.

It consists of 52 pages in A-4 format ($11\frac{3}{4}'' \times 8\frac{5}{16}''$) in loose leaves, but is also available in hard plastic binding with each leaf inserted in transparent pockets for everyday hard use.

Gradually editions in some seven other languages will appear. This seems to be an answer to the rapidly increasing requests from retail jewellers for an "instrument" which permits them to acquire detailed knowledge of diamond grading.

There are many instances when a retail jeweller does not know the exact grade of an individual diamond and cannot call for rapid assistance from his supplier. He may have purchased a lot of mixed qualities or perhaps a single stone from a private source. He may also be offered a diamond as part-payment on a larger purchase or have been requested to give an estimate at replacement value.

Scan.D.N. is designed to assist the jeweller in all such cases. A detailed knowledge of all the factors influencing the light-effects, the colour and the clarity will reveal the expert retailer and create confidence. Grading can, however, normally be learned only through a detailed study of the subject and some training. Wherever needed local organizations will no doubt be prepared to arrange courses.

However, one problem will remain unsolved. We cannot expect the entire diamond world to accept Scan.D.N. or in any case every detail of it. Some of the contents must be considered as compromises and therefore of a controversial nature. A world-wide agreement on all details will, no doubt, take a very long time.

The American Gem Society will eventually propose new grading standards for assessing cutting grades and CIBJO plans to form a committee to discuss diamond nomenclatures on an international level.

We also know that there will be many misunderstandings between retailers following the "Scandinavian" rules and their conservative suppliers in the cutting centres. One main reason for this is the divergent conception with regard to several terms, which have different meaning with different suppliers. Another is the varying opinion on quality in different parts of the world. This latter can probably never be entirely overcome. The list of varying opinions on how to grade diamonds could be very much extended, but is hardly of importance in this connexion.

The Scan.D.N. Committee does not expect that their standards will facilitate the purchases of diamonds for the average jeweller, since it feels the diamond business should remain as much as ever possible in the hands of the organized trade. It believes, however, that it will greatly assist the established jeweller in his contacts both with his customers and with his local supplier. In the second instance it is hoped to bring forth some grading service from those dealers who supply retailers in their home communities and who aim to foster the integrity of the whole jewellery trade.

CONTENTS

The Scan.D.N. contains rather detailed rules and definitions on treatment, shape, proportions and weight and it illustrates the standard cut with facet names consequently used in the same form throughout the text as are all other terms as well. The "Scan.D.N. Standard Cut" is shown also on another plate with correct angles and proportions clearly indicated. This shape is further explained in the chapter on Cut—both written and with the aid of diagrams—and indicates acceptable deviations from this theoretical "ideal". This Standard Cut has been designed with a table size of 57·5%, a crown height of 14·6%, and a pavilion depth of 43·1%. The illustration of girdle thicknesses indicates maximum figures for various weights of a diamond within the Scan.D.N. tolerances. Of special interest is that the combination of the figures for crown height, inclination of the upper main facets and table size—which govern the passage of light through the crown—could be properly explained with the aid of a simple diagram.

Scan.D.N. recommends a general use of four grades only for proportions *very good*, *good*, *medium* and *poor*, but the well trained grader is offered the possibilities for further subdivision into as many as 11 subgrades.

Considering the average proportioning of diamonds to-day, the Scan.D.N. grade "very good" should perhaps have been called "exceptional". This would have matched the recent proposal for a German nomenclature where, in practice, "medium" is accepted as "correctly cut". Further the grade "poor" may have been said to be below any honest jeweller's standards. The committee, however, decided for neutrality and thought it better to leave it to the individual jeweller to explain the meaning of every grade according to prevailing conditions in his region.

For diamonds below 0·50 ct the principles of grading are the same as for larger stones, but no other instrument than the 10 × magnifying lens should be used. For this reason the broader grades only are applicable.

Also with respect to colour and clarity one detailed and one broad scale is used, because it was felt that there is no commercial need for very detailed grading of diamonds below half a carat.

The chapter on Clarity includes brief descriptions of the various grades. The clarity symbols—similar to those generally used—are illustrated and described.

The chapter on Colour briefly explains the principles of grading and gives some practical hints. It is based on the largely accepted GIA-system (Gemological Institute of America) with its' scale from "D" to "X" and supplemented by readings from the new Diamant-Photometer, developed in Western Germany, in co-operation with the Scan.D.N. Committee.

At the time of publication of this article, the Diamond-Photometer is not yet generally available and the production of the AGS Electronic Colorimeter has been discontinued. Grading centres and official laboratories in several countries will, however, be in the position to assist jewellers all over the world in their selection of sets of diamonds for their every-day colour comparison work. These sets are the jeweller's tool for grading by eye and involves the comparison of the body colour of the stone being tested with these thoroughly pregraded diamonds, using a light source and viewing technique which will assure the greatest accuracy and reproducibility.

With regard to colour, it may further be said that the Scan.D.N. for the larger sizes (0·50 ct and above) has chosen the following terms although they have been so much misused: River, Top Wesselton, Wesselton, Top Crystal, Crystal, Top Cape, Cape, Light Yellow and Yellow. For the smaller sizes the following terms are introduced: Rarest White, White, Tinted White, Yellowish and Yellow. Each grade is explained in detail.

Scan.D.N. does not attempt to solve all the existing problems, but to provide what is believed to be an exact and detailed enough system available to any jeweller who is seriously interested in the exact grading of diamonds.

ODONTOLITE AND FULGURITES

By G. V. AXON

COLLECTORS know only too well that many items casually dismissed in textbooks prove the hardest to acquire. Surely odontolite is one of these, for how many gemmologists have knowingly seen either cut or rough odontolite? So desperate are some collectors to acquire odontolite that they assume something they have already is the coveted item. Thus one collector supplied the writer with a chunk of white ivory, saying it was odontolite, but without explaining how white material could ever be used as a substitute for turquoise. Another collector assumed that blue silicified dinosaur bone was odontolite even though the large cell structure clearly disqualifies it.

Oddly enough, many gemmologists probably have seen odontolite in small fine blue cabochons in old jewellery, and have assumed, without thinking, that it was fine turquoise. Thus odontolite is worth some slight examination.

Basically, the name tells us what it is, for the "dont" is similar to dental, and the "lite" is, of course, the same as lithography, or stone. So odontolite, as the textbooks tell us, is simply tooth-stone. Here, a question arises, for teeth are associated with ordinary bones, yet as we all know there is quite a difference between an ivory carving and a bone carving. Possibly, then, odontolite is limited to teeth, and not to bones, for the cell structure of bone does not produce the very fine material that can reasonably be used as a turquoise substitute. Clearly, this is the case of the silicified dinosaur bone found in the United States, and it may apply to the bones that could be found alongside true odontolite.

Rough odontolite, especially the curved pieces, show clearly that the enamel, as might be expected, is less receptive to change than the inner tooth, so top quality odontolite of fine blue is found inside, while the outside tooth tends to be whitish.

Alas for the collector, most odontolite seems to come in small pieces, quite cracked and fragmented. No doubt this accounts for

the small cabochons of odontolite. Yet the finest odontolite does not seem to need heat-treatment to bring out the colour. It is already there, in the inside of the tooth that has been fossilized, apatite (mainly) replacing the organic material, and the white of the ivory being changed to fine blue by vivianite.

Odontolite is difficult to cut, from the cracks, so epoxy cement may be needed. Whether odontolite is worth all the trouble it causes to the collector is a matter of opinion, but getting rough and cut odontolite is quite an achievement for many collectors, and the little bits they get are guarded as though they were diamond rough.

Fulgurites are quite different from almost every angle. They can hardly qualify as gem material, but are interesting as examples of natural glass.

They are formed, of course, by bolts of electricity as they strike ground containing silica, as in sand, or, sometimes, clay. They are common in the deserts of the United States, and are collected and sold.

What seems to happen is this: lightning strikes the sand and penetrates some distance in many directions, gradually petering out but only after forming a type of tree root. Later, the wind blows the sand away, revealing the stump of glassy pipe, similar to a lead pipe, hollow, but gradually tapering. Collectors see the stumps in the desert, dig them up, cut them up, and sell them as curiosities. Thus for a dollar or so, a collector can acquire an inch or so of the glass piping known as a fulgurite.

Certainly, fulgurites are not too much to look at, and even these days they would hardly qualify for use in jewelry. Still, they have their interesting aspects, and, like odontolite, are hardly ever seen by the average gemmologist.

Gemmological Abstracts

BANK (H.). *Hochlichtbrechender orengefarbener Korund aus Tansania.* Orange corundum with high refractive index from Tanzania. Zeitschr. d. Deutsch. Gemmologischen Gesellschaft, 1970. 19, 1, 1-3.

These orange-coloured corundums are sometimes erroneously called padparadscha. The author deals with a certain type found in the Umba Valley, the RI being 1·760-1·762 up to 1·768-1·770. Bibliography.

E.S.

BANK (H.), BERDESINKI (W.), OTTEMANN (J). *Durchsichtiger smaragdgrüner Grossular aus Tansania.* Transparent emerald-green grossularite from Tanzania. Zeitsch. d. Deutsch. Gemmologischen Gesellschaft, 1970, 19, 1, 4-7.

