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OF GREAT BRITAIN

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Gemmological Notes

Simple Method of Differentiating between Natural Blue Diamonds and Diamonds coloured blue artificially

J. F. H. Custers, H. B. Dyer and F. A. Raal

To-day diamonds can be coloured a distinct blue artificially by appropriate bombardment with electrons or gamma-rays of an energy of about 1 MeV.

This artificial colouration, which is offered as a facility in the United Kingdom and the U.S.A., has come to worry the ethical jeweller in that a diamond of somewhat inferior quality could be irradiated and sold by unscrupulous elements as a natural blue stone which, in comparison, is highly priced and sought after. An expert, after a lot of practice, might be able to discriminate between such diamonds, but he could not be absolutely sure just from visual inspection.

The ensuing method, which is an adaptation of one by Custers and Dyer[1], provides a simple and inexpensive way of ascertaining unambiguously whether a diamond is coloured blue naturally or artificially. The method, besides being quick, also has the advantage that a brilliant does not have to be demounted, but could be tested *in situ* in a ring.

The basis of the method[2] is that all natural blue diamonds are semi-conductors of electricity, i.e. they pass an electric current, however small, on the application of a voltage across them, whereas

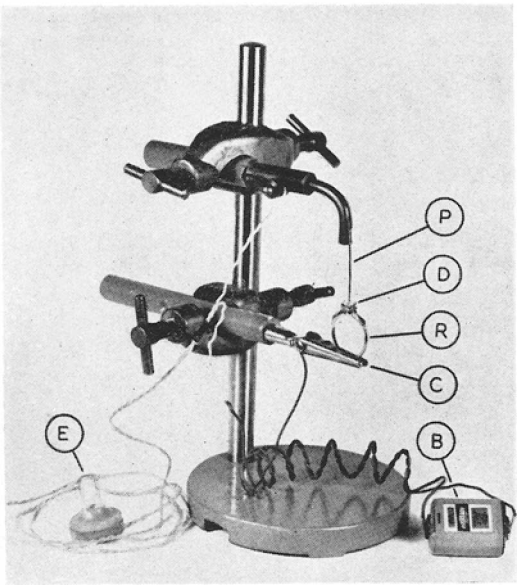

FIG. 1. *Simple Apparatus for testing whether a diamond is coloured blue naturally or artificially.*
E—earphone;
B—30 volt dry battery;
C—clip; R—ring;
D—diamond brilliant and P—insulated metal probe.

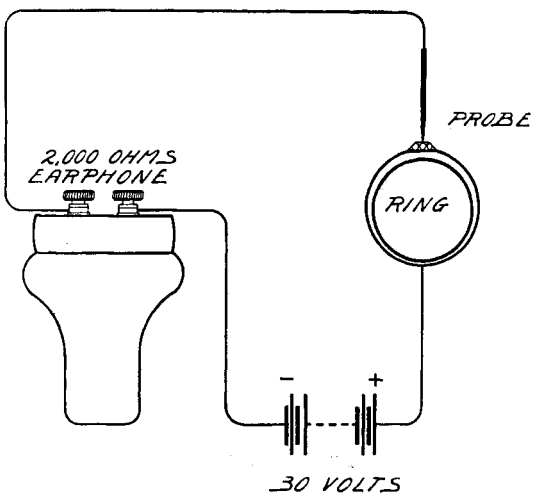

FIG. 2. *Schematic circuit diagram of the apparatus in Fig.* 1.

all other diamonds to our knowledge, are insulators and do not carry an electric current.

Earphones are very sensitive to the passage of minute electric currents as witnessed by their constant use in electrical conductivity experiments. Good earphones, of which there are many miniature versions on the market, and a power supply are, therefore, virtually all that are needed for the test.

Fig. 1 shows a diamond subjected to test and Fig. 2 depicts the electrical circuit of the set-up.

It is found that a 30-volt hearing-aid dry battery serves well as a power source, and that it is advisable to have a sharp-pointed probe to make contact with the table of the brilliant. In order to get maximum response from the earphone it is best to choose one having more or less the same electrical resistance as a natural blue diamond. The electrical resistance of these diamonds varies considerably from specimen to specimen and is, of course, also dependent on the size of the stone. However, a value of about 2,000 ohms is average and an earphone with this resistance has proved most satisfactory.

The procedure of testing is as follows.

The ring R, of which the brilliant has to be tested, is held in position by the clip C such that the probe P just touches the surface of the diamond D. On listening with the earphones E and moving the probe P around a bit on the surface of the diamond D a scratchy noise is heard when the diamond is a natural blue one. The noise heard can be likened to that of the " atmospherics " experienced with older radio sets. If the diamond is an artificially blue one no sound whatsoever will be detected.

Care should be taken for the probe not to come in contact with the metal of the ring as the electrical circuit would then be closed and could lead to erroneous interpretation.

Also, due to the nature of the semi-conductivity of natural blue diamonds, it is essential that the probe be connected to the negative pole of the dry battery as shown in Fig. 2.

A considerable number of natural blue and other diamonds have been tested in this way, and without fail one could discriminate between them.

REFERENCES

(1) Custers, J. F. H., and Dyer, H. B. *Gems & Gemology*, Vol. VIII, No. 2, 35, 1954.
(2) Custers, J. F. H. *Physica*, **18**, 489, 1952.

CUTTING A KUNZITE

NEVILLE DEANE.

Kunzite is a very beautiful gem-quality spodumene of an attractive lilac colour, varying from pale to much richer shades, and also tints more inclined to the blue side of lilac. That is, the stones are beautiful when they are cut, but unfortunately many of them fall by the wayside.

Kunzite is very dichroic. The crystals are usually thin, flat tabular pieces, and the best colour is obtained when the table facet is cut across the thin section. This limits the size of the stone very much, and usually Kunzites are cut with rather greater depth than most other stones, for this and other reasons.

The material is very cleavable, and is liable to cleave, when worked with abrasives having a " wedging " action, very much like a " book " of mica. If this does happen the stone is either completely spoiled, or becomes even thinner. Sawing a crystal is done with a very smooth diamond saw and more or less with hopes that no cleavages will develop. Unfortunately they quite often do and once started are liable to go further and further down the stone.

Madagascar kunzites seem to be particularly awkward, those from California less so, and the attractive green spodumenes from Brazil (not true hiddenites) are rather more accommodating.

Having sawn the crystal into suitable pieces for cutting stones, the best thing to do with them is to put them away for a day or so. It is not at all uncommon to leave apparently sound pieces over night only to find some of them showing cleavages in the morning so the best plan is to leave the pieces and not waste any more work.

In the ordinary way, the next job is to grind flat that surface which will be the table facet, on a lap. This is a tricky job, because the cleavages can start round the edges and extend right down the stone, so the only way is to play safe and use a very small grit and a soft lap, the safest being 600 grit on a lead lap. This is a job for patience, and quite often the surface becomes flat but has more or less an " etched " appearance. This does not matter as polishing will take care of that.

