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IMMERSION CONTRAST SIMPLIFIED

by B. W. ANDERSON, B.Sc., F.G.A.

IN the "Journal" for April, 1952, I described an easy photographic method whereby the refractive index of faceted gemstones could be closely estimated and their size, shape, and facet distribution permanently recorded, without the use of a camera. Briefly, the process consisted in immersing the stones in a glass cell containing a suitable liquid, then, in the dark, sliding under the cell a sheet of printing paper or flat film, and exposing for a few seconds to light from an overhead lamp. After development, the contact print so produced showed very clear, indeed one might say spectacular, differences in the appearance of the stones according to their refractive indices in relation to that of the liquid.

This method gives results which are æsthetically pleasing* and of practical value in certain circumstances. But, being a photographic process, a heavily darkened room if not an actual " dark-room " is required, and moreover even the simplest processes of development and printing are bound to consume both time and money, each of which are usually in short supply. It therefore seemed worth while to find some convenient means of making the process a visual one where desired. Simply by placing the immersion cell containing the stones on a ground-glass sheet and holding this above eye level under a hanging lamp one is able to see what the photographic emulsion recorded in the method outlined above ; but this is at best an awkward, and at worst a dangerous attitude to adopt, as a tilt of the cell may easily result in drops of noxious liquid falling into the eyes.

This difficulty can easily be overcome by placing a pocket mirror, tilted at 45°, under the cell and its ground-glass support. The following arrangement enables this to be done with comfort and security. Two cubic blocks are constructed from wood or cardboard, and a third, wedge-shaped piece, which in section forms a right-angled triangle, is placed between the cubes to form a support for the mirror. The sheet of ground-glass acts as a bridge between the two cubic blocks, and the immersion cell is placed in the centre of this bridge. It only remains to arrange for a suitable overhead lamp directly above the cell, and to place the blocks, etc., on some form of raised platform (a pile of books will serve as a temporary expedient) on a bench or table to enable the effects in the mirror to be observed without discomfort.

The actual dimensions of the blocks, etc., is largely a matter of choice, but the writer has found that blocks of about 3½-inch edges are suitable, the wedge-shaped centre piece being about 3 inches broad with two of its sides 3½ inches in length and the sloping side nearly 5 inches long, to satisfy Pythagoras.

In case this description is not sufficiently clear, a diagramatic sketch of the arrangement is given in Fig. 1. A finely-ground glass sheet, costing a shilling in quarter-plate size, can be bought at any photographic suppliers, and a mirror (about 3½ × 2½ ins.) from a chemist or Woolworth store. Having satisfied himself of the usefulness of the set-up, an enthusiast may care to construct something more handsome and permanent from wood. The writer happened to have at hand an old " dissecting microscope " stand consisting of a bevelled block of wood with a glass stage fitted with a sloping mirror below which answered the purpose of this immersion process admirably.

In place of a hanging lamp, a beam of more or less parallel light from a low-voltage microscope lamp can be used, or, in emer-

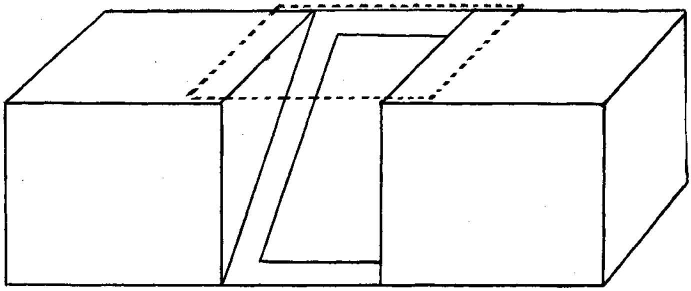

Fig. 1. Diagrammatic sketch showing two cardboard cubes and wedge-shaped support for mirror, as recommended for study of immersion contrast effects. The dotted line indicates the position of the ground-glass "bridge" on which the immersion cell containing the stones is to be placed.

gency, light from a pocket torch, if the room be suitably darkened. The results observed should be very similar to the contact photographs, with the added beauty of colour. Typical photographs were reproduced in my former article, but another is shown here in Fig. 2, to refresh the reader's memory.

Results of almost equal practical value, though less spectacular, can be obtained by even simpler means. If a sheet of white paper (filter paper serves admirably) be placed under a glass immersion cell containing faceted stones and the appearance of the stones critically noted when placed under a good light, the effects of dark borders and bright facet edges for stones of higher index than the liquid and bright borders and dark facets edges for those with lower index can be seen quite clearly. This simplest-of-all immersion technique was used by the writer with complete success in the course of a recent routine test of some parcels of small colourless baguettes, ostensibly diamond, but actually a mixture of synthetic white sapphires and spinels. When these were immersed in a glass cell containing methylene iodide, which has a refractive index almost exactly mid-way between the two species, it was remarkable how clearly the spinels could be separated from the corundums by their appearance as they lay in the cell on a sheet of filter paper with an ordinary bench lamp above and slightly to one side. The tiny facets of these stones made refractometer readings hardly possible, so that the method was here of real value, especially as the con-

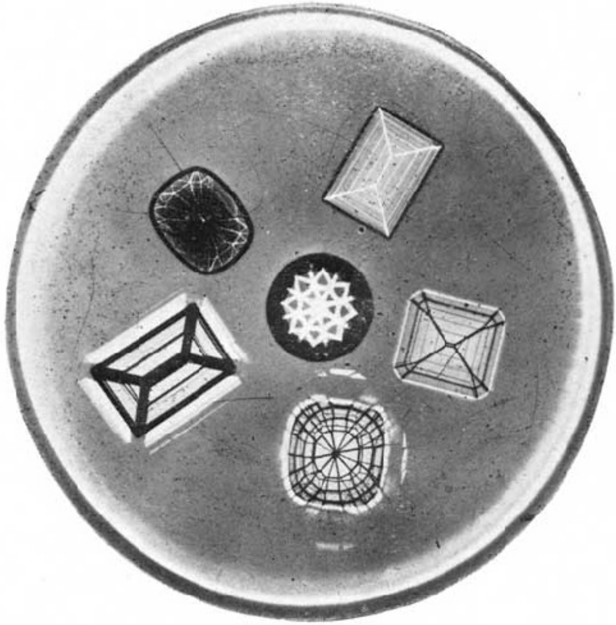

Fig. 2. Immersion contact photograph showing quartz, topaz, spodumene, spinel, chrysoberyl, and (centre) zircon, immersed in monobromonaphthalene.

signment consisted of more than a hundred stones. For purposes of record, an immersion contact photograph was taken of one of these parcels, and an enlargement of this is shown in Fig. 3. It will be seen how clearly the three synthetic spinels which were present stand out by comparison with the corundums. A difference exists here between what the eye sees and what the film records, since for the slow fine-grained emulsion used, blue and violet were the operative colours, and for these wavelengths methylene iodide, with its high dispersion, has a refractive index much nearer corundum than spinel—hence the greater contrast shown by the latter in the photograph. More than that : for blue-violet light the refractive index of methylene iodide is actually *higher* than that of corundum, as revealed by the faint pale borders and dark facet edges of the sapphires. To the *eye*, the reverse effect was visible.

This example underlines the great usefulness of the method in detecting any "odd men out" in a parcel of stones which are meant to be all of one kind. It functions in this way very much

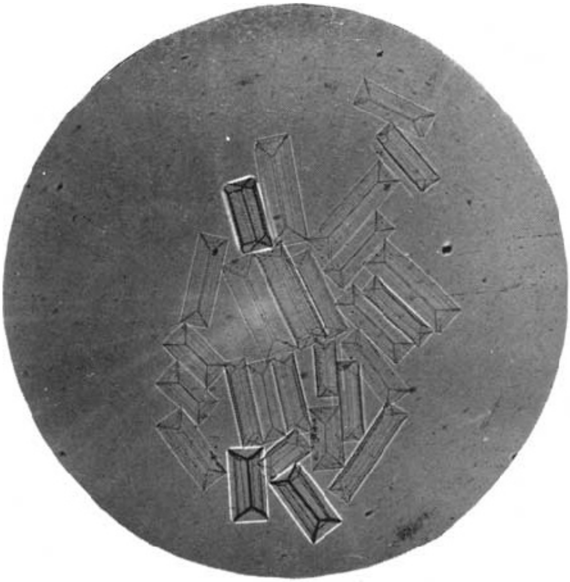

Fig. 3. Enlarged immersion contact photograph of synthetic corundum (faint outlines), and synthetic spinels (three stones with bolder outlines) immersed in methylene iodide. "Line" film used, 3 seconds exposure.

as heavy liquids do in the density field, and, like the latter, it gives the most clear-cut separation where the liquid is so chosen as to be intermediate in properties between the species concerned. Differences in immersion contrast have of course been utilised for years in a general way : what seems to have been hitherto unnoticed is the ease with which one can diagnose whether specimens have an index higher or lower than that of the immersion medium, and approximately how much higher or lower.

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* In a private letter, Mr. E. J. Burbage, F.G.A., revealed to me that he had taken contact prints of gemstones for decorative purposes many years ago. As they had no scientific purpose in view, these photographs were never published.

JADE

A PROBLEM IN NOMENCLATURE

by Sir Charles Hardinge, Bart.