These newly found grossularites are green like emeralds and red under the filter, so could easily be taken for emeralds if examined under the filter only. The material has also been sold as chrome-tourmaline, a similar material also found in Tanzania. To avoid confusion the various physical characteristics are given: $n = 1{\cdot}742$ to $1{\cdot}744$, S.G. $= 3{\cdot}68 \pm 0{\cdot}01$. The chemical formula is $Ca_3Al_2(SiO4)^3$. Bibliography.

E.S.

BANK (H.). *Glasimitationen von Orthoklas und "Jade".* Glass imitations of orthoclase and "jade". Zeitsch. d. deutsch. Gemmologischen Gesellschaft, 19 (1970), 2, pp. 64-66.

Three cut, transparent, light yellow pieces of so-called "orthoclase" from Madagascar were examined and shown to have a RI of 1·52, which could just be within the limits of orthoclase. The material was singly refractive and proved to be glass. This was confirmed by the presence of air bubbles.

Jade in the trade covers a multitude of green stones, although it is only correct to call jadeite and nephrite by this name according to accepted rules. At present there is a glass imitation of "jade" on the market which has an RI of 1·540 and was thought by many to be coloured agate. However, it was found to be glass containing

mainly lead, calcium and copper with traces of iron, manganese a little potassium and zinc. It was therefore determined as a calcium-lead glass.

E.S.

CASSEDANNE (J.). *Euclase in Brazil. Bulletin, Association Française de Gemmologie*, 1970, 24.

A new find of euclase at São Sebastião do Maranhão, Minas Gerais, has become the major producer since 1968. The crystals, which are never more than 8 cm in length, are found in geodes of feldspar or mica, for which latter material the area is principally worked. The colour is white, either clear or milky. Crystals 4-5 cm in length and with a section of 3×1 cm, of gem qauality, may fetch up to $100 U.S. at Governador Valadares, the chief gem marketing town in the state.

The author gives a brief review of other euclase-producing sites in Brazil, together with a useful map, bibliography and drawings of euclase crystal habits.

M.J.O'D.

CRONSTEDT (K.). *The Green Vaults of Dresden.* Australian Gemmologist, 1970, X, 9, pp. 14-16.

The history of the Green Vault of Dresden, so named as at first in about 1572 the walls of the vault were green. Until the beginning of the 18th century the green vaults, first envisaged as a museum by Augustus the Strong, were used more as a safe deposit than as a museum. Both during the thirty years war and the Second World war (when the city of Dresden was bombed to destruction in 1945), the treasures, of which there are now some 3,100 works, were taken to the Castle of Konigstein and so avoided destruction. Details are given of a number of the exhibits and of the jewellers who made them. 4 illus.

R.W.

CROWNINGSHIELD (R.). *Developments and highlights at GIA's lab. in New York.* Gems and Gemology, 1969/70, XIII, 4 and 5, pp. 112-122; 156-164.

There is a concise report on flux-grown rubies and mention is made of a suspected artificially coloured opal, and on newer

developments in plastic-treated turquoise. Jade-like idocrase from Pakistan, another case of damage to zoisite, a natural sapphire which fluoresced under short-wave ultra-violet light and a chrome "chrysoprase" (chrome chalcedony from Rhodesia?), a hydrothermally grown pink sapphire and a cultured black pearl which glowed reddish under long-wave ultra-violet light are among a number of items discussed. Others are a chrome aventurine quartz resembling jadeite, elephant tooth ivory, a Tanzanian alexandrite-like garnet and there is further mention of Gilson, Chatham and Zerfass synthetic emeralds. 47 illus.

R.W.

EPPLER (W. F.). *Goethit-Nadeln im Topas.* Goethite needles in topaz. Zeitsch. d. deutsch. Gemmologischen Gesellschaft, 19 (1970), 2, pp. 44-46.

Goethite is an iron ore, more specifically the α form of an iron hydroxite FeOOH, which crystallises in the rhombic system. These crystals are sometimes found as very thin, needle-like inclusions, sometimes slightly bent, in topaz, where they are not distributed throughout the stone, but are numerous in various spots, and not found at all in the rest of the stone. 4 photomicrographs, 1 diagram.

E.S.

EPPLER (W. F.). *Nadelige Wachstumröhren als Einschlüsse in synthetischen und natürlichen Kristallen.* Needle-like growth tubes as inclusions in synthetic and natural crystals. Zeitsch. d. Deutsch. Gemmologischen Gesellschaft, 1970, 19, 1, 8-11 and 22-23.

Coloured photomicrographs show needle-like inclusions in the synthetic emerald of K. Nacken, the Lechleitner emerald and the synthetic hydrothermal emerald of Linde (in one case the needle being parallel to the c-axis, in the second case starting from a phenakite crystal inclusion). Further photographs show needle inclusions in a synthetic crystal which was grown from a lithium molybdate melt, also starting from a phenakite crystal inclusion; the sixth photomicrograph shows a growth tube in a natural emerald parallel to the c-axis and a similar inclusion in a green tourmaline from Brazil is shown. The last illustration shows a kyanite with a needle-like inclusion. The author has a theory regarding the crystal inclusions of needle-like tubes which decrease

in size. A small particle was in the path of the "tube" and was "pushed" in front of the tube to form the needle with the slightly smaller diameter at one end. Bibliography.

E.S.

EPPLER (W. F.). *Der "schwierige" Smaragde.* The "difficult" emerald. Deutsch. Goldsmiede Zeit., 1970, 4, 406-407.

Prof. Eppler discusses the problem of testing emeralds. This used to be easy. It would generally be said that synthetic emeralds had a lower SG than 2·67, natural a higher one; apart from that, the RI at 1·569 was a barrier and one could always make sure by looking at inclusions. Eppler now mentions a few exceptions to the general rule, such as the hydrothermal emeralds as described by Liddicoat and B. W. Anderson. Emeralds from a new source in south Rhodesia are also considered. The stones found there cannot be mistaken for those found in the Sandawana mines. Although the values for SG, RI and birefringence are practically the same as for stones from the Chikwanda mine (also southern Rhodesia), the inclusions are completely different and unlike any found in other emeralds. Eleven photomicrographs are published and explained. The nature of some of the inclusions is not given, some are actinolite, one is apatite and mica inclusions are present. The SG of the new emerald is 2·74 ± 0·01, the RI is n_o 1·590, n_e 1·582 and n_e-n_o = 0·008. The pleochroism is yellow-green and bluish-green.

E.S.

EPPLER (W. F.). *Das Edelstein-Bild.* The gem photograph. Deutsch. Goldsmiede Zeit., 1970, 4, 409-411.

Articles consisting of four different items illustrated with six photomicrographs. (*a*) Crystal inclusions in rock-crystal. The inclusion in this rock-crystal is a long crystal of tremolite with a double refraction of 0·025, while its host has a DR of 0·009. (*b*) The second crystal is a yellow zircon, from Madagascar, which has a particularly beautiful yellow colour and inclusions. These inclusions were found to be disc-like. The photomicrograph shows a disc which is oval, the longer axis being the c-axis. (*c*) Two illustrations show olivine in diamond. In the first case the olivine is surrounded by a heavy shadow; in reflected light (second illustration) this shadow is seen to be "tears" in the stone. (*d*)

The last two photomicrographs show liquid films in aquamarine. In the first case the liquid film is parallel to the c-axis and vertical to the base. The aquamarine has no cleavage plane in this direction, so must have been a growth disturbance. Further growth disturbances in varying thicknesses are illustrated in the second photomicrograph.

E.S.

FRERE (A.). *Opal-Tripletten.* Opal triplets. Zeitschr. d. deutsch. Gemmologischen Gesellschaft, 19 (1970), 2, p. 63.

Opals are often found in thin plates and these are used to produce opal doublets. Usually in these opals a thin plate of precious opal is fixed onto a lower part of opal of a lesser quality or onto black onyx. Lately a number of opal triplets have been found on the market. When viewed in nitro-benzol one can easily see a thin slice of precious opal (about 0·5 mm.) fixed onto chalcedony or lower quality opal. On top of the opal slice one finds a cabochon-cut piece of rock crystal. The advantages of this type of triplets are the ease of setting the stone and the hardness of the surface. The disadvantages are a glassy look and a slightly hazy play of colours.

E.S.

FRYER (C. W.). *Non-fluorescent high-property synthetic emeralds.* Gems and Gemology, 1969/70, XIII, 4, pp. 106-111.

A comprehensive report on the Gilson synthetic emerald illustrating the change in characters of this firm's more recent production. Eighteen unmounted stones were examined of which seven were found to be non-fluorescent; six fluoresced red and five orange-red comparable to the first recorded fluorescence characters of Gilson emeralds. These last five stones had refractive indices of 1·564-1·569 (0·005), a density of 2·65 and typical flux-fusion inclusions with phenacite crystals. These stones had a yellowish-green colour. The remaining stones were bluish-green in colour, six of which fluoresced red and had a refractive index of 1·562-1·567 (0·005/6), a density of 2·65 and had typical flux-fusion inclusions. The other seven stones had refractive indices of 1·571-1·597 (0·008) and a density of 2·68/9. The inclusion of iron is said to be the cause of the change of characters. Confirmation of this notion is by the line at 4270Å which is seen in the absorption spectrum of these stones, and by the opacity of them to x-rays. 9 illus.