Next comes grinding roughly to shape, that is, shaping up the pavilion. The best advice in this connexion is not to attempt grinding at all. There may be a grinding wheel which is safe, but the writer has not found one yet, and kunzites are rather too expensive with which to do much experimenting. The green

spodumene from Brazil may sometimes, with the utmost caution and smooth even-running wheel, be trimmed up a little.

But the best way is to mount the stone on the dop stick, and using 600 grit and water, slowly wear the stone down to shape. Whilst a lead lap is safest, a harder lap can be used with care. The writer has used a steel lap with success, and found it preferable to use a harder lap with the fine 600 grit, than to use the lead lap with a coarser grit such as 320. The latter has caused trouble, particularly when the grinding of the stone gets down to size. Working seems a bit easier if done first on one side of the stone, then on the opposite, and then on the other two sides, then going back to the first side and so on, but nothing so far tried can really reduce the time taken and ensure safety to the stone.

Polishing is fairly easy. Of course the polishing powder—in this case ruby powder—is extremely fine, so there is not much risk of cleavage, and it is really quite a treat to see a dull and sometimes rather etched facet take on a brilliantly polished appearance. On one or two facets it may be necessary to finish off the polishing dry, instead of wet, but compared with the cutting of the facets, polishing is relatively easy.

At this stage, and quite often only at this stage, is it possible to see into the stone, and it is surprising how in many cases, an apparently clear crystal will show a few long straight crystal or tube-like inclusions. However only a few stones have no inclusions at all and the brightness of the finished stone hides small inclusions quite effectively. Undopping and cleaning present no particular difficulty and if all has gone well the result is an extremely attractive and unusual stone.

REGENCY TABLE (Period 1810–1820)

G. A. White.

During a recent geological field excursion to Derbyshire I had occasion to call at the offices of Derbyshire Stone Ltd., Bank House, Matlock, and there I saw a Regency Table which is a superb example of Derbyshire minerals.

This lovely table was for many years in the home of a Scottish nobleman. The wood, is principally Burr Elm, which is supported on a pillar of Egyptian porphyry.

The top consists of 124 polished sections, each 1½ inches square, of Blue John, Derbyshire spar, Hopton wood marbles, Fossil

marbles, Galena and non-ferrous minerals, the whole contained within Greek White Statuary inserts and surrounded by a polished frame of Ashford Black Marble which is etched to show Bacchus, grapes and vines.

A casual caller at the Derbyshire Stone Ltd. offices could not fail to be attracted by this colourful table but a geologist or gemmologist would find this a most fascinating exhibit.

THE STRANGE CASE OF W. J. LEWIS ABBOTT A. STORES

It is one of the inexplicable quirks of the literary world that the career of a solid, dull, Erastian, middle-of-the-road Bishop is more likely to be crowned by a definitive two-decker biography than is that of someone whose passage through life has followed a less predictable but more interesting orbit.

I was not therefore surprised to find how lamentably inadequate was the documentation of W. J. Lewis Abbott. This was the man who initiated the first classes in gemmology, yet his death went unrecorded in the gemmological journal of that time, and one gets the impression that no gemmologist has given him a thought ever since.

Outside gemmological circles, one meets with occasional references to Abbott as an archaeologist and geologist, references mostly of an unenthusiastic or even pejorative sort. The trouble is that so little data survive that it is difficult to attempt a balanced judgement on Abbott as a gemmologist, although he is better documented as an archaeologist. All that seems to be recalled about him is that he was a peppery, self-opinionated little man with eccentric notions on how to stock a retail jeweller's establishment, which may be true, but I am confident that there was more to Abbott than this unattractive façade and I feel that a reappraisal of the man is long overdue.

Personal facts are certainly scarce about Abbott. He was born in the eighteen-fifties and apparently worked at the bench at Benson's as a young man. He was a member of a group of amateur geologists and archaeologists which centred round Benjamin Harrison, the archaeologist-grocer of Ightham, near Sevenoaks, and showed an early interest in worked flints, especially in the Wealden area; an early paper, published in the 'eighties dealt

with the coliths found in the Forest-Beds of Cromer in association with *Elephas meridionalis*, but most of his later published work relates to Sussex and Kent. In order to be near his archaeological " digs," he left Benson's and set up shop as a jeweller first in Sevenoaks and later in St. Leonards. He instituted classes in gemmology at the Polytechnic in Regent Street and lectured there during the 1900s, although unfortunately the Poly archives can provide nothing about this most interesting phase of his career. At his St. Leonard's shop gemstones jostled incongruously with worked flints, bones and so forth and, not surprisingly, his business suffered and friends had from time to time to come to his aid financially. The exciting days of the Piltdown Skull affair saw Abbott much in evidence, and he was accustomed to let it be thought that Dawson's " discovery " resulted largely from his suggestion and encouragement.

He died at St. Leonards in 1933 at the age of eighty.

Abbott's papers on archaeology are numerous and wide-ranging. H. G. Wells in his " Outline of History " (1920) paid tribute to his work on flint implements and, in an appreciation of his work published in *Nature* shortly after Abbott's death, it was stated that he " must always be held in esteem by archaeologists as a pioneer and substantial contributor by a long series of discoveries to the advancement of archaeological studies in Britain."

J. S. Weiner in " The Piltdown Forgery " (1955) delivers a distinctly less favourable judgement, quoting instances where Abbott's findings do not to-day find ready acceptance, and where some of his excavations are now regarded as not wholly satisfactory.

The changing climate of archaeological opinion, and the more exacting techniques of excavation are hazards which beset all archaeologists, and as they have occulted the reputations of Pitt-Rivers and Colt-Hoare, they will similarly dim those of our pollen-analysis and radio-carbon contemporaries in the process of time. This being so, Weiner's verdict seems an ungenerous one, glossing over Abbott's very positive achievements such as that which earned him the Lyell Award of the Geological Society, his discovery of a cache of vertebrate remains in the Shode Fissures near Ightham.

In contrast to the many papers by Abbott on geology and archaeology, published locally and in the journals of learned societies, and which are preserved in the libraries of the geological

and science museums, only one item of gemmological interest seems to have achieved publication, a rare little pamphlet called "Gemmographical Tables," of which a photostat was obtained for me through the good offices of Miss F. M. Vaughan, who ran a copy to earth in the library of the Natural History Museum. It is undated, but evidence suggests 1896 or thereabouts. It consists of " Tables of Specific Gravities, Hardness, Crystalline Forms, Cleavage, etc., Illustrations and Descriptions of Crystalline Forms of Gems, Names and Colors of Two Hundred Varieties, Twin Colors of Gems as seen in the Dichroscope. (Arranged in Tables to be removed and framed for constant reference where desired). By W. J. Lewis Abbott, F.G.S., etc., Lecturer on Gemmology at the Polytechnic Institute, Regent Street, W."