I BOUGHT my first piece of jade in 1918 to celebrate the end of the war and was not long in finding out that few people knew much about it and that not many of these knew very much. The first person I got to know who was of any real help in acquiring knowledge was that very delightful man, the late Mr. Stephen Winkworth, who very kindly lent me his copy of "Jade," by Dr. B. Laufer, published about 6 years before. When I came to p. 22, and read foot-note 2, I found something I could not follow, I mentioned it to Mr. Winkworth: after some consideration he agreed with me. Other things and the fact that I did not then know any one else whose opinion was worth much, left the matter pigeon-holed until in April, 1950, Mr. S. H. Hansford very kindly presented me with a copy of his book, "Chinese Jade Carving." When I read the paragraph which begins at the bottom of page 1, I saw Mr. Hansford took the same view that I had 30 years earlier. I have often intended mentioning the subject to him but somehow it has always escaped me when I saw him. Quite recently I have been trying to get out a list of all authentic localities in which both varieties of jade have been found, crude and unworked (not necessarily "in situ"), and this has brought back to me very insistently that I should like to clear up the suspicion I have had for so long, one way or the other.

About the middle of the sixteenth century the first jade to be brought to Europe in any quantity arrived from the Spanish possessions in America, Raleigh is said to have acquired some from the Spaniards and to have been the first to bring it to England. It came as worked objects. The natives of the countries these objects came from called the mineral they were made of *Chalchihuitl* (*a*). We called it Jade and Nephrite.

Mineral (*a*) is *Chalchihuitl*, *Jade*, *Nephrite*, *Fei-ts'ui*, *Jadeite*. Mineral (*b*), referred to later, is *Yu*, and what the Maoris call *Pounamu*. There is no convenient or kennel name for it for Europeans and English-speaking peoples; it is described as either

(1) Felted or interlocked fibrous Actinolite, if it contains iron, or
(2) Felted or interlocked fibrous Tremolite if it contains no iron.

Dr. Laufer thinks *Jade* (*a*) was so called because the Spaniards called it "*Hijada*," and that it was also called *Nephrite* (*a*) because the natives of the countries the objects came from thought it possessed amuletic properties against diseases of the kidneys, both quite satisfying reasons. He discards a suggestion that *Jade* was derived from a Turkish word. Mr. Hansford spells the Spanish word "*Ijada*," and adds an alternative "*Rinones*." Miss Elsie Ruff in her book "Jade of the Maori" on p. 17 mentions "*Hijada*," "*Ijada*," and adds "*Yjada*," and "*Ijar*." She also makes another suggestion, that *Jade* is derived from the Latin word "*Ilia*" which means the flank, the fleshy or muscular part of the side of an animal between the ribs and the hip. "*Ilium*" is the upper part of the hip-bone—the flank-bone. Miss Ruff also says the Romans and the Spaniards both thought it had curative powers for colic. A medical friend of mine tells me you can only have colic in the kidneys if there is a stone in them and he thinks a derivation for the word *Nephrite* (*a*) from either "*Ilia*" or "*Ilium*" would be very far fetched, and nothing like as appropriate as the derivation which satisfies both Dr. Laufer and Mr. Hansford, and also I expect Miss Ruff. He agreed with me when I suggested that if Colic was responsible for naming the mineral that some such name as "*Abdomenite*" would be much more satisfying. For approximately 200 years, all, or practically all, the objects made from this mineral which came to Europe, came from the Spanish possessions in America.

About the middle of the 18th century, 200 years after the first importations from America to Europe, objects began to come from China which *were thought* to be made of the same mineral. The Chinese called it "*Yu*" (*b*). The Chinese had obtained probably all their Yu from the K'un-lun Mountains in Chinese Turkestan, about 1,800 miles in a straight line from Pekin, a very difficult and arduous journey. About the middle of the 19th century they also got some Yu from Siberia. They have been working this mineral for approximately 2,000 years. Naturally as it *was thought* to be the same mineral, these objects imported from China were also called both *Jade* (*a*) and *Nephrite* (*a*).

At about the same time, the middle of the 18th century, the

Chinese obtained a mineral from Burma, which they at first *thought* to be Yu, but from practical experience in working it they very soon found it was not real *Yu* (*b*) and they called it *Fei-ts'ui* (*a*). We are told at first they did not much care for it, but that it soon became more costly than *Yu* (*b*). It is from *Fei-ts'ui* that so many of the wonderful 18th century and later Chinese works of art are made. After the sacking of the Emperor of China's palace, some of these beautiful objects came to Europe and a French scientist, Damour, in 1863 found that many of these objects were not made from the same mineral as the Chinese had used for all their earlier objects *Yu* (which the Chinese had found out about 100 years earlier from practical experience) but that they were made from the same mineral (*a*) as the objects which had come from the Spanish possessions in America 300 years earlier (*a*) and which we had for 300 years called *Jade* (*a*) and *Nephrite* (*a*), he called it *Jadeite*, so it now had three names for Europeans and English-speaking peoples.

It seems to me that as there are so many Jadeologists to-day that any fact connected with either mineral would be of some interest to quite a number of people even if their primary interest was not perhaps mineralogical. I am not concerned in the very least about any confusion that may arise if my submission is correct, a fact is a fact, and if I am correct any confusion there may be started 90 years ago owing to a slip-up on the part of a mineralogist. Surely there is no reason for any mineralogist to-day to blush for a slip-up on the part of a professional ancestor three or four generations ago, it provides yet another example of the wonderful foresight of the Author of the ten commandments when he laid down :— " and visit the sins of the fathers upon the children unto the third and fourth generation." That any confusion will be caused is extremely unlikely I should imagine. I have only raised the matter in the hope of getting a definite decision one way or the other.

B. W. Anderson *writes* :—

Readers of Sir Charles Hardinge's interesting article may well be feeling somewhat confused in the matter of jade nomenclature, so perhaps I may be permitted to add a few words of reassurance.

The fact he has seized upon, and which most of us had admittedly not recognised, is that the terms jade and nephrite were originally applied to the mineral we now call jadeite, as it was this material which formed the bulk of the jade objects which entered Europe after the Spanish conquests in South America. This is perfectly true, and certainly brings to notice a peculiarly twisted history in the nomenclature of jade. Bowenite properly plays its part also, since it was identified as nephrite by Bowen in 1822, and not recognised as a hard form of serpentine till years later.

But the really important issue does not belong to the past but to the present. What matters is, have we now got names for both these jade minerals which we can use without fear of confusion ? Terms, that is, acceptable and understood by mineralogists, jade collectors, and in fact by all those with a real interest in such matters. The answer is, yes, we have names, both scientific and general, which are quite well understood.

First, there is the general term *Jade*, which is an umbrella name under which, by common, if reluctant, consent, only two species are allowed to shelter. One of these, a calcium and magnesium silicate with density near 3.0, belongs to the great amphibole group of rock-forming minerals, of which hornblende is the most prominent member : the other is a sodium aluminium silicate with density near 3.3, which belongs to the equally important pyroxene group of minerals, of which augite is the type representative. The mineralogist places the amphibole jade in the tremolite-actinolite series, according to its iron content : the gemmologist is accustomed to call it nephrite, while the jeweller is apt to distinguish it as " New Zealand " jade, regardless of its actual origin. As for the pyroxene jade, the mineralogist recognises the term " jadeite " as the name of a definite mineral species (it has no other mineral name). The gemmologist, of course, follows suit, while the jeweller either just calls it " jade," since it is *the* jade of modern commerce, or, with his usual rather vague sense of locality, he may use the term " Chinese " jade.

The point I want to make is that, *whichever* of these terms is used, the meaning is clear, even where they are logically, historically, or geographically incorrect : and *clarity of meaning is the one really important thing about a name.*

After all, a tangled and twisted history is nothing exceptional amongst the names of gems. Even to-day, such names as olivine, jacinth and chrysolite mean different things to different people ;

the sapphire and diamond of the Bible were not the sapphire and diamond of to-day ; while when it comes to the use of " topaz " there is still a cleavage of opinion between the gemmologist and the jeweller.

Thus with jade, though it shares with alabaster the disadvantage of being too general a term, we may consider ourselves lucky to have an adequate number of more specific names, each of which is, in daily practice, unequivocal.

References :

1. CHALCHIHUITL, YJADA, JADE, NEPHRITE, FEI-TS'UI, JADEITE, and 2. YU, POUNAMU.

Ex " A New English Dictionary on Historical Principles." Oxford 1901.

Jade, also Jadde. (F. le Jade (1667 in Hatz-Darm) for l'ejade (Voiture, 1633)). It. iada (Florio 1598) ad Sp. ijada in piedra de ijada or yjada (monardes, 1569) lit. " Colic stone " f. ijada, yjada, " the small ribs, the collike, the flanke " (Minsheu), the synonym Nephrite f. Gr. *Nephroi* kidneys, reins.

1569, Monardes Cosas de las Indias (heading) De la Piedra de la yjada.

1595. Raleigh discovered Guiana, 24, " a kinde of greene stones which the Spaniards call Piedras Hijadas, *and we use for spleenestones*." See later Ref. ex Hakluyt's Voyages.

1598. Florio, Iada, " a kinde of precious stone like an emeraud."

1633. Voiture, Wks. Let. to Mdle Paulet, 1665, 47. " Ainsi pour ce coup, l'Ejade a eu pour vous un effect que vous n'attendez pas d'elle."