R.W.

JARVIS (A. T. C.). *A brief account of the search for diamonds in Australia.* Australian Gemmologist, 1970, X, 10, pp. 31-32.

A historical survey of the finding of diamonds in Australia. Diamonds have been known in Australia since 1851, and have been found in all the States of Australia, including Tasmania.

R.W.

LIDDICOAT (R. T.). *Developments and highlights at GIA's lab. in Los Angeles.* Gems and Gemology, 1969/70, XIII, 4 and 5, pp. 123-133; 148-155.

Synthetic emeralds, a diamond with an unusual spectrum, synthetic yellow and green sapphires and synthetic quartz from Russia are mentioned. A carving in a pure white-green flecked material was identified as diopside. A number of rare stones were examined in this laboratory and these included augelite, creedite, whewellite and simpsonite. Opals of low density which had been treated with black plastic are reported upon. An alexandrite-like synthetic spinel, vegetable ivory and a cat's-eye and a star-peridot have been examined. 34 illus.

R.W.

MCCOLL (D.). *A method for differentiation of natural and synthetic yellow sapphires.* Australian Gemmologist, 1970, X, 11, pp. 9-11.

A discussion of the use of the x-ray spectrograph as a tool for detecting synthesis in yellow sapphire. The criterion is that nickel is generally present in synthetic yellow sapphires and is not present in natural yellow sapphires. A few synthetic yellow sapphires were found which did not show a nickel content but other metal oxides, but these had not been explored at the time of writing the article. 2 illus.

R.W.

NASSAU (K.) and JACKSON (K. A.). *Trapiche emeralds from Chivor and Muzo, Colombia.* Lapid. journ., 1970, 24, 1, 82.

An outline of a detailed examination given in the *American Mineralogist* (55, March-April, 1970) of two types of trapiche emeralds from the Chivor and Muzo mines in Colombia.

S.P.

OUGHTON (J. H.). *Yellow sapphire: natural or synthetic.* Australian Gemmologist, 1970, X, 11, pp. 5-8.

The problem of the determination of yellow sapphires is discussed and methods of testing suggested. The Plato effect is considered as requiring too much expertise. For the average worker more reliance could be placed on the transparency to ultra-violet light. There are some synthetic yellow sapphires which do not follow the ordinary laws postulated and the behaviour of such stones is discussed. A table is given of the various types of yellow sapphires.

R.W.

POUGH (F. H.). *Giant emerald crystals found in Brazil.* Lapid. Journ., 1970, 24, 6, 840.

A concise report about large emerald crystals occurring in the Carnaiba district of Brazil. Their colour is due, probably wholly, to their chromium content, though the abundance of iron inhibits the appearance revealed by Colombian stones under an emerald filter. Dr. Pough indicates that production of the better-coloured Colombian emeralds is minimal and that most of these stones reach the markets by unreliable and devious routes.

The Brazilian Carnaiba crystals provide moderately priced emeralds of acceptable size. An attempt is being made to cut calibrated stones mechanically.

A new African occurrence is reported to be at the Mufulira Mine in Zambia. It is suggested that there is a great potential in Africa for a variety of gemstones.

S.P.

ROLFF (A.). *Gem news from Brazil.* Lapid, Journ., 1970, 24, 3, 514.

Opal, similar to the blue Australian type, has been found in northern Brazil (Piaui State) together with fire opal. The alluvial diamond deposits of Brazil are well-known, but geologists are believed to have located the first diamond pipe deposits to be recognized in Brazil. The report is not confirmed. Aquamarines have been found in the Teofilo Otoni area.

S.P.

SAROFIM (E.). *Gem rich Tanzania.* Lapid. Journ., 1970, 24, 3, 434.

A brief survey of the gem materials occurring in Tanzania. Diamond is the most important stone, with small amounts of rubies and sapphires, garnets and tourmaline. Demand for the recently discovered transparent zoisite exceeds supply and monthly production is about two kilos. The author does not refer to heat-treatment of the material. Other stones are found and there would appear to be a great potential in the country.

S.P.

SCHIFFMANN (C. A.). *A Geological Curiosity*, Schweizer Goldschmied, Aug. 1969, 8.

In 1968 a geological curiosity was discovered which gave rise to certain Swiss newspapers reporting that they were "black fossil pearls of great beauty and great worth". The items were found in the upper marine Swiss midland in a phosphoritic layer rich in alpine water-worn pebbles. The spheres may have had an organic or inorganic origin. It seems likely that the Bernese nodules possibly had an animal origin because echinids have been found in the same vicinity, and excremental balls from these are known. The spheres seem to have been impregnated with calcium phosphate during or after the time of their deposition.

S.P.

SUZUKI (S.). *A new design for brilliance plus dispersion.* Aust. Gemm., 1970, 10, 10, 13.

Brilliant-cut gemstones are often designed purely for brilliance, and colour dispersion is regarded as incidental. As a consequence it is generally believed that not much colour dispersion can be expected in stones with lower refractive indices (lower than say 2·0). It is true that stones with higher refractive indices show more or less satisfactory colour dispersions (due to their inherently larger relative dispersions) even if they are cut for brilliance. And stones with lower R.I. do not exhibit enough dispersion even when cut in what is called the "dispersion design". However, colour dispersion is still a desirable feature for lower R.I. stones as well (except in special cases such as ruby), and it should be quite advantageous if we can bring out more colour dispersion than is obtainable from such lower R.I. stones with current designs.

A new design concept called the "double dispersion design" has been developed, in which dispersion comparable to those usually obtainable only in higher R.I. stones can be achieved in lower R.I. stones without much loss of brilliance.

The double dispersion design brings out a quite distinctive dispersion, without sacrificing the brilliance very much in medium to low R.I. materials for which the current dispersion design is not effective. It is believed that this new design establishes an approach towards the improvement of the design of the standard brilliant cut.

S.P.

TILLANDER (H.). *Diamantgraduierung nach der Skandinavischen Diamant-Nomenclature.* The graduation of diamond according to the Scandinavian standards. Zeitschr. d. Deutsch. Gemmologischen Gesellschaft, 1970, 19, 1, 14-20.

This article deals with one brilliant of 0·32 cts which was carefully classified according to the standard. Four illustrations and three sketches to show how faults, etc. should be marked.

E.S.

TOMBS (G. A.). *Zircon phenomena.* Australian Gemmologist, 1970, X, 10, 26.

A report on an Australian brown zircon which faded on being subjected to a low heat but which returned to its original colour after twenty minutes exposure to sunlight.

R.W.

TRIPP (E. J.) and HERNANDEZ (L. H.). *The complete trapiche emerald picture.* Lapid. Journ., 1970, 24, 1, 97.

An account of the cutting of gems from trapiche emeralds. Pena Blanca and Muzo are mentioned as sources of the emeralds.

S.P.

WEBSTER (R.). *Forensic problems in jewellery.* Australian Gemmologist, 1970, X, 9, pp. 7-13.

An article reprinted from the Criminologist, an English journal dealing with forensic sciences. (Abstracted Journ. Gemmology, 1968, 11, 2, 56.)

P.B.

WOLF (R.). *Look through your magnifying glass.* Australian Gemmologist, 1970, X, 11, pp. 29-30.

A useful article discussing the use of the hand lens in identification of gemstones. What to look for and how to do it.

R.W.

ZEITNER (J. C.). *All American gems.* Lapid. Journ., 1970, 24, 2, 300.

Brief descriptions of gems discovered in America, including morganite, goshenite, kunzite, hiddenite, benitoite and rhodolite. These are the major gems of faceting quality. Others include danburite, bowenite, williamsite, californite, as well as accepted varietal names of other species less well known to the gemmologist.

S.P.

BOOK REVIEWS

Scandinavian Diamond Nomenclature and Grading Standards. Scan. Jewellers' Assns., c/o Tillander, Helsinki. 1970. £7.

A detailed nomenclature for the designation of diamonds. The term "inclusion" is sensibly used instead of the outmoded "imperfect" for describing internal characteristics. There is a comparison of different colour-grading systems, the Scandinavians preferring to use names, e.g. top crystal, crystal, top cape, instead of the alphabetical and numerical systems used in the U.S.A. The nomenclature contains rules for grading and clarity and gives tolerances of the standard cuts for diamond. The informative chapter on clarity, with many helpful illustrations, comprises about half of the nomenclature and it is unfortunate that this chapter was separately published in 1969 at a low price, which now makes the cost of the complete work very expensive.

The Scandinavians are to be congratulated upon formulating a nomenclature which will undoubtedly influence diamond grading language in other countries.

S.P.

Mineral Digest (the Journal of Mineralogy). New York. $12.00 per annum (foreign $16.00) published quarterly.

A new Journal devoted to gem minerals and gemstones with many excellent colour illustrations some of which have been published elsewhere. First contributors include Messrs. P. E. Desautels, F. H. Pough and J. Sinkankas. The aim of this new Journal is to encourage the organized production of the wealth that nature has created and to assist in all who work and deal in those products to obtain fair value for the raw and fabricated materials.

S.P.