Many of us will recall having seen similar tables many years ago " framed for reference " in the grubby outer offices of Hatton Garden wholesalers, bearing the names of stone-dealers such as Claremonts, which may have been overprinted issues of Abbott's compilation.

A series of tables is necessarily impersonal in character, but nevertheless throws some light both on Abbott and on the state of gemmological knowledge half a century ago. The absence of any reference to refractive indices points to its compilation at a date before the marketing of Dr. Herbert Smith's handy little instrument and, although the present writer notes with approval that Abbott evidently set great store by the dichroscope, the exhaustive listing of the twin colours of (for instance) fourteen shades of colour in both ruby and sapphire seems excessive, whilst some of his findings seem gravely open to question, e.g. peridot (twin colours cited as brown-yellow and pea-green) and aquamarine (light sea-green and straw yellow). A typical Abbott touch is provided in the note on dichroic gems. " Daylight is best, but an opal covered light will answer, allowance being made for the Phenomenon of Noctichroism "—an example of his zeal for the creation of neologisms (Plateauliths, Mezzoliths, the technique of Lithoclasiology, etc.; —of these inventions, only Gemmology seems to have taken root.)

Of a monochroic gem he somewhat mystifyingly writes that it " presents a far lighter and clearer field and usually shows decomposition in one of the squares."

His list of 200 varieties is a fake, since if all the now obselete variant names and the minerals which cannot be accepted as

gemstones are thrown out, the number reduces to quite modest proportions.

My quest for Abbott has had much less success than that of Symons for that equally puzzling oddity, Baron Corvo, or (to vary the literary simile) after much Hunting for the Snark I still cannot determine whether or not he was a Boojum. Does he (after all) merit his present deflated reputation ? Not, I think, on his work on the Wealden Pleistocene, but Abbott as a gemmologist is still problematic. If only one knew a bit more about those classes at the Regent Street Polytechnic ! Was he (one wonders) a free agent or subservient to the control of some other department ? Did he lecture, or demonstrate, or set practical work, and, if so, with what equipment ? Was he, as Weiner surprisingly states " inspiring " ? (one would not have guessed it). Did he ever look over the wall (so to speak), and, straying from his syllabus, evince any awareness of matters outside his special interests ?

All such questions must necessarily remain unanswered, unless, by good fortune, there are any JOURNAL OF GEMMOLOGY readers who " sat under " Abbott in those days and can satisfy our curiosity.

" INMITES " IN MICA

E. H. RUTLAND

It is always pleasant to browse among minerals with a microscope. Even the dullest-looking stones can reveal breath-taking beauty of design, form and colour under the right lighting and magnification. One always finds out something new and is led on to further comparisons. When I sit down to have a good look at new specimens I am always prepared for surprises, even from familiar species. I was not prepared for this one :—

At the end of a viewing session I picked up a somewhat cloudy slab of muscovite mica that had come to me with a collection of minerals some ten years ago and which I had used for various jobs about the house. I wondered what caused the cloudiness. There were the usual fibrous inclusions of asbestos and also some curious articulated fibres which I had not seen before. But almost the first thing that came into the field of view, right in the middle of the slab, and about $1\frac{1}{2}$ inches from the nearest edge, was an unmistakable insect ! There was no obvious means of entry, no obvious air space and no sign of strain in the mica. The insect was flattened

but preserved a trace of 3-dimensionality sufficient to necessitate focusing with the fine adjustment on different layers at 30 × enlargement. Further search revealed several more insects and parts of insects in this and another sheet of mica. Their size ranged from 1mm to 0.2mm.

Drs Evans and Speyer at the Natural History Museum kindly identified the insects as mites (Cheyletus) and thrips (Limothrips) of British species but also widely distributed round the world. They thought it likely that they crawled between the layers during storage in Britain. Clearly the mica must then have been agape, closing up again subsequently. Some of the edges of the slabs still show an earthy deposit. Apparently insects are sometimes found preserved in shale in the same way. What causes these spiders and insects to behave in such a flagrantly non-claustrophobic manner is difficult to guess at. However, these "inclusions" appear to be quite recent and not in the least comparable with the venerable flies in amber, which may be up to 50 million years old.

BOOK REVIEW

QUICK, LELAND and LEIPER, HUGH, F.G.A. *Gemcraft.* Chilton Co., Philadelphia, 181 pp., $7.50, and Pitman, London, 242 pp. 42s. 1960.

Copiously illustrated with step-by-step photographs, this book is a further addition to the excellent works on gem cutting that have been published in N. America in recent years. The book covers the equipment needed and describes how to saw, grind, sand, lap and polish many types of gemstones. The sculpturing of gemstones and mosaic and intarsia work are also described. There is a description of the properties and physical characteristics of gems and their imitations, though the book keeps away from gemmology as far as possible and limits itself in sensible and concisely expressed language to the creating of gem materials into gems and other useful objects. The bibliography is very helpful and lists works not only about gem cutting but on jewellery making, minerals and gemmology.

S.P.

HEALING FISSURES IN PERIDOT

By W. F. EPPLER

AMONG the inclusions which are typical for this lovely gemstone with three names (olivine, peridot, chrysolite), E. J. Gübelin* describes a particular feature as:

" An inclusion characteristic always of chrysolite consisting of a rounded but flat concentration of irregular cavities with a small brown to black inclusion in the center."

By testing a good coloured cabochon of medium size, the cavities were revealed as rounded to oval-shaped cleavage cracks parallel to the main cleavage plane (010) of the host peridot, as is demonstrated in Figs. 1 and 2. The cause of origin of the peculiar cleavages was found to be a dark primary crystal inclusion which has been already mentioned by Gübelin. In Fig. 2, the dark crystal is situated near the right border of the crack. In most cases, the cleavage crack started to heal after its origin, producing a charming and at the same time a typical pattern, as shown in Fig. 3. Here, the dark primary (heterogeneous) crystal inclusion centres an oval-shaped healing crack. Just below it is situated a small system of a similar healing fissure, the crystal inclusion of which is a little off

* E. J. Gubelin, Inclusions as a Means of Gemstone Identification, Gemological Institute of America, Los Angeles, 1953

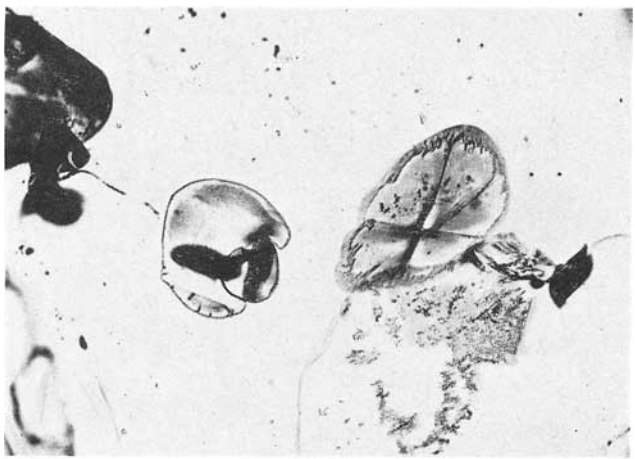

FIG. 1. *Healing fissures of typical shape parallel to the prism plane of a peridot.* 22×.

centre. By chance it was found that the primary crystal inclusion, which caused the origin of the disklike cracks, is a very dark red garnet. According to its colour, it belongs to the almandine series.