1657. J. D(avies) tr. Voiture's lett. XXIV, 37, " So that this time L'Ejade hath had for you an effect which you expected not from it." Ibid. XLII. – 79. " I perceive there must be found out for me some more substantial remedies than the Ejade." (mispr.) Ejacle.

Ex Bishop — " Investigations and Studies in Jade." I., p. 1.

" There is no word of *Jade* in European literature before the discovery of America by Columbus in 1492. The earlier Spanish navigators brought back specimens of green stones which were highly valued by the natives of Central and South America and were worn by them as badges of rank or as amulets against certain diseases. For this last reason it was given the name of piedra de hijada " Hypochondriac, or colic stones," which first occurs in the workes of Monardes, a physician of Seville, in 1565. He also alludes to its synonym piedra de los rinones or kidney-stone, and to its reputed value in renal diseases. Hence the name of nephrite from Nephros, the kidney, and that of Lapis Nephriticus which is so frequently used by the older writers."

Ex " History of the Conquest of Mexico." By Prescott, Vol. II, p. 63.

" Both cloak and sandals were sprinkled with pearls and precious stones among which the emerald and the chalchihuitl—a green stone of higher estimation than any other among the Aztecs—were conspicuous."

Ex Hakluyt's Voyages. Everyman Library Ed., Vol. VII, p. 296.

" These Amazons have likewise a great store of these plates of golde, which they recover by exchange chiefly for a kinde of greene stones, which the Spaniards call Piedras hijadas, *and we use for spleene stones :* and for the disease of the stone we also esteeme them. Of these I saw divers in Guiana : and commonly every king or casique hath one, which their wives for the most part weare ; and they esteeme them as great Jewels."

p. 302. " The Spaniards ledde him in a chaine seventeene dayes, and made him their guide from place to place betweene his countrey and Emeria, the province of Carapana aforessyd, and he was at last redeemed for an hundred plates of golde, and divers stones called Piedras Hijadas, or Spleene-stones."

pp. 333, 334. Same repeated again.

The above from a Report from Sir Walter Raleigh to Sir Charles Howard and Sir Robert Cecyll, of H.M.'s Privie Council.

These two from a Report by Laurance Keymis, gentleman, to Sir W. Raleigh.

p. 380. " Farther this old man showed mee, whence most of their golde commeth, which is formed in so many fashions : whence their Spleene-stones, and others of all sorts are to be had in plentie."

p. 386. " To such as shall be willing to adventure in search of them, I could propose some hope of golde mines, and certaine assurance of peeces of golde, of Spleene-stones, Kidney-stones, and others of better estimate."

The above was in the 16th century.

A GEMMOLOGIST VISITS the ROYAL ONTARIO MUSEUM

by D. S. M. Field, A.G.A.

RANKING among the great museums of the world, the magnificent Royal Ontario Museum buildings contain many unique examples of gemstones, and ornamental minerals in infinite variety. Indeed, nowhere else in the world are Canadian gemstones so well represented ; and for anyone accustomed to thinking of Canada purely as a source of economic minerals, a visit to the collections of Canadian gemstones holds many delightful surprises.

One of the most striking " gems " in the collection is not a precious stone at all, but it deserves special mention on account of its amazing size and symmetrical perfection. It is a section of a huge crystal of muscovite mica that measures nearly six feet in diameter and is almost completely free of inherent flaws and surface imperfections. The crystal from which the section was removed was found near Eau Claire, Ontario.

When it is remembered that single crystals a foot in diameter have fetched as much as seventy-five thousand dollars, the value of the Eau Claire mica crystal may be more readily appreciated.

Nevertheless, and notwithstanding the economic and scientific importance of the mineral collections housed by the R.O.M., it is the gemstones that are of paramount interest to the gemmologist.

It is difficult, however, to single out any particular specimen as the best one of the lot. Nearly all of them are most interesting and beautiful, although it must be said that the lighting arrangements leave much to be desired.

Upon entering the main gallery, one is at once impressed with the great size of the rough specimens. Indeed, many of the larger ones are individually displayed in large glass cases with a capacity of forty cubic feet or more. There are huge groups of rock crystal and fluorite—the latter from British mines; and blocks of amethyst, from Uruguay, measuring a yard or more in diameter, are in various sections of the hall. Indeed, a whole cave of enormous crystals of pink calcite—the whole measuring at least fifteen feet in depth—has been transported from Sterlingbush, New York.

In all, there are twelve cases of cut gemstones. These include spheres of cairngorm and chatoyant rose quartz, white scapolite cat's-eyes, star sapphires and star rubies, and opals of singular beauty and pattern. One cut specimen of black opal, cut in the form of a large marquise cabochon, is perhaps the most beautiful specimen of Australian opal.

Two cases are devoted to Canadian gemstones. One of these contains a sixteen-piece group of figurines, trays and strings of beads cut from sodalite ; while another case contains beads and cabochons of peristerite, collinsite, amazonite, and the rarer mineral cancrinite—which derives its name from the late Count Cancrin, of the Imperial Russian Court.

The green amazonite from Ontario is particularly beautiful ; but the faceted gems hint that Canada may someday become an important source of many familiar and rare gem varieties.

Of the faceted gems, iolite, aquamarine, almandine, rock crystal, diopside, sphene, zircon and vesuvianite (idocrase) are comparable to the best from other countries ; and this same obtains in the case of the cabochon stones. The latter class includes gold quartz, mordenite, agate, apatite, amber, banded jaspilite, labradorite, sphalerite, chlorastrolite, thomsonite and prehnite. A transparent orange-coloured cassiterite is among the rare gemstones on display.

The tenth case of cut gemstones contains a most interesting and unusual collection of stones cut by oriental lapidaries ; and the contrast is great between the symmetry of these and the modern well-proportioned stones produced in Europe and North America.

The last two cases are devoted to displays of synthetic corundum and spinel. These are well arranged, but one questions the wisdom of using misleading trade names in a scientific exhibit—particularly when such are used without qualification or species name, except at the foot of the case. For instance, a lovely blue coloured synthetic spinel group is labelled " kyanite," and the terms " topaz," " aquamarine," etc., are much in evidence.

Huge crystals of Canadian apatite, zircon, sphene, etc., are to be noted in some wall cases ; others show series of specimens to illustrate genesis, molecular structure and crystal habit. The student will find the beginners' collections, arranged to illustrate terminology of descriptive mineralogy, of great value ; while the advanced scholar will appreciate the systematic collections.

JADE in the MEXICAN ART EXHIBITION

by Elsie Ruff, F.G.A.

SOME standard must long have existed to give significance to the word *jade*—or the word's equivalent. Perhaps colour came first, followed by diaphaneity. Later, with the experience of cutting and polishing, toughness would be an essential. The mistakes of early peoples were probably no greater than those of to-day, for the word is still bandied about. Yet some norm was established. Had it been possible to prove that jade was in fact more than one species, the information could hardly have received more than passing attention. And regardless of the term used. It might be Chalchihuitl or Yü or Pounamu or, as we are told the Eskimos called it, Singok.

Jade labels in the recent exhibition of Mexican Art at the Tate Gallery could have been catalogued by the original artist. There is doubt whether some pieces were jade at all. It must be conceded they were jade-like. A few were labelled *jadeite*, confusing enough to the public. An enquiry disclosed that one might accept *jadeite* as tested material. *Jade* appeared where pieces may or may not have been tested. And that, in any case, all Mexican jade was almost certainly jadeite. Curiously enough, at the time, it seemed to have no more significance than we suppose it had to early man. Perhaps it was the atmosphere, or the appreciative visitors, or that you caught the spirit of those unknown artists. At any rate one found oneself questioning, why all the pother ? Why indeed ? It is not a question of something real as against something counterfeit, like gold and gold-plated. It is solid throughout. Nor is it based on wearability or longevity.

When we really get down to the nomenclature of jade and its varieties—and it is imminent—it would seem that we must first establish what we are after. Are we after the original substance known to man as jade—the material he dug out of the earth or chanced upon in boulder form or collected from some clear river that almost certainly tricked him on colour ? Or are we after the early primitive expert's jade—the man who had learned to appreciate and carve it and leave his imprint upon it, for subsequent generations to worry over his meaning ? Original material will be hard to prove. Popular material a much simpler matter. Or are we going to accept the terms of one particular race ? Or are we going to ignore the background ?

Despite labels, the Mexican jade was very instructive. There was too, for those deeply interested in this subject, the pleasure of seeing some piece heretofore known only by illustration. Several pieces were familiar in this way. And since the museum of Mexico City is outside the ken of most of us, one's mind flashed back to illustrations in current books on Mexican art or to a famous illustrated journal. It was more than seeing the original of a great canvas most of us anticipate. Here was a change of dimension.

We are told that Mexico allowed these national treasures out of her country only with reluctance. Yet the British Museum was able to contribute in no small measure.

The story of Mexican jade has not yet been written. Indeed, Mexico itself is only just beginning to unfold. Matured Mexicologists are still hesitant about precise dates for the various cultures.