PERRY, NANCE and RON. *Australian Opals in Colour*. A. H. and A. W. Reed, Sydney, 1969, 112 pages. £2 5s. 0d. (£2.25).

Dedicated to the people of the opal fields of Australia, this book is a companion to the authors' very popular Australian *Gemstones in Colour*. After an introduction and a glossary, the different opal fields of the continent are covered in detail, with maps and coloured illustrations of the type of opal to be found in each. Means of access to each area are described in detail and interesting vignettes of life in opal mining communities help to bring the life of the opal miner closer to the reader.

The chapter on the nature and origin of opal covers the CSIRO discovery of the cause of the play of colour; the first time this has been mentioned to my knowledge in a book. The different methods of cutting are well-described and illustrated, in particular the method of making doublets and triplets. In this connexion the gemmologist should note the recent appearance of "schnapper-skin triplets" which contain no opal but consist of a layer of fish skin with red or blue dye mixed with the cementing agent. They may be detected by the skin showing grey at the girdle when examined with a lens, and also by the false hues of the reds. Another seldom-treated aspect of opal use is shown in the section on the treatment of matrix opal. The book ends with the method of setting opal chips in plastic containers. These have been seen in this country and although not unattractive, would hardly pass for solid opal.

There are 86 illustrations in colour and the quality is high, particularly so when one remembers earlier attempts to photograph

this gemstone. This book should certainly be found in the collection of every gemmologist.

M.J.O'D.

SAKIKAWA, NORIYUKI. *Jade.* Japan Publications Inc., Tokyo, 1968. 61 pages. £1 10s. 0d. (£1·50).

The author is a professor at the Tokyo Institute of Technology and an authority on gemstones. This is a well-illustrated and accurate book dealing with the jade minerals and their commoner simulants.

Dr. Sakikawa opens with a general summary of the jades and then goes on to treat jadeite and nephrite in separate chapters. He mentions the history of the use of jade and the methods of mining and then deals with the present-day distribution of the best material. An interesting comment is that although the United States Customs forbid the import of jade (at the time of writing) as it is held to be of Communist Chinese origin, in fact Burma jadeite reaches the Western market from Rangoon via Japan or Hong Kong.

Another interesting note mentions magatama, the jadeite found in the Itoi River area of Japan. It was formerly thought that the objects dating from AD 250-552 found in burial mounds were of Chinese origin, but archaeologists now believe that the material is Japanese.

Dr. Sakikawa ends with notes on the commoner jade simulants. Among these is "meta-jade", a material made synthetically and belonging to the actinolites. A colouring agent and an unnamed chemical which induces the formation of crystals are added to a mixture of fused quartz and alumina. The material has been made in green only and has a hardness of 5·5 and a lower density than jadeite though the figure is not given.

The illustrations, in particular those in colour of imperial translucent jadeite are excellent, and the book closes with a distribution map.

M.J.O'D.

ASSOCIATION NOTICES

Presentation of Awards

AUSTRIA, Belgium, Canada, West Germany, Holland, Norway, Sweden and Spain were all represented at the Gemmological Association presentation of awards, at Goldsmiths' Hall, Foster Lane, London, on 16th November. The chairman Norman Harper welcomed all who attended and especially mentioned Senor M. Masso, President of the Spanish Gemmological Association, and Professor M. Font-Altaba and Dr. J. M. Bosch Figueroa of the University of Barcelona, where gemmology had now been made a faculty subject.

In his opening address, Mr. Harper said it had become a habit to say, "This year we have broken all records for the number of examination candidates, and, again, I have got to say it this year, when 811 people sat the examinations."

Mr. Harper mentioned that it was the first year that a Gem Diamond Course had been held in Spain and went on to say that the Gem Diamond Course in Birmingham, the first of the Gem Diamond Courses, had temporarily ceased through lack of support. He then introduced the Prime Warden of the Worshipful Company of Goldsmiths', Ivan Tarratt, a Fellow of the Gemmological Association, and the first Fellow to become a Prime Warden.

In the talk he gave following the presentation of awards, Mr. Tarratt said quite a lot had happened since one evening in the 1930's, when he went along to the Royal Society of Arts, at the Adelphi, to receive his diploma. The number of people attending on that occasion was very few, because only a few people enrolled at all to take the examinations. He said it was very obvious to him that the amount of knowledge acquired now was so much greater than that able to be acquired in the 1930's. Although the course

was basically the same, it had been broadened and lengthened. Also very important was the sort of practical training provided now, it was so much more organized.

He continued by saying that it was never more important than the present time that people in the trade should have gemmological knowledge. The law in Britain was very tough about wrong identification of gem stones, and the continued demand for gemstones meant that everyone was having everything revalued, and those people revaluing gemstones realized just how difficult and tricky this could be.

The Prime Warden said that it seemed to him that the GA had become so united—almost a United Nations, and the international character of what had become the established science of gemmology was truly remarkable and the letters FGA meant something in every part of the world.

Having told his audience that he considered it impudence on his part to continue to talk about gemmology, Mr. Tarratt then spoke about livery companies, saying that while many people had visited the Hall in which they were now seated, "and many of you must have wondered what this 'funny' sort of medieval institution is all about?"

There were he said something like 84 institutions such as the Goldsmiths' Company in the square mile around the Hall. Known as livery companies from their inception up to the present time, they were known as such because in medieval times if a person was a member of one he wore a sort of uniform, or livery to denote the company that he belonged to. The livery was still worn today,said Mr. Tarratt, for special occasions.

The Goldsmiths' Company began shortly after the Norman Conquest, about 1080 AD. Most of the companies were very old, but a few, just a few, had been formed more recently. All the companies began life as a guild by persons in a trade or a craft, to protect themselves and to pass information to each other. They arranged such matters as taking on apprentices and to prevent wrong practices taking pace in their craft. Admittance to a company was afforded to those people of some integrity and misdemeanours were rewarded by expulsion.

No one had really been able to work out the seniority of the companies, there were, however, said Mr. Tarratt, what were known in rather an arrogant way as the 12 great companies, but

they were the oldest and the biggest and started with the Mercers' Company; the Goldsmiths' Company was numbered fifth.

It was the custom in the beginning for members when they died to leave a legacy of money, or a token, or a piece of land in the City of London, and by the time of the middle ages the companies had become very wealthy.

The Lord Mayor of London was elected by the livery companies at a meeting in the Guildhall each year, and the election was done only by a show of hands. When other facilities were lacking, the livery companies made arrangements for charities and education by forming trusts, some of which remained in existence today.

Some of the companies continued to maintain an interest in their craft, and from 1300 AD the Goldsmiths' Company had been required to mark all gold and silver articles to show such articles were up to the required standard. The Company had an Antique Plate Committee to which jewellers could refer when they were uncertain about a certain piece of plate or suchlike in their possession. Also, there was the Technical Advisory Committee advising on matters of technical importance to manufacturers. A third committee was known as the Craft Advisory Committee, and it was the one that really concerned every one listening to him for it set out to promote good relations between the trade and its customers. It also sought out young men and young women designers of talent, to give them every encouragement to ensure that they became established, and which had produced trends in jewellery which the world was noting.

The Company had a magnificent library of books and photographs taken over the last 20 years and also a collection of colour slides, all of which were there to be used and borrowed by members of the trade.

Mr. Tarratt concluded his talk by saying that the Company was truly democratic, for he had come up through the ranks, so to speak. Also, every fourth year there had to be a jewellery craftsman or trader as the Prime Warden.

Mr. Norman Harper thanked the Prime Warden and through him the Company for the facilities granted to the Gemmological Association at the Hall throughout the year. Mr. Harper then turned to an entirely different subject, the retirement of Dr. G. F. Claringbull as an examiner since 1938. Dr. Claringbull's connections with the Association went back to the days when Dr.

George Herbert Smith was president. The standard of gemmological training throughout the world was, said Mr. Harper, due to the consistently high standards demanded by Dr. Claringbull and other examiners. To mark his long and devoted service the Association had decided to give him a piece of silver to start off his collection, and it was understood it was his intention to make some of his own when he retired.

In a witty reply Dr. Claringbull said he had two things to say—having been got on to this platform for a most pleasing surprise—one was that the reason he had been associated with the Association for so long was the very friendly nature of the people he had had to deal with, particularly Basil Anderson, another examiner. The other thing was the very high standard they had been able to maintain despite pressure from certain sections of the trade which had pointed out that the knowledge of about five gemstones was all that was required. The examiners had resisted the demand for standards to be reduced. The need for gemmological knowledge was still there however for, said Dr. Claringbull, it was not many months ago that one could see in a shop in South Kensington a sales ticket which read "a real pearl necklace made by captive oysters."

MEMBERS' MEETINGS

London

A meeting was held on the 9th October, 1970 at Goldsmiths' Hall in conjunction with the British Academy of Forensic Sciences, when the following talks were given: Mr. J. S. Forbes, B.Sc., F.R.I.C., Deputy Warden of the Worshipful Company of Goldsmiths and London Assay Master, on "Forged hallmarks", and Mr. E. G. V. Newman, O.B.E., B.Sc., Chemist and Assayer to the Royal Mint on "Forged sovereigns".