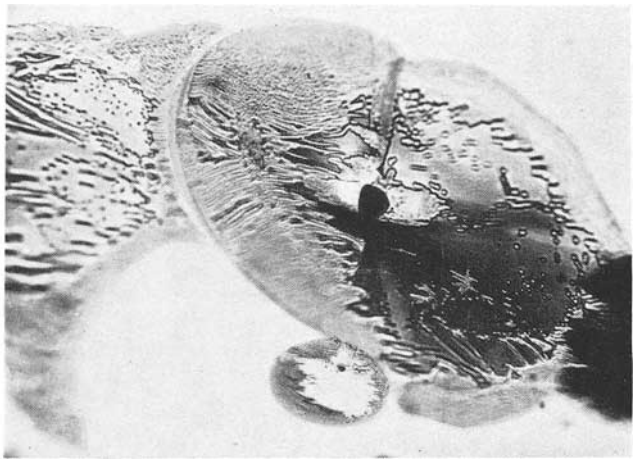

FIG. 2. *Cleavage crack in a peridot. Part of Fig. 1.* 65×.

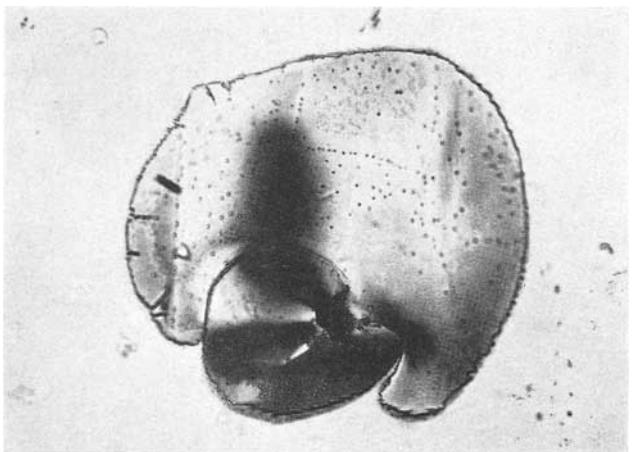

FIG. 3. *Typical healing fissure with a very dark almandine garnet in its centre. The system is parallel with the main cleavage plane (010) of the including peridot.* 22×.

HOW RARE ARE CHATOYANTS AND ASTERIAS ?

By NIGEL W. KENNEDY

THE very detailed article describing an unusual star-beryl recently examined by W. F. Eppler, which appeared in the issue of the Journal for January, 1960,[1] attracted my interest and attention, and has encouraged me to write some observations on the subject of chatoyancy and asterism in minerals, and on rarity of gems.

I have never posed as an authority upon this subject or any other in the field of gemmology, and the fact that I am not in the gem trade rather limits the number of specimens that pass through my hands. My ever-increasing collections of both minerals and cut stones, and my intense interest in other collections, private and public, have brought to my notice many unusual minerals including a wide range of chatoyants and asterias, a further acquaintance with which has convinced me that there is ample room and an urgent need, for an exhaustive work on the occurrence and characteristics of cat's-eyes and star-stones.

Some of the most enlightening articles in recent gemmological literature include a general survey of these phenomena by Alice S. Tait,[2] and two contributions by W. F. Eppler,[3, 4] and sundry odd references during the past ten years or so, yet to the seeker after useful information they are rather like the crumbs from the rich man's table.

What strikes me most forcibly is the use of the prefix " rare " in Eppler's observations on asterism, if not so much in reference to chatoyancy, and I am left with the impression that he believes both phenomena to be much less common than is, in fact, the case.

My interest in asterias was first awakened by the sight of two lovely examples on view at an early gemmological exhibition at Goldsmiths' Hall. Two superb gems, a star-sapphire and star-ruby of 8 or 10 carat each, and exhibiting perfect asterism, colour and translucency—two of the finest star gems ever to be allowed out of India.

Since that occasion, through the interest of so many friends, I have made acquaintance with many beautiful minerals that display chatoyancy or asterism, sometimes both, and my present gem collection includes some fifty cat's-eyes and about fifteen asterias.

In my experience these delightful optical effects are to be found to a greater or lesser extent in most gem minerals, although the phenomena may be of rare occurrence in a few species, and I know of only a few minerals (topaz, for example) in which I have so far never heard of their occurrence.

It seems to me that the average gem collector, or student of gemmology, lacks enthusiasm for the little-known chatoyants and asterias, probably because most gemmologists are in, or connected with, the jewellery trade, and liable to be biassed in favour of the few " trade stones " which consist of the better-known stones in popular favour. There are, in fact, too many jewellers who could not care less if no other species existed.

The lack of interest on the part of other and more broad-minded gemmologists may be accounted for if, as appears very probable, they interpret the terms " chatoyants and asterias " to refer to a very limited number of gems, namely chrysoberyl and quartz cat's-eyes, and tiger's-eye; and star-sapphire and ruby, with possibly star-garnet, which are all commonly known.

Another explanation for apparent lack of interest in the subject may be that the usual text-books are at fault (as in other instances I can recollect), in that they give the student quite an incorrect impression that these fascinating optical objects are very much rarer than they would actually appear to be.

I remember an anecdote that I attribute to a gemmologist it was never my good fortune to meet—Louis Kornitzer—but whose memoirs provide much profitable and amusing reading. He relates that on one occasion a friend said he had never seen a star-garnet. Kornitzer asked him if he had a stock of almandines at hand, and in due course they went through a selection by the light of a candle, and in a short time had easily found quite a number whose existence had not even been suspected by their owner.

The text-books tell the student that gemstones are rare because minerals of gem quality are only produced in nature's

laboratory if impurities and external influences can be avoided, otherwise impure minerals are formed which have no gem value. Two familiar examples are corundum and emerald, which as minerals are relatively common in a grade suitable for industrial purposes, usually as abrasives, but are impure and opaque, and useless as gems. In general, gem quality in a species is usually found rarely and only in certain areas.

In the case of chatoyants and asterias, perfect clarity is not usually essential, and some chatoyants may be quite opaque without loss of beauty, for example, crocidolite or sillimanite cat's-eye. Asterias are usually translucent and sometimes only faintly so but both effects are, after all, due to the presence of inclusions of various types, which, however, must be arranged in parallel bundles, or layers, or lines, orientated with perfect relation to crystallographic development of the host mineral.

In many instances such materials may be so commonly found as characteristic inclusions that they are of diagnostic importance, and if this simple fact is admitted (and I do no think anyone would deny it) then it must be clear that in species in which this is the rule, the possibility of such optical phenomena may be far from rare. My limited experience indicates that this is so.