Unlike the Maori of New Zealand, who made no attempt to reproduce in jade the human face or figure—with the one exception of his Tiki—the early Mexican appears to have been intent on this very subject. Someone has suggested that this Mexican must have been somewhat of a world traveller, since he has produced an international gallery of types. The exhibition was proof of it, both in pottery and jade. There was Mongolian, Negroid, Norse. Did not Montezuma believe that Cortés represented the great white god of their mythology ? (Pacific Island people welcomed Captain Cook for the same reason). The ancient Mexican artist must have recognised that his country was made up of many types, layer upon layer of culture. Yet chalchihuitl persisted, not only as a medium but as the country's most precious material.

To jadeologists—to use a recently coined word—this is the most startling of all facts about jade. Not that it should have been discovered, and used, perhaps simultaneously by several peoples, but that for so many races it represented *the most precious material.* And this material is still precious. Most of us to-day might prefer to discover diamonds or radium, but the motive behind our discovery would be totally different.

The exhibition of Mexican art was an innovation for this country. Only once before was ancient Mexico represented in this way, and that as far back as 1824. It was understandable therefore that the Presss made much of it. Frequent among the criticisms were the words grotesque and gruesome. Yet right throughout the Pacific, and indeed the Far East, this same style exists side by side with the gentler issues. Surely modern expressions repeat it, except that we interpret it in terms of the subconscious mind. Maybe these early peoples had no such term. They merely recognised that they felt this way—at times. A jade plaque might look out at you with an expression of derision. Derision is still a human characteristic though we do not carve it into our precious materials. Critics complained of human skulls carved out of fine substances. (The British Museum's Aztec rock crystal skull was an outstanding contribution.) But the skull and cross-bones has long been a motif in the white man's world. It played a part in World War II. Death cults have had several periods of popularity in Europe. Liquidations, whether you call the motive political or religious, leave no room for criticism of the odd human sacrifice in Mexico, frequently tendered rather than extorted.

In the Mexican jade and jewellery world there would seem to be evidence of Chinese influence. (Some suggest that it may be the other way round.) Since the general public is more knowledgeable on the subject of Chinese jade, one heard comments regarding this similarity. Yet other influences were apparent, Egyptian for one. The discovery of a tomb in Monte Albán, Oaxaca, disclosed work of the Mixtec culture (A.D. 800–1521)—a people greatly influenced by the preceding Toltecs—that not only established them as great goldsmiths but exhibited a style we have learned to associate with Egypt. There was a magnificent necklace, for example, in gold, turquoise, mother-of-pearl, and pearls, comprising no fewer than twenty-three rows, the fringe made up of small gold bells. Jade from this tomb alone was noteworthy. There was a necklace of eighty-eight beads in various shapes. Another, with some of the jade a rich emerald green, of sixty beads. Both necklets would be wearable to-day. There was a pale jade necklet made up of three rectangular beads and six spherical ones. Another of seventy-seven beads in two rows with a pendant representing a human head. There was a white jade circular pectoral in the form of a monster's head. From this same tomb were jade pendants, jade earrings, one circular and almost the size of a bangle, another flower shaped. There was a lip-plug (for the lower lip) composed of a green jade and gold eagle head. Very interesting were three all-jade rings. One, a simple band (wedding ring style), each side finely grooved. Another, engraved. A third, of emerald green jade with the finger bone still attached to it. The rings were sizes that approximate to-day's finger. And all this from one tomb that may have ante-dated the Spanish Conquest by perhaps 700 years.

The jade and jewellery from another tomb, discovered on the Isthmus of Tehuantepec during 1952 has evidently not yet reached the exhibition stage. This story reads, for all the world, like a mummified Egyptian pharaoh with a Chinese bias. Yet it was no other than an exalted Mayan leader of the Palenque civilization. It is well worth quoting :

> " In the red-painted cavity below lay the all but pulverized skeleton of a middle-aged man. His fine cloth raiment was in tatters, but his burial jewellery made as rich a display as it had when he was interred 13 centuries ago. A jade diadem covered his skull, and chunky jade earrings lay where his ears had been. A jade mask with inlaid emerald eyes covered his face. Inside the mouth was a jade bead, and a long jade necklace hung over a beaded breast plate. At his crumbling collarbone he wore a pearl as large as a walnut. His right hand held a large jade cube, his left a jade sphere. Jade ornaments stood by his feet, and nearby were two jade idols."

The discoverer, Mexican archæologist Alberto Ruz Luhillier, does not attribute any of this to Egyptian influence. We are not told whether he gives credit to China, though his statement that it is no more than coincidental resemblance, proving only that wherever man lived human culture followed similar patterns, would seem to deny this also.

The Mexican exhibition unfolded with an astonishing display of earthenware figurines, male and female. These were dated 1500—100 B.C. and were headed archaic. In it was no jade, though jade figurines were a feature of a later culture. Next came the Olmec culture, 500—100 B.C., which may be likened to the Han Dynasty of China, so high was its level of artistic creation. It is catalogued as " one of the riddles of Mexico." And it is rich in jade. One piece, probably less known than most, was lent by a private owner in New York. It is that of a standing human figure, $8\frac{11}{16}$-in. by $3\frac{1}{8}$-in., holding an infant to its body. One leg is broken off at the knee. Here were many representations of what appears to be the deformed head, not unlike cranial deformations we occasionally see to-day. The facial expressions on these heads vary from the sort of twisted-mind type to that of poised intelligence. It is believed that babies' heads were bandaged to produce this high cylindrical form, which was apparently desirable. But the human figure was everywhere in jade. There were squatting figures, recumbent figures (many with feline mouths), human masks, a wonderful head of an old man ($2\frac{3}{4}$-in. by $\frac{15}{16}$-in.), a jade head with gold encrusted eyes, cross-legged figures, seated figures, dwarfish bodies. And expressions both grotesque and joyous. We were told that the grotesque was largely the work of priests or priestly influence. Left to themselves, like most human beings, the ancient Mexican was not bereft of the joy of living.

Within these same cultures were, of course, beautiful jade axes. A large grey-green axe, from Vera Cruz, measured $8\frac{11}{16}$-in. by $3\frac{15}{16}$-in. Another, almost identical in size, came from Tabasco and was of pale green jade, beautifully polished. Both were Olmec.

Jade was sometimes combined with gold, sometimes with rock-crystal, often both. Rock-crystal seems to have been popular, perhaps second only to turquoise. And turquoise ran a close second to jade. Only one piece could I discover that bore any resemblance to the Maori's Tiki. This was a jadeite plaque from the British Museum, $5\frac{1}{2}$-in. in height and carved in relief. It was listed under

Small Male Nude Figure Olmec Culture. 4¾-in. Grey-green jade. Cerro de las Mesas (Vera Cruz).

Exhibited at the Exhibition of Mexican Art, London, 1953.

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the Maya culture of the Old Empire (A.D. 317–987). The bat was apparently a symbol in the Mexican world as it was with the Maori and the Chinese. One large pectoral, finely carved and realistic, was made up of jade, mother-of-pearl, and slate. It represented the Bat God with jade lips in the shape of a flower. Eyes and teeth were encrusted with mother-of-pearl.

The impact of Mexico—experienced in the hushed atmosphere of the Tate Gallery—was a strange one. It can hardly be described as stimulating. Yet it was unquestionably exciting. For the gemmologist it was another chapter on jade. One can do no better than quote the words of Dürer, with which Dr. S. Linné of the Stockholm museum concludes his article in the fine catalogue of Mexican Art issued by the Arts Council of Great Britain. The words come from Dürer's diary, after he had seen the collection of Mexican work sent to Charles V in Brussels during 1520. This great artist, incidentally the son of a goldsmith, was then in his maturity. He wrote : " Never in my life have I seen anything which so made my heart leap in me . . ."

Gemmological Abstracts

ANON. *Staatsexamen in Edelsteinkunde.* State examination in gemmology. Zeitschr.d.deutsch.Gesellsch.f.Edelsteinkunde, Vol. 1, No. 2, 1952–53, pp. 1–4.

An examination in gemmology has been introduced in Western Germany, corresponding roughly to the Diploma of the Gemmological Association in this country, but the " State-examination " of the State Institute for Gemmology at Idar-Oberstein is of a more official nature than the Diploma. Rules of examination and syllabus are given. First successful candidate was Mr. R. Wacker-Wakelin, F.G.A., of Birmingham. E.S.

CHUDOBA (K. F.). *Grundlagen und Probleme der Diamantsynthese.* Basis and problems of the diamond synthesis. Zeitschr.d. deutsch.Gesell.f.Edelsteinkunde. Vol. 1, No. 2, 1952–53, pp. 4–9.

Survey of literature on diamond synthesis. The author reaches the conclusion that in spite of many investigations, the knowledge gathered so far is but little and success not very near. E.S.

ANON. *Die Bonner Diamantsynthese.* The Bonn Diamond Synthesis. Zeitschr.d.deutsch.Gesellsch.f.Edelsteinkunde, Vol. 1, No. 2, 1952–53, pp. 9–10.

Indictment is expected soon in the Bonn case of fraudulent " diamond synthesis." No boart was produced any more when the experiments were transferred from the laboratory of the " inventor " to the Mineralogical Institute of the University of Bonn. E.S.

PLATO (W.). *Orientierte Streifung in synthetischen Korunden.* Orientated straight lines in synthetic corundum. Zeitschr.d. deutsch.Gesellsch.f.Edelsteinkunde, Vol. 1, No. 2, 1952–53, pp. 10–13.