Mrs. N. Armstrong gave a talk on "Late Georgian and Victorian Jewellery" at Goldsmiths' Hall on the 28th October, 1970.

Midlands

At a meeting held on the 10th September, 1970, Mr. R. Webster, of the London Chamber of Commerce Gem Testing Laboratory, gave a talk on modern synthetics illustrated with colour slides.

On the 20th September, 1970, an outing was arranged for members of the branch to the Tower of London for a private viewing of the Crown Jewels. After lunch members visited the museums at South Kensington.

A talk was given on the 19th November by Mr. G. Tomlinson on "Precious Metals in the Jewellery and Other Trades". The film "Precious Metals in Industry" was shown.

Scotland

A talk was given on the 8th October at the Kelvin Art Gallery and Museum on the organization of the proposed exhibition of gemstones to be held at the Museum during autumn 1971.

The films "Diamonds" and "One Hundred Million to One" were shown at a meeting of Scottish Branch members on the 16th November, 1970, at the Station Hotel, Perth.

GIFTS TO THE ASSOCIATION

The Council of the Association is most grateful for the following gifts:

Various mineral specimens from Mrs. E. Rhoda Blyth, Nanaimo, British Columbia, Canada.

A portable gem microscope and copies of the Japanese Association's *Journal of Gemmology*, from Mr. A. Chikayama, F.G.A., Director General of the Gemmological Association of All Japan.

A pocket book on *Precious Stones and Pearls* from Dr. Hermann Bank, Idar Oberstein.

A gift of samples of ruby corundum from a mine in Brazil from Mr. Julio Tanjeloff, President of Astro Minerals and publisher of the *Mineral Digest*.

An illustrated book on jewels in colour published by the Shobido Jewelry Company.

A sapphire crystal from the town of Sapphire in central Queensland, Australia, from Mr. K. Parsons, Plympton, Devon.

A tektite from Mr. K. Narayamamuthy, Pahang, Malaya.

GEMMOLOGICAL EXHIBITION

The Scottish Branch of the Association, in co-operation with the Glasgow Museums and Art Galleries, is arranging a gemmological exhibition at the museum during the last two weeks of

September and first two weeks of October, 1971. The Secretary of the Branch, Mr. G. Turner of "Kimberley", Grahamshill Street, Airdrie, Scotland, would welcome offers of any interesting gemmological exhibits which members might care to lend for the period.

NEW PUBLICATION

Bruton, E. *Diamonds.* N.A.G. Press Ltd., London, 1970. £5 (postage and packing, U.K. 4s. 0d. (20p). The only book in the English language which deals with the important aspects of gem diamonds (to be reviewed April 1971).

GEM DIAMOND EXAMINATIONS, 1970

There were 38 entries for the 1970 Gem Diamond Examination arranged by the Gemmological Association of Great Britain. The following is a list of successful candidates arranged alphabetically:—

QUALIFIED WITH DISTINCTION

Hawthorn, Graham, Solihull
Russell, Lionel Harold, London
Sancho Canto, Jaime, Barcelona, Spain

QUALIFIED

Ali, Nasim, Sutton
Arbunies Andreu, Manuel, Barcelona, Spain
Arla Felisart, Ramon, Barcelona, Spain
Armengol Abril, Emilio, Barcelona, Spain
Baguena Ruiz, Carlos, Barcelona, Spain
Brennan, John Douglas, Birmingham
Burwood, James Raymond, Wolverton
Castro Ferrer, Jaime, Barcelona, Spain
Clarke, Doreen Patricia, Camberley
Collingridge, James William, Tonbridge
Deeks, Noel William, Luton
Farras Sole, Jose, Barcelona, Spain
Ferneyhough, Miles Howson, Solihull
Grey, Alan Peter, Weybridge
Hird, Frank, Sheffield
Hundy, Christopher Leslie, Sutton Coldfield
Jefferis, Marcia Nicoletta, Watford
Pitt, Nicholas Charles Hamilton, Stourport-on-Severn
Pye, George Anthony, Brierley Hill
Rae, Francis Carl, South Harrow
Rouvier, Andre Edmond, London
Sancho Canto, Maria Pilar, Barcelona, Spain
Shipster, Thomas Reginald, Brighton
Stewart, Reginald William, Bickley
Torrents Domenech, Thomas, Barcelona, Spain
Traveria Cros, Adolfo, Barcelona, Spain
Vaughan, Susan Josephine, London
Villegas Sanvicens, Cesar, Barcelona, Spain
Walker, Patricia Joan, London
Watson, Vivian Peter, Northwood Hills
Wright, William Anthony, Potters Bar

EXAMINATIONS IN GEMMOLOGY, 1970

In the 1970 Examinations in Gemmology organized by the Gemmological Association of Great Britain, 510 candidates sat for the preliminary examination and 301 for the diploma. Centres were established in many parts of the world and the number of entries for both examinations was again very high.

Upon the recommendation of the examiners, neither the Tully Memorial Medal nor the Rayner Prize has been awarded.

The following is a list of successful candidates arranged alphabetically:—

DIPLOMA EXAMINATION

QUALIFIED WITH DISTINCTION

Alabaster, Wendy Jane, Birmingham
Allardyce, Anthony Stanley, Maidenhead
Berger, Roland, Ludwigsburg, (Wurtt.), Germany
Enkovaara, Maarit, Barcelona, Spain
Esteve Vila, Vicente, Barcelona, Spain
Figueras Calsina, Jorge, Barcelona, Spain
Fuente Cullell, Carlos De La, Barcelona, Spain
Garcia Gimeno, Jose Luis, Zaragoza, Spain
Hawes, John, Wakefield
Hayward, Richard Alan, Port Talbot
Heather, John Christopher, London
Holmes, Brian Michael, London
Jones, George Harrison, Burnham
Jornet Vila, Enrique, Barcelona, Spain
Just Chova, Jose Vicente, Valencia, Spain
Laub, Theodore, Johannesburg, S. Africa
Laug, Monika, Munchen, Germany
Lewin, David Alexander, Loughton
Marti Girona, Maria Montserrat, Barcelona, Spain
Miller, Stanford, Nashville, Tenn., U.S.A.
Pichon, Jean Daniel, Geneva, Switzerland
Pie De Masso, Rosa Maria, Barcelona, Spain
Raper, Frederick M., Toronto, Canada
Ricart Ribera, Arturo, Barcelona, Spain
Romero Fournier, Maria Del Carmen, Barcelona, Spain
Ruckli, Robert, Lucerne, Switzerland
Sallan Lopez, Rafael, Zaragoza, Spain
Schullin, D. Hans, Graz, Austria,
Shepherd, Naomi, Reading
Thomas, Arthur Ernest, Salisbury, Rhodesia
Thurgar, Stanley Hughes, Burlington, Ont., Canada
Warrington, Harold G., Toronto, Ont., Canada
Wight, Willow, Chambly, Quebec, Canada

Aas, Einar Eriksen,
Trondheim, Norway
Ahmad, Syed Vaqar, London
Alahendra, Anandapala, London
Allen, William,
Newcastle-Upon-Tyne
Anderson, Leonard John,
East Barnet
Andres Barbera, Manuel,
Valencia, Spain
Arla Felisart, Francisco,
Barcelona, Spain
Arnoldi, Regine,
Idar-Oberstein, W. Germany
Aung, Myint, Rangoon, Burma
Aye, Swae Swae, Rangoon, Burma

Baro Duran, Valentin,
Barcelona, Spain
Bartlett, Stewart Michael, Eccles
Beaver, Francis Bertram, London
Beck, Russell Joseph,
Invercargill, New Zealand
Belenke, Burton, Miami, Fa., U.S.A.
Benson, Ian Thomas, Manchester
Brand, Jonathan David,
Stellenbosch, S. Africa
Burke, Winifred Mary, Bexleyheath

Campbell, Ian Colin Cecil,
Bulawayo, Rhodesia
Challis, Peter James, Liverpool
Chalmers, William Andrew,
Manchester
Chapman, Ross Noel,
Thundersley, (Essex)
Clark, John, Lewes
Clavaguera Duran, Ricardo,
Barcelona, Spain
Cobden, Felix Sydney, London
Cucurella Comellas, Ignacio,
Barcelona, Spain

Differenz, Gabriele Monika,
Bad Homburg, W. Germany
Doi, Yoshiko,
Los Angeles, Calif., U.S.A.
Driver, Olive, Bexleyheath

Edwards, Janet Roberta, Bebington
Elfatatri, Abdel Ghani Abbas,
Leiden, Holland
Emmanuel, Peter John, Croydon
Eyre, George, Buxton
Ferrer Tor, Maria Luisa,
Gerona, Spain
Folch Bru, Rosendo B.
Barcelona, Spain
Foster, Susan Ellwood,
Toronto, Ont., Canada
Fraleigh, Ronald A.,
Toronto, Ont., Canada
French, Donald Peter, Colchester
Gold, Stewart D.,
Fergus, Ont., Canada
Grau Roca, Manuel,
Barcelona, Spain
Gregory, Jack, Barnsley
Grist, Nigel, Sheffield