Now to return to the original object of my observations, namely the able article by Professor Eppler. My comments are made merely as an attempt to unravel the skeins of what appears to be a well-established gemmological mystery. From the outset, I had the impression that the large star-beryl, was of special interest for several reasons: (*a*) because it was an asteria; (*b*) because in addition it was a star of the beryl species, which he evidently regards as rarer than most other asterias; and lastly (*c*) because the inclusions responsible for the asterism were not what one would have anticipated.

For reasons that follow I cannot understand either (*a*) or (*b*) but (*c*) is, of course, a very different matter, and Eppler's article is proof of the intensive nature of the research undertaken.

So far as I can see, asterism and chatoyancy in the beryl species is no novelty, but stones of large size may of course be rare. When the magnificent mineral and gem collection made by the celebrated mineralogist, the late Colonel de Vesignié, was split up on

his decease, and part brought for disposal to this country, I was fortunate to have an opportunity to acquire many rare gems I had never expected to possess, although I did find that some were incorrectly labelled. Among others was a star-aquamarine of 26 carats, dark blue, transparent and displaying an irregular 6-ray star. It was badly formed and will require re-cutting and centring, but is a fine stone.

Church includes one star-emerald in his catalogue of the Townshend Collection:[5] " Emerald. With six-rayed black star, sub-globular, with face and back centrally flattened, circular, ½-inch diameter, plain swing mount. (Hope catalogue, p. 46, No. 9), Plate II, fig. 24." The illustration is actually of a horrible looking object, but I assume the original is more impressive. So far I have never been able to locate the Townshend Collection in South Kensington and it is likely that the illumination will not be suitable for chatoyants and asterias.

I should imagine that star-emeralds *are* rare, and I have never seen one. I should add that I have no idea what is meant by the description " 6-rayed *black* star ".

Some years ago I acquired an aquamarine cat's-eye, of deep colour (blue), an oval three-quarters of an inch in length, with the eye lengthwise, and a lighter aquamarine 4-ray asteria five-eighths of an inch in diameter, with a definite but easily discerned star. Some time ago I received a half-inch diameter morganite (pink beryl) cat's-eye, cut from a piece of rough from Brazil. I also have a small milky-white cat's-eye beryl of unknown origin.

Until comparatively recently I had never heard of black star-beryl, but I understand that it is found in Brazil (?) and is sometimes offered for sale in mineralogical literature of the U.S.A.; and I have before me as I write an advertisement from a recent journal which includes the following gem items:—

" Black star and rose quartz in the rough,

Golden beryl cat's-eye and tiger-eye in the rough,

Morganite cat's-eye and aquamarine cat's-eye in the rough and the following polished cabochons:—

Star-moonstone—cat's-eye tourmaline and cat's-eye scapolite."

These items are not priced in the advertisement, but I have another which offers rough black star-beryl at 80c. per gramme. Incidentally, it is not clear to me whether the term " black star-beryl " indicates a black beryl asteria, or a black star in a beryl, similar to that described by Church in relation to the star-emerald he mentions.

This is something on which I should like to have further information.

It is clear to me that there must be a large amount of unpublished data in relation to this subject, particularly in the beryl species. It seems fairly certain that many chatoyants and asterias are known to occur in America, particularly North America. I have not read *Gem Collection of the American Museum of Natural History*,[6] nor have I read George F. Kunz's monograph on Gem Minerals of North America, now out of print.[7] I am hoping shortly to study John Sinkankas's recent work on the same subject[8] and feel sure that he will give much data in relation to asterism and chatoyancy, and having read so many of his recent articles on gem minerals[9] I am looking forward with great anticipation to reading his latest interesting contribution to gemmological literature.

With reference to other interesting examples of chatoyancy and asterism cited by W. F. Eppler in his valuable contributions on the subject (*Journ. Gemmology*, January,[3] and April,[4] 1958) I agree that star-spinels are very rare. I recollect having examined only one, some years ago, and one was described[10] in 1954.

Chatoyant zircon also appears to be rare, and the only specimens I have are grey stones which are faceted in a clumsy native manner, an extraordinary thing to do. I do not think that chatoyancy is rare in tourmalines, nor asterism in almandine and rose-quartz, but it seems odd that I have not seen any reference to a rose-quartz cat's-eye, nor asterism in tourmaline, optical effects governed by crystallographic development and the type of inclusion enclosed.

Although chrysoberyl cat's-eye is regarded as the most popular species (largely because the jeweller is not familiar with most other varieties), yellow scapolite cat's-eye appears to enjoy a deserved popularity when obtainable. I had not previously heard of the grey variety mentioned by Eppler.[10]

It is possible that some observations on the specimens forming my own collection of chatoyants and asterias might be of interest to fellow gemmologists and collectors and with this object in view I propose to resume the subject on a later occasion.

On further reference to available literature I found after writing the above observations, that I had overlooked a micro-photograph illustration to Eppler's contribution in the *Journal of Gemmology*, April, 1958, which shows a distinct 6-ray star in a spinel, consisting of dark inclusions forming the star, presumed to be caused by strain round an unidentified crystal.

Something of this nature might explain the black star-emerald mentioned by Church. I have also noticed, on again reading Sinkankas's article in *Gems and Gemology* (Fall, 1955), that he referred to a black star-beryl from Brazil as follows:—" . . . A most unusual beryl . . . which yielded star-stones when cut . . . like Australian star-sapphires, possessing the same dark-brown body colour and bronzy luster . . . " He found that asterism was due to abundant inclusions producing colour that varied from deep blue by transmitted light to bronzy black by reflected light. He hoped that more of this interesting mineral would become available, and since then his hope appears to have been realized.

REFERENCES

1. W. F. Eppler. *An unusual star-beryl*, Journ. Gemmology, January, 1960.
2. Alice Sumner Tait. *Asterism in corundum*, Journ. Gemmology, April, 1955.
3. W. F. Eppler. *Notes on asterism in corundum, rose-quartz and almandine garnet, and chatoyancy in beryl*, Journ. Gemmology, January, 1958.
4. W. F. Eppler. *Notes on asterism in spinel, and chatoyancy in chrysoberyl, quartz, tourmaline, zircon and scapolite*, Journ. Gemmology, April, 1958.
5. A. H. Church. *Precious Stones—Catalogue of gems in the Townshend Collection at South Kensington*, 1883.
6. F. Pough. *Gem Collection of the American Museum of Natural History, New York City*, Gems and Gemology, Fall, 1953.
7. George F. Kunz. *Gems and precious stones of North America*, 1890.
8. John Sinkankas. *Gemstones of North America*, 1959.
9. John Sinkankas. *Some freaks and rarities among gemstones* (2 parts), Gems and Gemology, Fall, 1955, and Winter, 1955/56.
10. R. Keith Mitchell. *Some notes on unusual gems*, Journ. Gemmology, January, 1954.