The article refers to straight line and shadow effect observed when synthetic corundum is viewed between crossed nicols in parallel light in a direction along the optic axis. Characteristic photomicrograph is reproduced. E.S.

Schmidt (P.). *Onyx, der Stein der Bibel.* Onyx, the gem stone of the bible. Zeitschr.d.deutsch.Gesellsch.f.Edelsteinkunde, Vol. 1, No. 2, 1952–53, pp. 15–18.

Interesting article tracing facts and legend about onyx in biblical times and antiquity. Oldest Babylonian cylinder seals date from the 5th millenium B.C. E.S.

Olson (E. E.). *History of diamonds in Wisconsin.* Gems and Gemology, Vol. VII, No. 9, pp. 284–285. Spring 1953.

Some twenty diamonds found in isolated areas in Wisconsin. They were found in the terminal moraines of the great glacial ice sheet, and are supposed to have been carried down from the Hudson Bay area by the Laurentian glacier some 25,000 years ago. Earliest report of a diamond find was in 1876, when a crystal of 16¼ carat was discovered near Eagle in Waukesha County during well drilling operations. The stone was bought by a Col. Boynton who bought it for one dollar as a " topaz," and subsequently sold it to Tiffany & Co. for 850 dollars. Col. Boynton subsequently " salted " the area with diamond crystals and floated a company. The fraud did not last long after the " salted " crystals were found to be South African stones. The largest diamond found in Wisconsin weighed 21½ carats and is known as the Therese diamond. R.W.

Anon. *Diamond polishing.* Practical Mechanics, Vol. XX, No. 231 pp. 232–234. March 1953.

A short but comprehensive survey of the polishing of diamonds for jewellery written for the non-technical reader. Reference is made to the close limits of work carried out by the diamond cutter using his eye alone. The actual process of diamond cutting has varied little in the past 400 years. Explanation is given of cleaving; sawing ; cutting (grinding or bruting) and polishing. Note is made of the experience necessary in order to find the " grain " of the diamond before polishing a facet, and the arrangement of putting on the facets. The process of polishing is described very fully—the actual operations carried out by the polisher giving quite a personal touch. It is interesting to note that the lap is called a *schijf* (pronounced *sky-ve*). This is an unusual spelling and maybe a variation of the Dutch *schyf.* A very readable and informative popular article. 5 illus. R.W.

ANON. *Chinese jade grinding.* Gemmologist, Vol. XXII, No. 260, p. 50.

A short note on the method used in jade grinding during the Ming Dynasty. A two foot cast iron wheel rotated in a vertical plane on a horizontal shaft which was driven by two ropes wound round (in opposite ways) at each end. These ropes were fixed to two pedals and operation produced a backwards and forwards motion. Wet sand and water was used as a grinding and cooling medium. 1 illus. R.W.

ANDERSON (B. W.). *Crossed filters for the study of fluorescence.* Gemmologist. Vol. XXII, No. 260, pp. 39–45. March 1953.

A report on experiments on the employment of complementary filters, as used initially by G. G. Stokes, in the detection of fluorescence of chromium coloured gem minerals. A strong source of light (a projection lamp) is filtered with a 600 ml. round flask containing a saturated solution of copper sulphate. The specimen is then placed in this beam of blue light passed by the filter and observed through a red filter (ruby glass) which passes only those rays which are absorbed by the copper sulphate solution. Whereupon the specimen, if it shows a red fluorescence, will appear a glowing red against a black background. Stones examined by this technique included ruby ; red spinel ; emerald ; topaz ; alexandrite. Extensions of the method included observation of the fluorescence spectra, by viewing the red glow with a hand spectroscope in place of the red filter. By using an ammoniacal copper sulphate solution, which cuts out the yellow rays and much of the green, and employing a yellow viewing filter (Ilford 109), the green fluorescence of certain diamonds ; uranium activated glass and scapolite ; and manganese activated willemite and synthetic green spinels ; and the reddish-yellow glow of Ceylon yellow sapphires may be easily observed. 1 illus. R.W.

FOSHAG (W. F.). *Mexican opal.* Gems & Gemology. Vol. VII, No. 9, pp. 278–282. Spring 1953.

An excellent account of the history and the mining of the opals from Mexico. The author does not agree with the oft repeated statement that Mexican opals are unstable and quick to dry and crack. Fine quality stones are rare and much inferior material is sold giving a poor reputation to Mexican opals. The only Mexican opal available to-day is that from Queretaro—first discovered in 1855. Zimapan is not now a supplier. Mexican opals are the wine-yellow to cherry-red fire opals ; the limped opals with fine play of colour (water opals ?) and milk opals (lechsos). Mexican names are given, and markets and methods of marketing explained. Fakes, such as " replicas " in which two pieces of glass are joined together by an iridescent film—and even automobile tail-light glass have been foisted on to the unwary tourist. Full details of geologic occurrence and the minor localities are given. 2 illus. R.W.

CAUDELL (P. M.) ; WEBSTER (R.). *An inexpensive short-wave ultra-violet fluorescent lamp.* Gemmologist, Vol. XXII, No. 261, pp. 60–62. April 1953.

Describes the employment of a Phillips TUV germicidal lamp, which operates directly off the house mains (200–250 volts), in conjunction with a Chance OX7 filter, to give 2537 A ultra-violet light. The characteristics of the lamp and the filter are given. 4 illus. P.B.

CUSTERS (J. F. H.). *La Belle Helene—a type II diamond.* Gems and Gemology, Vol. VII, No. 9, pp. 275–277 and 287. Spring 1953.

An account of the 160 carat diamond crystal found in March 1953 near the mouth of the Orange river in South West Africa. The stone is said to be a rare type II diamond. Differences between type II and type I diamonds are said to be as follows : Type II diamonds are laminated, type I not. Type II diamonds are transparent in the ultra-violet down to about 2250 Å, whereas type I only to about 3000 Å. Type II do not fluoresce under long-wave

ultra-violet light, type I do fluoresce—mostly blue. There are differences in the infra-red part of the spectrum, and they have different counting properties (for alpha particles and gamma rays). It is mentioned that there may be two classes of type II diamonds (Type IIa and Type IIb). They show different phosphorescence when irradiated with short-wave ultra-violet light and their electrical conductivity differs. Type IIa does not phosphoresce nor conduct electricity. Type IIb phosphoresces a strong bluish colour and can carry a strong electric current when under a potential difference of 100 volts. La Belle Helene was type IIa. 3 illus.
R.W.

FIRSOFF (V. A.). *A gemmologist in the Highlands.* Gemmologist, Vol. XXII, No. 261, pp. 64–67. April 1953.

A description of the author's visit to the Highlands of Scotland and of his search for gem minerals. Venus hairstone, milky quartz, rose quartz, cairngorms and citrines may be found on Creag na Caillich. Almandine garnets, staurolite, epidote, kyanite are mentioned. Pearl bearing mussels are said to be found in Dochart and Fillan Water. R.W.

RUZICKE (P.); STEPANEK (J.), trans. HRASE (J.). *The genesis of diamonds.* Gemmologist, Vol. XXII, No. 261, pp. 57–59. April 1953.

Description of an investigation on the surface structure of diamonds as shown by the electron microscope. From these investigations it is inferred that diamonds with plane octahedral faces grow in sheets of atomic layers by direct attachment of carbon atoms diffused in the magma. In most diamonds it appears that a fog-like emulsion of minute drops of molten carbon was found in the magma. Rounded diamonds, it is suggested, crystallize in a great drop of liquid carbon which developed from the carbon " fog " and became the sole crystallizing centre. The surface of the drop of carbon protected the stone from gross impurities except for colouring matter dissolved in the liquid carbon. Boart and carbonado contain many impurities owing to each minute drop of carbon having formed an independent crystallizing centre. Tetragons (and trigons ?) it is suggested are due to a minute impurity, perhaps only a single foreign atom, becoming attached to the growing face and disturbing the growth at that part. 2 illus.

P.B.

WEBSTER (R.). *Gemstones and jewellery.* The Police Journal, Vol. XXVI : No. 1, January/March, pp. 69–80 ; No. 2, April/June, pp. 150–159.

Written as a guide for the Police Officer. A comprehensive article giving the main facts concerning the more important gemstones, and the most common fakes. Some easy methods of identification are given ; the more common styles of cutting and information on the precious metals used in jewellery. An indication as to how jewellery may be best described ; literature to refer to ; where to obtain the testing apparatus and liquids referred to, and where and who to approach for expert technical advice. 17 illus.

P.B.

ANDERSON (B. W.). *Simple immersion techniques to determine the refractive index of faceted gemstones.* Gems and Gemology, Vol. VII, No. 8, pp. 231–235. Winter 1952/3.

A rewrite, with notes on additional techniques, of the immersion contact photographic methods, reported in the Journ. Gemmology for April 1952. Stones immersed in a cell of liquid of known refractive index and the cell and stones placed on a bare photographic film (or contact printing paper) and exposed to a point source light, show, on development, by their outline whether they have higher or lower refractive index than the liquid that they are immersed in. Stones of greater refractive index than the liquid show a dark border with bright facet edges on a print of the film. Stones with lower refractive index show a bright border and dark facet edges. The author points out that it is not necessary to photograph the effect, for it can be seen visually if the cell be rested on a ground glass sheet supported at each end by blocks so that a mirror arranged at 45 degrees is below the cell. On looking into the mirror the bottom of the cell is seen with the stones in the liquid. A suitable single point light source is arranged over the cell and the bright or dark borders and facet edges can then be seen comfortably in the mirror. Approximate refractive indices can be found by observing the effect in liquids of differing refractive index. A list of suitable liquids is given. 4 illus.