Haag, Susanne Renate,
Kirschweiler, W. Germany
Hague, Judith Elizabeth, Stockport
Harding, Jeremy Lance, Copthorne
Hayes, John Ernest, Altrincham
Heetman, J. A. M. Th.,
Rotterdam, Holland
Heyes, Alan John, Lancing
Hill, Brian Douglas, Chatham

Jayasundera, Amarasekera Bandera,
Badulla, Ceylon
Jones, Claire Patricia, Redhill
Jones, Denise May, Liverpool

Klocke, Christel Elvira,
Rexdale, Ont., Canada
Ko, Aung, Rangoon, Burma
Kuge, Georges, Gent, Belgium

Levy, Hanukah, London
Lewin, Persephone, Loughton
Lieben, Christl, Vienna, Austria

Macdonald, Robert Charles,
Hebden Bridge
Macfarlane, Alan Taylor, Glasgow
Mark, Malcolm David, London
Marthinsen, Elise, Tonsberg, Norway

Martin, Nancy Jean, Heidelberg, Australia
Mawson, Alan, Crewe
Mercade Galles, Jaime, Barcelona, Spain
Mertens, Rudolf, Idar-Oberstein, W. Germany
Miller, Elva E., Brentwood, Tenn., U.S.A.
Miro Bauza, Antonio, Manacor, Spain
Nadal Cerezo, Antonio, Barcelona, Spain
Nalliah, Selliah, Colombo, Ceylon
Nicolau Marti, Margarita, Barcelona, Spain
Nicolau Santasusagna, Ramon, Barcelona, Spain
Noakes, Norman De Berri, Auckland, New Zealand
Nuttall, Miranda, London
Parsons, Richard Frank, Chorley Wood
Pearce, Joan Emery, Liverpool
Phillips, Joan Doris, Manchester
Pickering, John Pearce, Port Noarlunga, S. Australia
Platts, Jean Isabel, Sheffield
Pollak, Charles John, New York, U.S.A.
Prada Sampedro, Jose, Barcelona, Spain
Prats Ballester, Juana, Barcelona, Spain
Ramon Rius, Carlos E., Barcelona, Spain
Reich, David K., Tunbridge Wells
Rigau Mestre, Francisco Javier, Barcelona, Spain
Rosner, Marc, Pacific Palisades, Calif., U.S.A.
Saing, Aung Sein, Rangoon, Burma
Sharman, Avril Faith, Plymouth
Snipper, Alison, London
Standard, Alan Kimball, Hawkinsville, Ga., U.S.A.
Stevens, Ronald Claude, Auckland, New Zealand
Stitt, Hamilton William, Montreal, Quebec, Canada
Stokoe, Colin Edmund, Wallsend
Tannum, Bjorn, Fredrikstad, Norway
Templeton, Paul Thomas, Oxford
Torndahl, Arne, Stockholm, Sweden
Troften, Irja, Sarpsborg, Norway
Wai, Minn, Rangoon, Burma
Walkey, Albert James, Ellesmere Port
Warrington, Mairin T., Toronto, Ont., Canada
Weerasinghe, Gamani Bandula, Ratnapura, Ceylon
Wharton, Stuart, St. Albans
Whatton, Edwin Albert, Sutton Coldfield
Wijeratne, Chandrakumara K., London
Wilson, Robert Henry, Caterham
Win, Win, Rangoon, Burma
Wolstenholme, Lawrence Edward, Sheffield
Wood, Robert Matthew, Peterborough
Zarook, Mohamed Hazim, Matara, Ceylon

Preliminary Examination—Qualified

Abellan Lopez, Adela, Barcelona, Spain
Adams, Michael Edward, Middlesbrough
Addis, R. C., London
Aguilar Cabezon, Javier, San Sebastian, Spain
Aho, Matti, Helsinki, Finland
Allum, Christopher, Nottingham
Allum, Peter Dennis, Shaftesbury
Alm, Eila, Riihimaki, Finland
Alm, Rudolf, Hyvinkaa, Finland
Alonso Fernandez, Elena, Leon, Spain

Altaba Artal, Maria Dolores, Barcelona, Spain
Anderson, Arthur Alfred, Guildford
Andres Barbera, Jose, Valencia, Spain
Anttila, Aimo, Lintuvaara, Finland
Ashbaugh, Maurice Donald, Upper Heyford, (Oxon)
Astrain Calvo, Rafael, San Sebastian, Spain
Aung, Myint, Rangoon, Burma
Aye, Mya Mya, Rangoon, Burma
Aye, Swae Swae, Rangoon, Burma
Backshall, Henry George Robert, Hainault
Balmaseda Fernandez, Javier, Palma De Mallorca, Spain
Beach, Rowan Michael, Twickenham
Berger, Roland, Ludwigsburg, (Wurtt.), Germany
Bjorudaleu, Jan, Oslo, Norway
Blakey, Linda, Warley
Blanco Artigues, Jose Maria, Lerida, Spain
Bonnin Valls, Vicente, Palma De Mallorca, Spain
Borgatta, Edgar F., Madison, Wis., U.S.A.
Borge, Grethe, Lillestrom, Norway
Boyce, Anthony James, Doncaster
Bradford, K. J., Westcliff-on-Sea
Bradley, Christina Susanna, Didcot
Brown, Jonathan Philip, Derby
Brumann, Hans R., Makati, Philippines
Buckley, Peter Ross, Halifax
Burgin, Derek Arthur, Nottingham
Butcher, Kathleen Mary, Sudbury
Camberg, Gerald Selwyn, Johannesburg, S. Africa
Cameron, John, Glasgow
Canudas Martinez, Jaime, Palma De Mallorca, Spain
Carballal Cirici, Carmen, Barcelona, Spain
Carter, David Marwood, Sidmouth
Chalk, Christopher Sean, Gillingham
Chapman, Philip Rowland, Luton
Chapman, Ross Noel, Thundersley, (Essex)
Child, Dominick, Warwick
Chlupacek, Joseph M., Gary, Ind., U.S.A.
Christie, Rosalind Seaton, London
Clarke, Anthony Everitt, Northampton
Clowry, Raymond Vincent, London
Coll Llobera, Pedro, Palma De Mallorca, Spain
Collins, Joseph Wray, Niagara Falls, Ont., Canada
Comely, Christopher Norman, Dorchester
Conesa Landines, Bernardo, Barcelona, Spain
Contreras Vila, Pedro, Barcelona, Spain
Cotton, John Alan Day, London
Cox, David Arnold, Doncaster
Coxon, Andrew Michael, London
Crossley, Roy, Halifax
Curry, Harold L., Eugene, Oregon, U.S.A.
De Bruin, Alphonsus Gerardus, London
Delange, Elizabeth Bellville, S. Africa
Dhupalia, Shamsuddin Mansuralli, Paris, France
Dickenson, John W., Liverpool
Doi, Yoshiko, Los Angeles, Calif., U.S.A.
Duley, Roy T., San Diego, Calif., U.S.A.
Dyson, John Allen, Elland, Yorks.
Ebbs, David Crispin, Meols, Cheshire
Etch, Motowo, Osaka, Japan
Ellard, John Eric, Wigan
Ferguson, Louisa, Glasgow
Fernando, M. Padmasiri Noel, Moratuwa, Ceylon
Fernando, S. U. H., Moratuwa, Ceylon

Figueras Calsina, Jorge,
Barcelona, Spain
Fish, Simon Timothy,
Durban, S. Africa
Forbes, Brian Winston Travers,
Johannesburg, S. Africa
Fraleigh, Ronald A.,
Toronto, Ont., Canada
Fransein, Eldon E.,
West St. Paul, Minn., U.S.A.
Frazao, Maria Luiza,
Lisbon, Portugal
Frontera Serra, Onofre,
Palma De Mallorca, Spain
Fukabayashi, Hiroyuki,
Hokkaido, Japan
Fuster Domenech, Jaime,
Palma De Mallorca, Spain
Fuster Fuster, Cayetano,
Palma De Mallorca, Spain
Gallon, Russell, London
Gammage, Michael John Ellis,
Northwood
Ganster, Doris Erlene,
Pico-Rivera, Calif., U.S.A.
Gardiner, Anthony Cluff,
Abadan, Iran
Garrido Ballesteros, Dolores,
Palma De Mallorca, Spain
Garrido Ballesteros, Maria Jose,
Palma De Mallorca, Spain
Gatie, Adrian Patrick, Leeds
Gelaberto Vilagran, Enrique,
Barcelona, Spain
Geyer, Adrian Michael, Birmingham
Gillings, Michael, Manchester
Goadby, John Barrie, Birmingham
Godfrey, Fraser Cranford, Midlothian
Gomez Escola, Ana Maria,
Barcelona, Spain
Gomez Gea, Jose, Barcelona, Spain
Gopalji, Kantilal, London
Grange, Doreen Mary, Sherbourne
Grange, Roger Stanley, Braintree
Grau Miro, Joaquin,
Palma De Mallorca, Spain
Grayson, Peter Ronald, Wallasey
Green, Adrienne, Wembley
Green, Arnold, Wembley
Grim, Roy Ivan,
Laurel, Md., U.S.A.
Guard, Norman Wesley,
Dublin, Ireland
Gyi, Ma, Rangoon, Burma