Gemmological Abstracts

HOLMES (R. J.) and CROWNINGSHIELD (G. R.). *A new emerald substitute.* Gems and Gemology, No. 1, Vol. X, pp. 11-22. Spring, 1960.

Fully reports the production by Johann Lechleitner in the Austrian Tyrol of a new type of synthetic emerald to which the name *Emerita* has been suggested. The details of the method used in the production have not been revealed. It is suggested that it is by hydro-thermal or by flux-fusion process. The seed used for the product is a faceted single-crystal piece of colourless or faintly coloured beryl. These shaped stones are approximately the size of the finished product and the synthetic emerald is deposited in crystallographic continuity on this faceted beryl. When the overgrowth is of sufficient thickness a stone, which only needs the facets to be polished, and is of good colour, is produced. The short time needed to produce a satisfactory overgrowth will influence the price of the stones which, presumably, will be cheaper than the Chatham synthetic emerald. The Authors had available a number of specimens, both rough and cut, of these synthetic stones for examination and they carried out a comprehensive and accurate study of them. They found the density to vary from 2·649 to 2·707 (average 2·684) and these values are compared with those for the Chatham synthetic emerald and of natural emeralds from various localities. The hardness, tenacity and fracture were found to be similar to the natural and earlier synthetic emeralds. The depth of colour depends upon the thickness of the overgrowth. The indices of refraction are higher than for other synthetics and were found to be 1·575-1·581 (the average of three determinations). The transparency was seen to be greater than most natural or synthetic emeralds and the absorption spectrum was that usual for emerald. The fluorescence under long-wave ultra-violet light is a visible reddish but less intense than that observed in the American synthetic emeralds. The surface markings seen in the rough stones are discussed. The internal structures were observed to be numerous parallel and sub-parallel short straight lines which are apparently minute parallel internal fractures in the synthetic overgrowth and may be attributed

to relief of strain. This defect is more pronounced in the ealier production and is expected to be less, or to be overcome, in later manufactures. X-ray powder diffraction patterns, both on the seed and the synthetic overgrowth, on Chatham synthetic and on natural emeralds, established the identity in structure. This important article concludes with a summary of properties.

7 illus. R.W.

CRIBB (H. G. S.). *Opal deposits and the Hayricks opal mine.* The Australian Gemmologist, No. 11, Vol. 2, pp. 7-16. May, 1960. (*Extracted from the Queensland Mining Journal of February, 1948*).

An introduction is given to the opal mining industry in Queensland. The opal deposits are some 250 miles in width and some 550 miles long in Western Queensland. The geology of the area and the occurrence of opal are covered in the survey. Particular information is given of the Hayricks opal mine, which lies near Quilpie. The various types and formations of opal are referred to. The mining methods and the production, and future prospects are discussed. An important article.

1 illus. R.W.

BENSON (L. B.). *Highlights of the Gem Trade Lab. in Los Angeles.* Gems and Gemology, No. 1, Vol. X, pp. 3-6 and 30. Spring, 1960.

Reports of a cabochon-cut star peridot with a 4-rayed star and an unusual synthetic sapphire in which a mass of gas bubbles were concentrated in the pavilion of the stone and the table of the stone had an etched or fused appearance, and there were twinning lines and distinct needle-like inclusions to be seen in this stone.

4 illus. R.W.

CROWNINGSHIELD (G. R.). *Highlights at the Gem Trade Lab. in New York.* Gems and Gemology, No. 1, Vol. X, pp. 7-10 and 31. Spring, 1960.

Refers to the danger of using anything but a black background to the stone when examining it for fluorescence effects under ultra-violet light. Discusses the second largest diamond found in the State of Arkansas in the past twenty years. This crystal weighs 6·43 carats and has a " Cape " colour. Reference is made to a

large cabochon sapphire in which was an included crystal of blue spinel. The Hope blue diamond was examined for electro-conductivity and was found to be electro-conductive. A number of unusual gemstones tested in the laboratory are mentioned.

5 illus. R.W.

GARTRELL (B.). *Sapphire mining in Australia.* The Gemmologist, No. 347, Vol. XXIX, pp. 103-108. June, 1960. (*Reprinted from The Australian Amateur Mineralogist.*)

A description of the Anakie sapphire fields of Central Queensland. Ruby Vale, Sapphire and The Willows are the mining towns. The flora and fauna, and the living conditions of the area are mentioned. The type of deposit and the associated minerals are referred to, and the methods of mining discussed. Famous sapphires found in the locality are mentioned.

3 illus. R.W.

BRUTON (E. M.). *Diamond mining in Guinea.* The Gemmologist, No. 348, Vol. XXIX, pp. 121-131. July, 1960.

Describes a visit paid by the author to the diamond fields of the newly formed Republic of Guinea, West Africa. The mines have been worked since 1936 and diamonds form 5% of the total exports of the Republic (in value). The diamond mines are in the forest area of Haute Guinée. The town of Kankan is the centre of the buyers' mart, where the sellers expect to be offered a price and not as normally price their stones. The weights are approximate. The mine visited was that of the Soguinex Co. There is also a French mining company and a native co-operative organization, and the history of this latter venture is fascinatingly told. The mine visited was at Banankoro and here the diamonds are found in the " pay gravel ", a yard thick. This is a whitish sand and is overlain by twenty feet of brick-red sandstone. Below the diamondiferous layer is the bed-rock of granite. The methods used in the mining of the diamonds are explained. Something of the French company and the native co-operative organization is told, and also notes are given on the living conditions in the area.

5 illus. R.W.

ANON. *Stone of the sun.* Gemmologist, No. 349, Vol. XXIX, pp. 157-159. August, 1960.

Discusses the greenish-yellow variety of beryl called *heliodor* which is found in the form of large crystals at Ameib, Rossing and Jackalswater some twenty miles north of Steinkopf in Namaqualand in south-west Africa. First found at Rossing mountain in 1912, there was a second discovery in 1925 and a third in 1938. The crystals are said to be radioactive. The article refers to the myth that heliodor came to the earth in a shower of meteorites and gives the reasons which led to this conjecture. The mines are now said to be worked out.

R.W.

WEBSTER (R.). *The many marbles.* Gemmologist, No. 346, Vol. XXIX, pp. 91-97. May, 1960.

A survey of the marbles used for ornamentation. It is a résumé of the author's work first published in this Journal. (*Journ. Gemmology, No. 7, Vol. VI, pp.* 297-333. 1958.)

5 illus. P.B.

WALTER (D. R.). *Kuri Bay.* Australian Gemmologist, No. 6, Vol. 2, p. 15. December, 1959.

Kuri Bay is about 200 miles north of Broome and is the location of the Australian cultured pearl industry, which is controlled by Pearls Pty Ltd., with whom is associated the Nippon Pearl Company of Tokyo.

R.W.

WEBSTER (R.). *Turquoise imitations.* Australian Gemmologist, No. 4, Vol. 2, pp. 5-7. October, 1959.