R.W.

BOOK REVIEWS

EVANS (JOAN). *A History of Jewellery*, 1100–1870. Faber & Faber, London. 10 colour plates, 176 pp., 48 line drawings, 5 gns.

This is a detailed account of fashions in jewellery from the twelfth to nineteenth century. The illustrations are particularly valuable and Dr. Evans' book should give much pleasure and reward to those interested in jewellery and the influences that affected design in each century. Various important pieces are described in detail and attention has been given to portraits of well-known persons wearing jewels of a particular period. Dr. Evan's belief that the history of jewellery has reached its conclusion comes as a surprise and an art which is of such importance as to merit the scholarly book which has been produced is not likely to end. The book itself is an inspiration and although at first sight the price seems high, it is a book which will be sought by the collector, jeweller and designer and possibly become a standard work on the history of jewellery in Western Europe for the period covered. A.G.

GRODZINSKI (P.). *Diamond Technology.* 784 pp., 486 illus. N.A.G. Press, Ltd., London. 52s. 6d.

This is a second and extensively revised and enlarged edition of the author's *Diamond and Gem Stone Production,* which was published in 1942. It is divided into two parts (*a*) General Manufacturing Methods and (*b*) Special Manufacturing Methods, though there is some unavoidable overlapping. The author has made a special study of the harder natural and synthetic substances used in industry, and has made this new book a standard work. The first ten chapters will have a special appeal to all gemmologists interested in the cutting and polishing of diamond, for the subject is thoroughly discussed. The remainder of the book is for the engineer interested in watch and instrument jewels, the classification of industrial diamonds and processes connected with grinding and lapping of sintered carbides. There is a chapter dealing with the production of quartz and other optical crystals. The author has avoided writing in too technical a language and at the same time avoided incompleteness. The numerous line drawings are extremely valuable, but a few of the reproductions of photomicrographs lack clarity, though this is a minor criticism of a book which should be of great interest to cutter, polisher, student and all concerned with diamond technology. A welcome innovation is the absence of trade advertisements. S.P.

GEMMOLOGICAL EXHIBITION GLASGOW

by S. D. Wood, F.G.A.

WHAT more opportune time to stage a Gem Exhibition than during a Coronation period ? At a time such as this, when popular interest is centred on our Royal Family, the pomp and splendour of pageantry, and, indeed, in all things appertaining to this great historical occasion, jewels are very much to the fore.

Let us put the Calendar back twelve months to an evening when what was to be a branch of the Gemmological Association of Gt. Britain was in its embryo stage. A group of enthusiastic Fellows resident in the West of Scotland gathered to discuss the prospect of forming a local group in order to retain the interest of students graduating from the Gemmology Classes. One suggestion made that evening was that a Gemmological Exhibition be staged as part of the group's programme. Four months later, this same group unanimously decided to become the West of Scotland Branch of the G.A., and before the Meeting closed, the interim Secretary was instructed to investigate the possibilities of an Exhibition to be held during the Autumn of 1953. An approach was made to the Director of the Kelvingrove Museum, with the hope that he might see fit to allow the Association to use a tiny corner of his large domain for its modest effort. This hope was more than fulfilled, for the Director, Dr. Stewart Henderson foresaw possibilities in such an Exhibition if held in conjunction with the Coronation festivities. And so, overnight, a modest ambition became a large scale project.

The Exhibition opened on 30th May in the presence of six hundred visitors. Councillor James Ritchie, Convenor of the Glasgow Art Gallery and Museum Committee, introduced Professor T. Neville George, D.Sc., PhD., Professor of Geology and Dean of the Faculty of Glasgow University, who opened the Exhibition. In his introduction, Councillor Ritchie intimated that Professor George had been elected Chairman of the Geology Section for the next meeting of the British Association for the advancement of Science, and he felt he was expressing the feeling of all those

Opening Ceremony

concerned in this Exhibition, when he said they were honoured by his presence on this occasion.

Mr. A. Ross Popley, representing the Council of the Gemmological Association, expressed his pleasure at being present on this opening day and would take back with him to his colleagues in London a report on this excellent display.

The opening ceremony concluded with a vote of thanks from Mr. Fred Bryan, Chairman of the West of Scotland Branch. In particular, he mentioned Dr. Henderson for having given such a splendid opportunity to the Association and for the wholehearted co-operation received from him and his Curator Mr. Charles Palmar, not forgetting the office staff and technicians who had rendered valuable assistance.

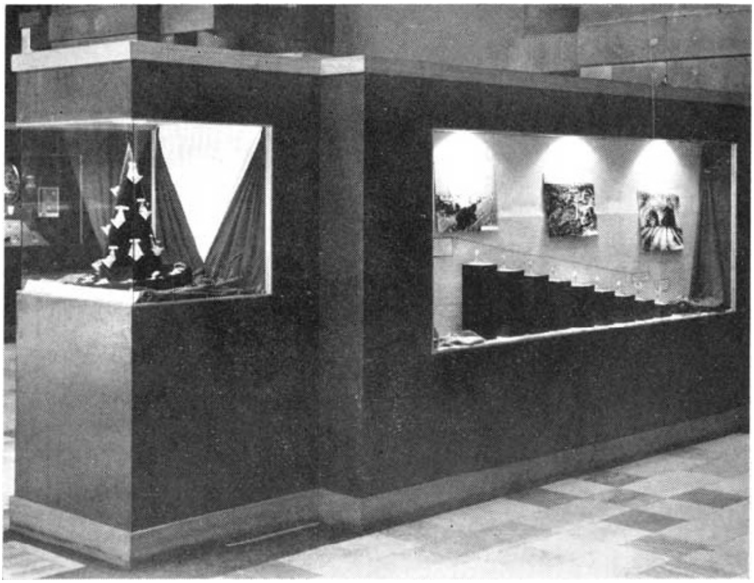
The Museum, situated on the fringe of Kelvingrove Park and with the River Kelvin flowing nearby (these names perpetuating the name of the great Lord Kelvin), is surrounded by other cultural institutions—the University and the Anderson School of Medicine.

It has its own Association numbering 2,500 members, its schools service, and is the largest local-government-controlled Museum in the United Kingdom.

And, what of the Exhibition itself ? What was its main objective ? Mainly, its objective was to create an interest in gems and gemmology amongst the citizens of the Glasgow area who, as past records show, seem to have an almost insatiable thirst for knowledge. Owing to the long term of the Exhibition, the hours clashing with the normal business hours of the members, it was quite impossible to arrange for stewards to be in attendance at all times. Nor was it practicable, when stewards were on duty, to carry out demonstrations of gem testing, because of the large numbers of visitors. The members responsible for the various cases set up their exhibits in such a fashion, with cards suitably printed with explanations, illustrations, diagrams and models so that even the merest tyro could follow and understand what was on view. Care and attention was also paid to "window dressing," for to the uninitiated, this does help to appreciate the natural beauty of gemstones. This was particularly noticeable in the real and cultured pearl cases where the pearls were tastefully laid out in shells on a blue velvet background.

The Diamond Section consisted of the three cases. The first dealt with the evolution of diamond from a 20-carat crystal embedded in blue ground, through the various stages of cutting and polishing, illustrated by means of models, to the fully faceted brilliant. The second case held the revolving cone on which were mounted models of some of the famous diamonds including the Cullinan and Kohinoor. The third case included brilliant and baguette cut diamonds, a group of coloured specimens, industrial diamonds, etc., against a background of photographs depicting mining scenes. After viewing this section, visitors were better able to understand the work performed by Mr. Joseph Maman, who gave daily demonstrations of diamond polishing. His work proved a most attractive feature.

Local interest was well provided for in several of the cases. Most interesting, possibly, were the enlarged photographs of the only acknowledged synthetic diamonds ever produced. This scientific " feat " was performed by J. B. Hannay, the Glasgow chemist in 1876 and the diamonds presented to the British Museum in 1878.



Diamond Exhibit

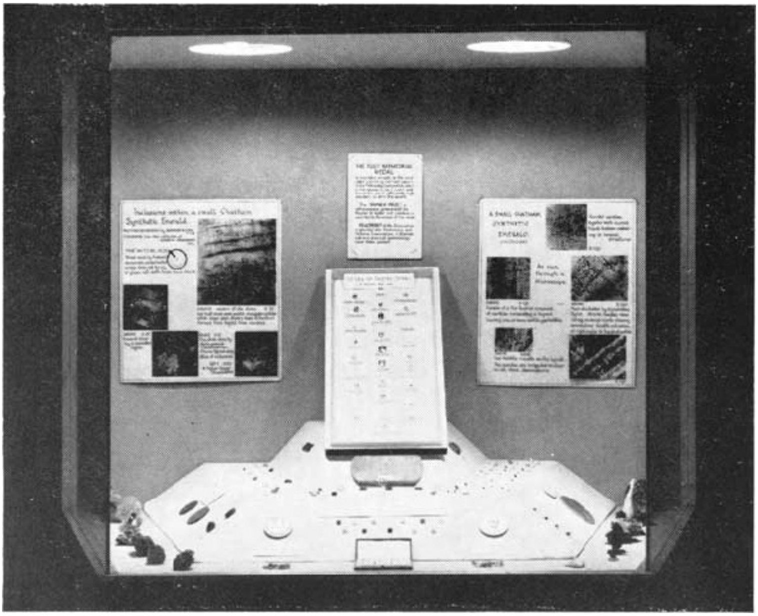
The Jade Exhibit with its contrasting pieces—the primitive weapons, tools and ornaments of the Maoris against a suite of jade jewellery in modern style—attracted much attention. Crossing to the West Wall of the Hall, the first case was the Ansell Collection, which included the famous Ansell Corundums reputed to be the finest collection of its kind in existence. Also included in this collection was a varied selection of spinels and zircons.