Hale, Patricia Emmeline, Worcester
Hall, Michael John, London
Hanna, Neil Randle,
Auckland, New Zealand
Harland, James Alfred, London
Harvey, Roger Sweyn, Hull
Heikkila, Juhani, Helsinki, Finland
Hilbourne, Anthony Charles,
Maidenhead
Hinchliffe, Brian, Sheffield
Hirohata, Tomoko,
Osaka-Prif., Japan
Holden, Andrew Neil, Walsall
Holliday, Barrie James, Northampton
Holmes, Eric Charles, Salisbury
Horesh, J., London
Howard, David John, Reading
Htwe, Htwe, Rangoon, Burma
Hubbard, Susan, London
Huddy, Molly, Salisbury, Rhodesia
Hutchison, Alfred Sandison,
Salisbury, Rhodesia

Iivonen, Helena, Helsinki, Finland
Ireland, Kenneth Leslie,
Salisbury, Rhodesia
Irwin, Margaret, Chester

Jackson, Ian, Bradford
Jarvis, Maurice Leslie,
Durban, S. Africa
Jenner, Peter Charles,
Tunbridge Wells
Jervis, John Martin, Liverpool
Jessel, Stephen Malcolm, Potters Bar
Jobbins, Howell Stevens,
Toms River, N.J., U.S.A.
Johnson, John William Sidney,
London
Johnson, Robert Charles, Nuneaton

Kadigamuwa, Piyasena,
Warakapola, Ceylon
Keeling, Judith Mary, Birmingham

Kivimaki, Kauko,
Hameenlinna, Finland
Knappett, William Paul,
New Market, Ont., Canada
Ko, Aung, Rangoon, Burma
Koskinen, Aito, Helsinki, Finland
Krieger, Rolf, Huddinge, Sweden
Kuge, Georges, Gent, Belgium
Kyaw, Aung, Rangoon, Burma
Lackey, Joseph Frank,
Laurel, Md., U.S.A.
Laing, William Stuart,
Troon, Scotland
Langthon, Kjell Odvar, Oslo, Norway
Larrazolo, Ruth L.,
Fort Clayton, Canal Zone
Laub, Theodore,
Johannesburg, S. Africa
Lehtola, Lauri William,
Suomi, Finland
Lehtola, Maire, Helsinki, Finland
Leino, Terttu, Helsinki, Finland
Levy, Hanukah, London
Lewis, Roger Anthony, Wallasey
Lilja, Irmeli, Rovaniemi, Finland
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Barcelona, Spain
Moran, John, Blackpool
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Soukka Espoo, Finland
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Fukushima-Ken, Japan
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Talangama, Ceylon
Palihena, Drukshini Anne,
Talangama, Ceylon
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Peranko, Pyry, Lahti, Finland
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Vientiane Laos, S.E. Asia
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Barcelona, Spain
Sanchez Ayala, Jose,
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Scull, Roger Vivian, Newport
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Matugama, Ceylon
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Rajagiriya, Ceylon
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Smith, Ronald Frank, Wilmslow
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Barcelona, Spain
Soratie, Aino Kyllikki,
Helsinki, Finland
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Balboa Heights, Canal Zone
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Bilbao, Spain
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Thomson, Ian, London
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Barcelona, Spain
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Cape Town, S. Africa
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Turnbull, Alan Stewart, Glasgow
Uchida, Sumiko, Nagano-Ken, Japan
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Utrecht, Holland
Van Rensburg, Christine
Stellenbosch, S. Africa
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Barcelona, Spain
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Walton, Edith Mary Ellinor, Prescot
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Warren, John Lisle, London
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Northwood Hills, Middx.
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Fergus Falls, Minn., U.S.A.
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Westerback, Simo,
Helsinki, Finland
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Williams, Anthony Martin,
Birmingham
Williams, Robert, Birmingham
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Winstead, Frances F.,
Eugene, Oregon, U.S.A.
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Johannesburg, S. Africa
Woolf, Debra, London
Wroblewski, Tadeusz, Birmingham

Ylonen, Sisko Hilkka,
Hameenlinna, Finland

Zandstra, Ilse, Staines
Zarook, Mohamed Hazim,
Matara, Ceylon
Zawadzki, Antoni Kurt Pawel,
Edinburgh
Zook, Theresa Fuetterer,
Alexandria, Va., U.S.A.

COUNCIL MEETINGS

At a meeting of the Council of the Association held in London on the 23rd September, 1970, the following were elected to membership:—

FELLOWSHIP

Harkins, Thomas, Glasgow. D.1949
Heather, John C., London. D.1970
Miller, Elva E.,
Brentwood, Tenn., U.S.A. D.1970
Lewin, Persephone, Loughton. D.1970
Reich, David K.,
Tunbridge Wells. D.1970

Verges Tuset, Maria,
Barcelona, Spain. D.1969

Alabaster, Wendy J., Birmingham
Allardyce, Anthony S., Maidenhead
Hawes, John, Wakefield
Heather, John C., London
Jones, George H., Burnham
Schullin, Hans, Graz, Austria
Alahendra, Anandapala, London
Bartlett, Stewart M., Eccles
Challis, Peter J., Liverpool
Driver, Olive, Bexley Heath
Emmanuel, Peter J., Croydon
Grist, Nigel, Sheffield
Harding, Jeremy L., Copthorne
Heyes, Alan J., Lancing
Levy, Hanukah, London
Mawson, Alan, Crewe
Snipper, Alison, London
Stokoe, Colin E., Wallsend
Wharton, Stuart, St. Albans
Wijeratne, Chandrakumara K., London
Wilson, Robert H., Caterham
Wood, Robert M., Peterborough
Berger, Roland, Ludwigsburg, Germany
Miller, Stanford, Nashville, Tenn., U.S.A.
Pichon, Jean D., Geneva, Switzerland
Ruckli, Robert, Lucerne, Switzerland
Thomas, Arthur E., Salisbury, Rhodesia
Thurgar, Stanley H., Burlington, Ont., Canada
Warrington, Harold G., Toronto, Ont., Canada
Wight, Willow, Chambly, Quebec, Canada
Beck, Russell J., Invercargill, New Zealand
Belenke, Burton, Miami, Fa., U.S.A.
Brand, Jonathan D., Stellenbosch, South Africa
Campbell, Ian C. C., Bulawayo, Rhodesia
Differenz, Gabriele M., Bad Homburg, W. Germany
Haag, Susanne R., Kirschweiler, W. Germany
Jayasundera, Amarasekera B., Badulla, Ceylon
Kuge, Georges, Gent, Belgium
Martin, Nancy Jean, Heidelberg, Australia
Mertens, Rudolf, Idar-Oberstein, West Germany
Nalliah, Selliah, Colombo, Ceylon
Noakes, Norman D. B., Auckland, New Zealand
Pickering, John P., Port Noarlunga, S. Australia
Pollak, Charles J., New York, U.S.A.
Rosner, Marc., Pacific Palisades, Calif., U.S.A.
Standard, Alan K., Hawkinsville, Ga., U.S.A.
Stevens, Ronald C., Auckland, New Zealand
Stitt, Hamilton W., Montreal, Quebec, Canada
Warrington, Mairin T., Toronto, Ont., Canada
Zarook, Mohamed H., Matara, Ceylon
Romero Fournier, Maria D. C., Barcelona, Spain
Arla Felisart, Francisco, Barcelona, Spain
Folch Bru, Rosendo B., Barcelona, Spain
Grau Roca, Manuel, Barcelona, Spain
Nadal Cerezo, Antonio, Barcelona, Spain
Nicolau Marti, Margarita, Barcelona, Spain
Nicolau Santasusagna, Ramon, Barcelona, Spain
Prats Ballester, Juana, Barcelona, Spain
Ramon Rius, Carlos E., Barcelona, Spain
Rigau Mestre, Francisco J., Barcelona, Spain
Lear, Doreen S., Winchester