Discusses the recent advances in the imitation of turquoise and the impregnation of friable American turquoise in order to harden it. The imitations mentioned are stained chalcedony, opacified and coloured glass, " Viennese turquoise," the German product " neolith " and some others. Resin and silica-bonded true turquoise are mentioned and some methods whereby these simulants may be detected are given, except for the silica-bonded type which, up to the time of writing, the writer had not encountered.

P.B.

WEBSTER (R.). *Density determination by spring balance.* Gemmologist, No. 347, Vol. XXIX, pp. 101-102. June, 1960.

Reports some experiments for the determination of density of figurines and other pieces which are too large to be accommodated by the usual chemical balance. Two spring balances were used ; one giving a range of one gram to 100 grams, and the other one gram to 500 grams. The results obtained with the balances and the accuracy found are discussed.

P.B.

WEBSTER (R.). *Spinel suite.* Gemmologist, No. 340, Vol. XXVIII, pp. 206-209. November, 1959.

A general discussion on the gems of the spinel species.

1 illus. P.B.

LEECHMAN (F.). *A matter of names.* Gemmologist, No. 346, Vol. XXIX, pp. 81-83. May, 1960.

Discusses the use of names for the varieties of chalcedony and criticizes the use of certain names for various types of the silica group of gems. A table of the silica family is given but this does not completely agree with the facts.

R.W.

GRANTHAM (D. R.) and ALLEN (J. B.). *Kimberlite in Sierra Leone.* Overseas Geol. & Mineral Resources, 1960, Vol. 8, No. 1, pp. 5-25, 6 pls., 2 figs.

Diamonds occurring in alluvium have been traced to kimberlite dykes near Sefadu, Sierre Leone. A high proportion of the Sierra Leone diamonds is coated but every transition exists between clear and coated stones : the octahedron, with related modifications, is morphologically dominant in both clear and coated types. An abraded or water-worn appearance is common even on stones collected directly from the source kimberlite, and subsequent re-growth with clear diamond is often shown. These features imply a considerable fracturing at depth before crystallization of the diamonds was completed. There are several excellent photographs illustrating the morphology of the diamonds and their surface features.

R.A.H.

ASSOCIATION NOTICES

COUNCIL MEETING

A meeting of the Council of the Association was held at Saint Dunstan's House, Carey Lane, London, E.C.2, on Wednesday, 13th July, 1960. Mr. F. H. Knowles-Brown, who presided, welcomed Mr. C. T. Mason, O.B.E., F.R.I.C., M.A., and Mr. E. Levett to the Council.

The following were elected:—

FELLOWSHIP

Rae, John G., Weisdale, Shetland. D.1934

Rostron, Norman J., Chiswick, W.4. D.1948

ORDINARY MEMBERSHIP

Blyth, Elizabeth R., Nanaimo, Canada.
Edelstein, Albert, Toronto, Canada.
Eschenbacher, Joseph A., Minnesota, U.S.A.
Graham, Dennis, Middlesbrough
Johnstone, John McLeod, Wirral, Cheshire.
Lasagna, Stefano M., Genova, Italy.
Penny, Lional F., Hong Kong.
Rao, A. V. S. G., Gwalior, India.
Rudman, Philip, Royton, Oldham.
Sher, Bernard, Los Angeles, U.S.A.
Taylor, Arnold, Transvaal, S. Africa.
Tooley, Gordon K., Waynesville, U.S.A.
Walter, Dennis R. Woodville West, S. Australia.

PROBATIONARY MEMBERSHIP

Lodge, John W., Newcastle on Tyne.

The Council agreed to invite Mr. G. McWilliam, of the West of Scotland Branch to serve on the Council as a co-opted member.

Messrs. J. R. H. Chisholm, T. H. Bevis-Smith and R. Webster were appointed to review the syllabus of examinations and to make recommendations to the Council.

GIFTS TO THE ASSOCIATION

The Council of the Association is grateful for the following gifts to the Sir James Walton Memorial Library :—

Gemcraft : How to cut and polish gemstones by Leland Quick and Hugh Leiper, F.G.A., from Hugh Leiper, editor of the *Lapidary Journal.*

A collection of rough and cut gems from John R. Fuhrbach, B.Sc., F.G.A., C. G., Amarillo, Texas.

From S. Buzalewicz, Cracow, Poland, a copy of *Einführung in die Kristallographie,* by W. Kleber.

One half of a large garnet crystal from John R. Fuhrbach, B.Sc., F.G.A., of Amarillo, Texas, U.S.A. The crystal was found in Ontario, Canada, and measured 71·6 × 95·4 mm. before being divided.

Three books about Indian jewellery from H. C. Jhaveri, of Bombay, India.

The Ancient Indian methods of testing gems by A. V. G. Rao, from the author.

The Association is indebted to the *Jeweller and Metalworker* for the report of the 1960 annual meeting, which appeared in Vol. VII, No. 7.

TALKS BY MEMBERS

WELL, G. T. : " Diamonds ", Maidstone Rotary Club, 11th March ; Tunbridge Wells Resident's Association, 18th March, 1960.

LAUVLAND, K. : " Jewellery and gemstones ", Norwegian Y.W.C.A., London, 20th April, 1960.

BAGLEE, G. : " Pearls and opals ", South Shields Afternoon Tea Club, 20th July, 1960.

BLYTHE, G. A.: " Gemmology ", Royal College of Nursing, Westcliffe, 12th September, 1960.

EXAMINATIONS IN GEMMOLOGY, 1960

The 1960 examinations attracted a large number of candidates and 185 sat for the preliminary and 110 for the diploma. Centres for the examinations were established in Holland, Switzerland, Kenya, France, Finland, Canada, Ceylon, Poland, West Indies, Southern Rhodesia, Norway, Malta, Australia, India, Germany, South Africa, Hong Kong, New Zealand, Netherlands Antilles and the United States of America, apart from the United Kingdom.

Upon the recommendation of the examiners the Tully Memorial Medal has been awarded to Mr. H. S. Heikkilä of Helsinki, Finland. The Rayner prize has been awarded to Mr. D. Hayes of London.

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

DIPLOMA

Qualified with Distinction

Arend, Robert, Richmond Hill, Canada
Edge, William Seebo, Glenelg, S. Australia
Goward, David Evans, Matlock
Gritzkewitz, Boris, Helsinki
Haigh, David Ernest, Lincoln
Heikkilä, Heikki Sakari, Helsinki
Hinks, Peter John, London
Hyman, Geoffrey Maurice, Blackpool
Orkomies, Lotta, Helsinki
Paronen, Tauno Kalevi, Helsinki
Riley, Philip William Temple, Chester
Rufli, Jean Claude, Idar-Oberstein
Saller, Xaver, Munich

Qualified

Beach, Michael Leonard, Twickenham
Boermans, L., Venlo, Holland
Burwood, James Raymond, Coventry
Chalcroft, Pamela, Edinburgh
Childs, Allan John, Hornchurch
Christophersen, Einar, Sandnes, Norway
Collins, Christine Deanne, Wolverhampton
Elout, Hélène, Wassenaar, Holland
Fisher, Peter Jack, Cookstown, N. Ireland
Hamara, Pauli Richard, Helsinki
Havem, Unni, Oslo, Norway
Hickman, John Thomas, Bristol
Jarvis, John Clifford, Calcutta
Kaskimies, Keijo Lauri Kalervo, Helsinki
Kraus, Pansy D., San Diego, U.S.A.