The next case told the story of the gems originating in Ceylon—that veritable jewel box. Displayed in proper sequence was the illam as scraped out of the dried up river beds, the dullam after the first process of washing, and the stages of sorting, cutting and polishing to the finished beautiful gem stone.

The Zircon Story followed along the same lines, with a series of photographs forming an attractive background. Here it was brought to the notice of the layman that the attractive colourless, blue and golden-yellow zircons are in reality the brown variety which has been heat treated.

Other items of local interest included massive specimens of various types of quartz found in Scotland—jasper, bloodstone and agates ; also amethyst, citrine, garnet and beryl. Interspersed with these were mounted pieces in gold and silver in the shape of brooches, plaid brooches and a suite consisting of necklet, brooch and earrings.

Other cases emphasized that there are a great number of gem stones which are not generally known, and have, in most cases a strong resemblance in appearance to the more common gemstones. This was emphasized in an exhibition of four stones, identical in colour—zircon, beryl, chrysoberyl and peridot. Other



Rarer varieties of gem material

specimens shown were indicolite, azurite, brazilianite, kornerupine, sinhalite sphene and other rare and lesser known gems.

A pleasing and amusing exhibit was a world map, fronted by a panel of 16 press button switches, each bearing the name of a gem, and visitors were able to locate the world occurrence of the principal stones.

Of particular interest to the student was the series of 15 photomicrographs showing inclusions in natural gems and their counter-parts. This exhibit was specially prepared for the occasion by the members of the East of Scotland Branch of the Association.

In the instrument section were practically all the aids used by the gemmologist in testing, together with explanatory cards, diagrams and models to help those whose knowledge of the subject is limited. The highlight of the section was undoubtedly the case set up with materials which respond to ultra-violet light. This was a piece of very fine equipment which not only delighted the public, but created tremendous interest amongst those acquainted with apparatus of this nature.

The West of Scotland Branch have achieved something of which they have a right to be proud and have undoubtedly created an interest in a comparatively unknown science in these parts.

NEW DIAMOND GAUGE

The new Diamond Gauge which has recently been produced by Messrs. Rayner and Keeler should be of great use to the jeweller as it provides a quick and accurate means of ascertaining the weight of diamonds. There is no other diamond gauge on the British market at the moment. The Leveridge gauge, which costs over £20, and the Moe gauge are unable to be imported.

The Rayner simple caliper takes readings down to 1/10th of a millimeter and the book of tables provided, which is really the most important part of the apparatus, is correct and satisfactory.

The cost of the gauge is 37s. 6d., or with a lens attachment 45s., postage and packing 6d. extra. The lens attachment instead of assisting tends to hinder reading of the scale.

It is a pity that a few extra shillings were not spent on the finish of the gauge and in giving greater clarity to the calibrated scale. Otherwise the gauge is a suitable and satisfactory instrument for the estimation of the weight of diamonds, and we understand it has been rapidly taken up by the jewellery trade.

FURTHER COLOUR FILTER EXPERIMENTS

by L. C. Trumper, B.Sc., F.G.A.

I HAVE made use of the method of feeding stencils successively to the print roll of an addressograph, to feed the large number of colour filters which I now have to a newly designed experimental filter viewing box, in such a way, that without removing my eyes from the viewing position, I can feed in two batches of 25 some 50 filters successively at one loading to a position in front of my right eye, and thereafter these are automatically ejected and restacked in the same order in which they were first loaded into the Feed rack.

Provision has also been made for from one to three filters to be placed additionally over the eye piece so that combinations of up to four filters can be achieved.

In this way with any one filter in the fixed position all other filters can be rapidly passed through and on selecting a suitable combination of two in this way they can if necessary be placed on the eye piece and the remainder passed through again and so further combinations investigated.

In addition to this by suitable fittings which can be rapidly fixed in position, one of the standard filter discs containing four pairs of filters as already described in this Journal, Vol. III, p. 156 (1951), can be inserted in the viewing box and used either alone or indeed superimposed on any of the other filters or combinations of filters.

Finally to provide for future possibilities, three sets of illuminants, all separately switched, are arranged in their lamp houses so that either may be selected to illuminate the box and stones under observation.

One light provides ordinary artificial light for the Chelsea filter, the discs of filters and for general purposes. A lever enables this source to be filtered by the complementary blue filter 45a for fluorescence test of rubies and spinels in conjunction with the Complementary filter 25A. (Vol. III, p. 163). A second illuminant is filtered through the Wratten Photometric filter No. 80 which thus provides an illuminant close to daylight for general observation. The third illuminant is at present a spare for further development.

The construction of the viewing box is largely based on the experience gained with the earlier models, some useful modifications have however been made. The distance from the observing eyes to the stones under test has been increased, with particular advantage to older gemmologists, by 3 inches, by increasing the height of the box 2 inches and the height of the shaped viewing shield by 1 inch. At the same time the width of the viewing shield has been increased by $\frac{3}{4}$ inch to allow for the insertion of a normal face even if wearing glasses of normal overall width.

A slight increase in the depth of the box also allows more room for the viewing section and its fittings which is also removable without the necessity of unscrewing any screws. This is an advantage as it enables the half dozen or more filters which remain in the slide after the last filter has been introduced by the feeder, to be removed quickly.

The rack on the right can be loaded with up to 50 filters which are then fed by the slider one by one into the feed slide by the simple action of moving the slider from right to left, and then back again. Each movement feeds one filter into the slide, the next movement feeds another which at the same time pushes the previous one along ahead of it and so on.

There are three points to be noted should any other gemmologist contemplate making up a similar system. The first and most important, however obvious it may appear to be, is that of filter size standardisation. It does not matter what size but they simply must be all the same. In my case I fortunately adapted a standard right from the very first gelatine filter that I purchased—a filter size of $1\frac{1}{2}$-in. square, bound between cover slips $1\frac{5}{8}$-in. square. There usually is a reason for most things and my reason was a simple one—I happened to have by me a very considerable number of lantern slide cover glasses of convenient thickness (about 20 to the inch), these cut across with a diamond both ways yielded four squares of $1\frac{5}{8}$-in

Lantern slide binding strips were used to bind the gelatine filters between two cover glasses, but the width was first reduced to approximately $\frac{5}{16}$-in. The fourth edge was bound with white strips cut from gummed labels so that the identification of the filter could be written in Indian ink.

The finished thickness of the filter is about $\frac{1}{10}$-in., and when not in use they are stored in grooved boxes as shown—the grooves being $\frac{1}{8}$-in. wide and an $\frac{1}{8}$-in. deep and each box accommodates about 100 filters.

The second point is that the slider must be so made that at the extremity of its travel to the left, the end of it is some multiple of the width of a filter from the end of the filter in its exactly correct place under the viewing eye whether arranged for the left or right eye.

Clearly unless this is so, the slider movement will not feed the filters uniformly to the eye piece.

When using the slide for the purpose of rapidly changing the filters only one eye can be used and the other eye piece is blanked off by inserting a black square of wood or other opaque substance.

The third point is that after the filters have passed across the eye piece, the length of the slide, if necessary as in my case, by the use of an extension piece must be such that the completion of the movement of the slider just ejects the filter clear of the slide so that it can drop into the collecting rack which they do in the same order as placed in the feed rack.

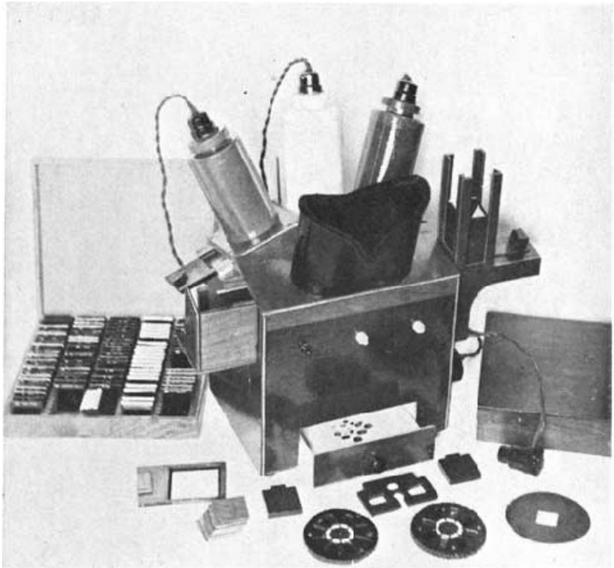
Whereas the feed rack could be any height to hold almost any number of filters, experiment has shown that there is a practical limit to the depth of the collecting rack.