Akizuki, Ryozo, Osaka, Japan
Alberts, Arnold E.,
Massapequa Park, N.Y., U.S.A.
Amarasuriya, Sunil T.,
Idar-Oberstein, West Germany
Baker, Nancy J., Manotick, Canada
Berlage, Peter J.,
Idar-Oberstein, West Germany
Bezalel, Moshe, London
Bishop, Paul L., London, Canada
Borden, Paul L.,
Manhattan Beach, Calif., U.S.A.
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Rupert, Vermont, U.S.A.
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Boyd, Aubrey, Nice, France
Bradley, John T., Portsmouth
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Brewer, Grahame H., Cheddar, Som.
Brown, Ronald, Morpeth
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Denver, Colorado, U.S.A.
Calabrese, John F. (Mrs.),
Denver, Colorado, U.S.A.
Cepak, Livio, Trieste, Italy
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Chiba, Yutaka, Tokyo, Japan
Chikayama, Yoko, Tokyo, Japan
Christopoulou, Maria, Athens, Greece
Clark, Harry F.,
Haddonfield, N.J., U.S.A.
Coleman, Margaret, London
Cook, Marion E., Victoria, Canada
Cummings, Bruce W.,
New York City, U.S.A.
Dallas, John O., Hong Kong
Dickinson, Peter H., Wareham
De Silva, Ambepitiya W.,
Mount Lavinia, Ceylon
Ebbs, David C., Wirral
Epps, Alfred W., Walton-on-Thames
Driver, Olive, Bexleyheath
Evans, Robert O.,
Billings, Montana, U.S.A.
Faulds, Matthew C. M., London
Fowler, Myrtle W. A.,
Gymea Bay, Australia
Freeman, Aileen S.
Gladwyne, Pennsylvania, U.S.A.
Fujita, Sadaharu, Tokyo, Japan
Gans, Louis B., Amsterdam, Holland
George, Michael C.,
Southborough, Kent
Godfrey, Fraser C.,
Penicuik, Midlothian
Green, Margot I.,
Stonehaven, Kincardineshire
Greig, Donald H.,
Auckland, New Zealand
Griffiths, Clive, Bournemouth
Hemachandra, George G.,
Kandy, Ceylon
Herdman, Peter R., Tenterden
Hopkinson, Peter G., Huddersfield
Horesh, J., London
Imai, Yoshiko, Nagoya, Japan
Jaipuria, Pavan K., Rajasthan, India
Kanno, Saburo, Tokyo, Japan
Kasama, Masahiko,
Kawasaki-shi, Japan
Katsuta, Yasuo, Nagoya-City, Japan
Kiuru, Kerttu, Helsinki, Finland
Kojima, Yasutaka, Nagoya, Japan
Komiakoff, Leo. N.,
New York, U.S.A.
Kawai, Shigenori, Tokyo, Japan
Knappett, Paul W.,
Newmarket, Canada
La Due, Martha,
Miama, Fa., U.S.A.
Larson, Eda B., Rainier, Canada
Leighton, Michael A., Leigh-on-Sea
Levy, Benzion, Edgware
Lewin, David A., Loughton
Lo, Louis Y. S., Hong Kong
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Barcelona, Spain
Lowe, Peter E.,
Windhoek, S.W. Africa
Margolis, Eva,
San Diego, Calif., U.S.A.

Masaki, Iwao, Tokyo, Japan
Maslen, Grant L., Nairobi, Kenya
McLachlan, Archibald R.,
Auckland, New Zealand
McNae, John, Keighley
Mizuhaya, Mineo, Kamakura, Japan
Murray, James I. M., Redhill
Mays, Stephanie J., Windsor
Nakagawa, Masateru, Osaka, Japan
Nakatani, Eija, Tokyo, Japan
Needham, Brian, Ilford
Nickel, Karin I., Troisdorf, Germany
Nightingale, Stephen, Wembley
Noble, Clifford,
Heckmondwike, Yorks.
Okuyama, Isamu, Tokyo, Japan
O'Neill, Peter J.,
Glendalough, Ireland
Oohashi, Takehiro,
Kamakura-city, Japan
Pinner, Benjamin R.,
Oxon Hill, Md., U.S.A.
Popplewell, Wilfred, Bristol
Ray, Charles G.,
St. Saviours, Guernsey, C.I.
Roberts, Gerald T., Bolton
Rogers, Anthony C., Exmouth
Romaine, Grahame B.,
Geneva, Switzerland
Rosner, Marc.,
Pacific Palisades, Calif., U.S.A.
Rubenstein, Frances,
Johannesburg, South Africa
Saito, Takayoshi, Nagoya, Japan
Sallom, A. Kalil,
Upper Darby, Pennsylvania, U.S.A.
Sardelli, Michael W.,
Greenbelt, Md., U.S.A.
Schnitzlev, Otomie W., Axel, Holland
Shrimal, Kanak, Rajasthan, India
Siddle, W. H., Nottingham
Smidt, Maria J. A.,
Salisbury, Rhodesia
Sothilingam, Pathmanathan,
Point Pedro, Ceylon
Stevens, Peter J., London
Stirling, Frederick H.,
Brampton, Cumberland
Strenge, Arthur J.,
Lanham, Md., U.S.A.
Talati, Dipil J., Ahmedabad, India
Tanaka, Paul, London
Taylor, Frank, Surbiton
Taylor, Michael P., Enfield
Thomas, Suzanne E.,
Orlando, Fa., U.S.A.
Tokura, Masao, Okinawa, Japan
Walter, Charlotte A.,
Miama, Fa., U.S.A.
Watanabe, Kiyoshige, Kyoto, Japan
Whitehead, Michael E., Birmingham
Wiltshire, John A., Morden
Woods, Cecil C., Hailsham
Yamada, Kazunori, Tokyo, Japan
Yamada, Motonobu, Tokyo, Japan
Young, Mary A., Farnham
Zara, Louis,
Philadelphia, Pa., U.S.A.

At a meeting of the Council held on the 16th November, 1970, the following were elected:

FELLOWSHIP

Aas, Einar E., Trondheim, Norway
Ahmad, Syed V., London.
Allen, William, Newcastle-upon-Tyne
Anderson, Leonard J.,
East Barnet, Herts.
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Valencia, Spain
Arnoldi, Regine,
Idar-Oberstein, W. Germany
Baro Duran, Valentin,
Barcelona, Spain

Benson, Ian T., Manchester, Lancs.
Burke, Winifred M.,
Bexleyheath, Kent
Chalmers, William A.,
Manchester, Lancs.
Clavaguera Duran, Ricardo
Barcelona, Spain
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Doi, Yoshiko,
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Leiden, Holland
Eyre, George, Buxton, Derbys.
Figueras Calsina, Jorge,
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Foster, Susan E.,
Toronto, Ont. Canada
Fraleigh, Ronald A.,
Toronto, Ont. Canada
French, Donald P.,
Wivenhoe, Essex
Gregory, Jack, Barnsley, Yorks.
Hayes, John E., Altrincham, Ches.
Hayward, Richard A.,
Port Talbot, Glam.
Heetman, Joannus A. M. T.,
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Holmes, Brian M., London
Jones, Claire P., London
Jones, Denise M., Liverpool, Lancs.
Jornet Vila, Enrique,
Barcelona, Spain
Just Chova, Jose V.,
Valencia, Spain
Laug, Monika, Munich, W. Germany
Lieben, Christl, Vienna, Austria.
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Hebden Bridge, Yorks.
Macfarlen, Alan T.,
Glasgow, Scotland
Mark, Malcolm D., London
Marthinsen, Elise, Tønsberg, Norway
Meadowcroft, Judith E.,
Sale, Ches.
Miro Bauza, Antonio,
Mallorca, Spain
Nuttall, Miranda, London
Pearce, Joan E., Liverpool, Lancs.
Phillips, Joan D., Manchester, Lancs.
Platts, Jean I., Sheffield, Yorks.
Sharman, Avril F., Plymouth, Devon
Tannum, Bjørn, Leiden, Holland.
Templeton, Paul T., Oxford
Torndahl, Arne, Stockholm, Sweden
Walkley, Albert J.,
EllesmerePort, Ches.
Weerasinghe, Gamani B.,
Ratnapura, Ceylon
Whatton, Edwin A.,
Sutton Coldfield, Warwicks.
Wolstenholme, Lawrence E.,
Sheffield, Yorks.

ORDINARY

Allum, Ian J., Telford, Salop.
Ambar, Kris, Djakarta, Indonesia
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Bangor, Co. Down, N. Ireland
Dellow, Henry, Blackburn, Lancs.
Dube, Rene A.,
Halifax, Nova Scotia, Canada
Duley, Roy T.,
San Diego, Calif., U.S.A.
Gould, Trevor A.,
Westville, Natal, Rep. of S. Africa
Grim, Roy I., Laurel, Md., U.S.A.
Jabir Mohamed, Packeer M.,
Beruwala, Ceylon
Jayendran, A., Khartoum, Sudan
Jennings, Oliver, Devizes, Wilts.
Jessel, Stephen M.,
Potters Bar, Herts.
Jubber, Joselyn H.,
Camborne, Cornwall
Klocke, Christel E.,
Rexdale, Ont., Canada
Lackey, Joseph F.,
Laurel, Md., U.S.A.

Levasseur, William J.,
Edgewater, Md., U.S.A.
Macdonald, Graeme R.,
Wellington, New Zealand
McCarthy, Dorothy L.,
Greenbelt, Md., U.S.A.
Moran, John, Blackpool, Lancs.
Naim, Edward, London
Posso, Louis R., Gibraltar
Pratt, David, Bradford, Yorks.
Riuttala, Alexander N.,
Islington, Ont., Canada
Ross, Ivan A.,
Teddington, Middlesex
Smith, Joseph W.,
Port Credit, Ont., Canada
Smith, Thomas A.,
Scarborough, Yorks.

Varley, Michael, Burnley, Lancs.

White, James G.,
Rockville, Md., U.S.A.
Wilson, Anthony A., Oxford, Oxon.

EXAMINATIONS IN GEMMOLOGY 1971

The dates for the 1971 examinations are as follows:

Preliminary	Theory	Tuesday, 15th June.
Diploma	Theory	Wednesday, 16th June.
	Practical	Thursday, 17th June or Friday, 18th June (London). Other centres as arranged.

The final date for entry is the 1st March.

GEMMOLOGY GROUP

Any Fellows in the Manchester and North Cheshire areas who may be interested in forming a local gemmological group are invited to contact Mr. J. P. Connolly, 58 Ullswater Road, Congleton, Cheshire.

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