Qualified

Lee, Kenneth Arthur, London
Masters, Christopher Robin, Blackpool
May, Peter George, Coventry
McMillan, Archibald, Edinburgh
McTurk, George Leslie Cummings, Edinburgh
Mikkola, Toini, Helsinki
Mortimer, Frederick, Loughton
Norman, Michael Stephen John, Bath
Nyman, Yrjö Ilmari, Helsinki
Øiesvold, Arild, Aarnes, Norway
Øiesvold, Odd, Jessheim, Norway
Parker, George Edward, Birmingham
Parsons, Elizabeth Marian, Leicester
Patni, Chandulal Gordhandas, Nairobi, Kenya
Pettersson, Ulf Jarl, Helsinki
Ranta, Olavi, A., Helsinki
Riddell, Eileen Rose, Armagh, N. Ireland
Rowley, Clement John, Stoke-on-Trent
Sarin, Baldev Krishan, London
Scorer, Brian, London
Sharp, Charles Sidney, Toronto, Canada
Springall, John Edward, London
Stoodley, Simon Alan, Eastbourne
Sundgvist, Jalo Aavre Matti, Helsinki
Taylor, Peter Gordon, Hounslow
Turton, George Gerald, Bromsgrove
Waddington, Alfred M., Scarborough, Canada
Walker, George Eustace, Toronto, Canada
Wilding, Peter, Liverpool

Preliminary Qualified

Aarne, Eino Leo, Helsinki
Abdeen, Mohammed Maharoof Zainual, London
Agius, Frank J., Malta
Ainsworth, Kenneth John, Blackburn
Allen, Michael, Ilford
Aminoff, Benjamin David, London
Anderson, Thomas Mark, Epsom
Axon-Ryder, Albert Roy, Bolton
Badrutt, Retor T. P., Geneva
Beasley, Barbara Ann, Windsor
Billington, Ronald Bernard, Cheadle
Bishop, Trevor, London
Blades, Colin, Harrow
Borgen, Per Otto, Sarpsborg, Norway
Brooks, Raymond Eric, Wallasey
Budd, Douglas Harold, Jamaica, W.I.
Burke, Frieda J., Philadelphia, U.S.A.
Butler, William Charles Finlay, Paisley
Buzalewicz, Sobieslaw, Cracow, Poland
Catton, Cedric Trevor, Ipswich
Cole, Kenneth Charles, Salisbury, S. Rhodesia
Cooper, Harry Alan, Mansel Lacy, Hereford
Cooper, William Edgar, Manchester
Cox, Karl Johaan, Ghana, W. Africa
Cozens, Jonathan Roper, Taunton
Crew, Leonard Wilfred, Hong Kong
Deeks, Noel William, Luton
De Silva, Edward Herbert Leslie, Colombo
Devlin, Gilpatrick, London
Dunbar, George, Liverpool
Ellis, John Rodney, Reading
Flower, John C., Cleveland, U.S.A.
Foy, Cyril, Blackpool
Francis, Roger, Birmingham
Friedman, Franklin, Johannesburg
Gray, Eleonora, Paris
Green, Edward William, Toronto, Canada
Green, Leslie, Rainhill, Nr. Liverpool
Greeph, Mayer, Manchester
Gritzkewitz, Boris, Helsinki
Gunaratne, Herbert Stanley, Colombo
Gurp, P. C. van, Netherlands Antilles
Halpern, Carlos Eugénio Júdice, London
Hamera, Vaino Aleksanteri, Helsinki
Harrold, David John, Southend-on-Sea
Hayes, Denis, London
Heasman, David John Alfred, Colchester
Heenan, Gillian Ruth, Wirral
Heidelberger, Martin, Zurich, Switzerland
Henry, Paul Brooks, Scarborough, Canada
Hewson, Robin John, Egham
Hill, Dennis Alan, Glasgow
Hirshon, Gerald Martin, London
Hiscox, Sieglinde Elsa, Solihull
Hodgkinson, John Alan William, Aberdeen
Inglis, Andrew Ian, Edinburgh
Ismail, Omar Mohular, Colombo
Iverson, Anker, Trondheim, Norway
Jochems, Ellen Meta Margaret, Holland

Preliminary Qualified

Jones, David Winzer, Sanderstead
Joseph, Timothy Richard, Knowle
Keiser, Paul J., Detroit, U.S.A.
Ketelaar, J. G., Heemdtede, Holland
Kraus, Pansy D., San Diego, U.S.A.
Maki, Juho Kalervo, Helsinki
McCarty, Fay Veronica, Birmingham
McGoldrick, Bernard, Liverpool
Maunton, Frederick John, Bromley
Morris, Clive Raphael, London
Nilam, Mohamed Abusalam
Mohamed, Colombo
Nuttall, John, Manchester
O'Connell, Sean, London
O'Neill, Marjorie, Henlow
Overvik, Eiliv, Namsos, Norway
Paronen, Tauno Kalevi, Helsinki
Pettersen, Egil Normann,
Fredrikstad, Norway
Piirainen, Veikko Kalevi, Helsinki
Price, Denis Edward, Smethwick
Proctor, Hugh C.,
Don Mills, Canada
Ranta, Olavi A., Helsinki
Redding, Roland Edward,
Southend-on-Sea
Rhodes, Douglas Brian, Preston
Rintala, Berit, Helsinki
Ritvanen, Martta Kyllikki, Helsinki
Rowe, Alan David, Worcester Park
Rouvier, Andre Edmond, London
Rufli, Jean Claude, Idar-Oberstein
Rybom, Lene, Fredrikstad, Norway
Sanford, Peter, Hatfield
Segal, Frank, Johannesburg
Sharp, Charles Sidney,
Toronto, Canada
Siltanen, Jsmo Kalevi,
Jyuaskyla, Finland
Silverberg, Lily, Pretoria, S. Africa
Sloman, Peter, Southend-on-Sea
Smith, Reginald Albert, Oxford
Stewart, Norman James Morton,
Rochford
Stirton, Kenneth Geeki, Ripon
Stout, Cornelis Andries, Rotterdam
Sundgvist, Arvo J., Helsinki
Synan, Nartin Thomas, Slough
Szymczyk, Joseph, London
Velthuizen, S. P., Arnhem, Holland
Westergärd, Eila Margareta,
Vaasa, Finland
White, John Anthony, Frome
Williams, Geoffrey Francis, London

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Names of authors are printed in small capitals, subjects in lower case and abstracts in italics

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