It was found that with anything over 3 inches deep, the weight of the filter was enough to cause it to turn either partly over or with increased depth right over.

The shorter collecting rack is however an advantage, for whereas the feed rack can be loaded with filters a few at a time until a stack of 50 or more are in readiness, the collecting rack is more conveniently emptied 20 or 25 at a time, as lifting out any greater number only results in the stack collapsing and the filters falling about all over the place.

I have also used a simple device with which to lift the stack quickly from the collecting rack.

The feed rack, slide and collecting rack must be accurately aligned and the dimensions of the slide as regards width and depth should allow for easy movement without any danger of a filter binding through slight inequality of the glass covers.



THE IMPROVED EXPERIMENTAL FILTER VIEWING BOX

A Box of Wratten and Ilford filters
B Slide for large illuminant filter
C Dummy filters to eject last seven filters from slide
D Blanks for eyepieces
E Rotating disc of four pairs of filters
F Adaptor to convert to rotating filter disc
G Drawer for gemstones
H Small illuminant slide to take standard size filters
I Collecting tray for ejected filters
J Lamp house for filtered illuminant
K Lever to actuate Blue complementary filter Wratten 45a
L General purpose illuminant lamp house
M Lamp house providing daylight compensated filtered light
N Feed tray with stack of filters ready for a test run
O Slider to feed filters into slide
P Main switch
Q Slotted viewing shield into which disc is slid and held by a pin around which it rotates
Ei Box for filter discs

NOTE.—The three selector switches will be seen on the front of the box and also a filter can be seen emerging from the slide and about to be dropped into the collecting tray I.

The drawer is of adequate size for placing the stones upon for examination and the whole of the inside of the box is painted with a special flat white paint that does not yellow with age, as so many white paints do. It was specially supplied by Hadfields of Mitcham, Surrey. Special Dead Flat White, Number 605278.

The outside of the box has been carefully varnished with several coats. Incidentally the wood used is a ¼-in. threeply with the outer faces cedar wood or mahogany and the inner ply a softer wood and a much wider ply which takes both panel pins and small brass screws without any tendency to split.

The lamp houses have been constructed from household tins of convenient size so that a 75-watt bulb will fit inside and provision has been made for ventilation which should be light tight at the top of each lamp house.

This is the lid end of a tin (a Cadbury Cocoa tin into which a 75-watt Osram bulb will just go), which is removable to enable a bulb to be changed or inserted and carries a standard bulb holder.

The end of the tin which goes into the viewing box has of course been cut away with tin snips.

For rapid identification the lamphouses have been cellulosed respectively red, white and blue and the colours of the push button switches correspond.

The filters over the light sources whether permanent or swinging into position must be light tight, this being achieved by means of a black velvet lining to the filter holder.

For hot air to escape, it must first be able to get in, so a number of holes have been drilled in the base a couple of inches underneath so that light cannot enter and the base itself is about ¼-in. clear of the bench being supported on four rubber buffers.

The push button switches are used to select the desired light source, but for general switching on and off a more robust tumbler switch at the right hand side conveniently placed below the slider is provided and this is in series with each of the push switches which are themselves in parallel.

A convenient length of flex with the usual adaptor is provided for connection with the gemmological switchboard described in the Gemmologist, Vol. 21.

The writer has a separate source of ultra-violet light with its own light tight viewing box, but if desired the central lamp with its ventilating lid could be removed and the viewing box then placed under the " black bulb " of the lamp for testing fluorescence through the filters.

The interesting article in the Gemmologist for March, 1953, by B. W. Anderson on complementary filters, or crossed filters as he prefers to call them, for the purpose of producing fluorescence in many gemstones, particularly the red stones and in emerald, alexandrite, etc., and for their spectroscopic study, has since prompted me to make a further improvement to the box.

The left hand or red coloured lamphouse has been fitted with a slide so that from the left hand side a carrier can be inserted which carries the standard size $1\frac{5}{8}$-in. filter. In this way filters can be rapidly introduced beneath the illuminant and the box flooded with the resultant filtered light.

Filters can be quite rapidly changed for experimental purposes and in addition a further slide carrier has been made to take the largest possible filter (approx. $2\frac{1}{2}$-in. square) for regular use after the required filter has been selected from the experimental set.

By the use of this refinement, it will be possible to work out the most useful set of " crossed filters."

Use of the complementary filters Wratten 44a and No. 25 has already been referred to. At the viewing end, Ilford 204 and 205 is equally effective for ruby and red spinel but Ilford 205 is not so effective with emerald. Ilford 608 gives similar results and the Non-Photographic Kodak filter NP.562 will also serve.

The filter at the blue end over the lamp has yet to be experimented with and that is where the carrier and slide will come in. It is of course desirable that as far as possible the filter selected should be reasonably stable and heat resisting as unlike the other filter, it has to stand up to the heat and intense light of the lamp. In this connection Wratten 44a is reasonably stable and heat resistent and has been selected already for those reasons.

Since carrying out the experiments which were the subject of my article in the Journal for January 1953, Vol. 4, No. 1, pages 27 to 32, I have been able to considerably extend my collection of Filters by obtaining the complete set of Ilford filters amounting to about seventy filters, which in no case exactly correspond to any in the Kodak range of Wratten filters. A further dozen or so Kodak Wratten filters have also been added. In addition I have also obtained a set of about thirty Kodak " Non-photographic " filters. These have been specially made for industrial purposes.

These are generally denser than the Wratten range and are for the most part made to pass a narrow wavelength band only. The available range covers the entire spectrum. These filters are more expensive and are only obtainable as coated glass filters. They can however be obtained cut to any size, so that I was able to obtain a set cut to $1\frac{5}{8}$-in. square and which I then protected by binding a cover glass to the coated side.

It is sometimes difficult to detect which side has the gelatine coating. If in any doubt, a useful check is to gently breathe on what you believe to be the glass side. If your judgment is correct, it will mist over, whereas the coated side will not do so.

Four of the slides proved to be too thick to pass through the instrument but these can of course be readily inserted over the eyepieces.

With the addition of nearly a hundred new filters, it was considered desirable to try further combinations of filters with the blue stones.

The following were a few of the more interesting results obtained with the pale blue stones from hundreds of tests :—

Filters	*Observations*
Wratten 68, 22 & 29F	Beryl, Aquamarine, Tourmaline and Apatite appear black, Topaz and Zircon grey, Euclase and Fluor colourless.
30 Rose Bengal and 203	Tourmaline green, rest colourless.
30 Rose Bengal and 105	Tourmaline green, other colourless but Euclase and Fluor pinkish.
30 Rose Bengal with 302 Minus Red	Aquamarine, Beryl and Apatite blue, Tourmaline a greenish blue, Zircon mauve, Topaz greyish, Euclase and Fluor pink.
Non-photographic 558/C/4	Euclase bright red, Tourmaline deep violet, Fluor pinkish, Beryl bluish, Apatite blackish, Topaz greyish, Zircon greyish.
Ilford 110, 23, E2	Tourmaline green, rest greyish.
302 Minus Red, 23 E2	Similar to Chelsea Filter.

Filters	*Observations*
105 and 302 Minus Red	Fluor and Euclase pink, Zircon colourless, Topaz pale blue, Tourmaline, Beryl, Aquamarine, Apatite peacock blue.
Non-photographic 552/5 and Ilford 501, Micro 6	Aquamarine, Blue Beryl, Blue Apatite and Tourmaline a bright Peacock blue, Zircon grey/colourless, Euclase and Fluor pinkish, Topaz colourless. (Better than 558/C/4 and very similar to the filters 30 and 34a already selected).

So far for pale blue stones, I have been unable to improve on the filters already selected. A further attempt was then made with blue stones of a deeper blue that could easily be confused with blue sapphires, namely two blue tourmalines, two blue spinels, three cobalt blue pastes, a blue garnet topped doublet, a benitoite, a royal blue kyanite and a royal blue iolite.

Many hundreds of tests were then made of which the following are a few of the more interesting results :—

Filters	*Observations*
207 Infra red	All black except the cobalt pastes which were reddish to bright red.
Ilford 111	Both tourmalines green, the pastes slightly greenish, rest black.
NP.549, Ilford 111	Pastes and the garnet topped doublet bright red, rest black or greenish.
NP.549, Ilford 110	Pastes and garnet topped doublet bright red, tourmalines bright dark green, rest black. (Better as background is nearly white).
12 Minus blue	Pastes green or greenish, tourmalines green, rest colourless.

Again it is felt that so far, the filters for the examination of blue stones have not been improved upon, but nevertheless the above examples will show the kind of results that can be obtained and may serve as a guide to other workers.

In conclusion it may be said that colour filters however well they may be selected can never replace the accepted methods of gemstone identification but they form an additional interest and a very quick method of initially checking a parcel of stones and of segregating doubtful specimens.

G. F. HERBERT SMITH, C.B.E., D.Sc., M.A.
1872 — 1953

ASSOCIATION NOTICES

DR. G. F. HERBERT SMITH

— AN APPRECIATION

To everyone who knew him well, the sudden death of Dr. Herbert Smith on 20th April came as a great shock. True, the evidence of the calendar was there to prove that he was over eighty years of age ; but, until the last few weeks of illness, he was so cheerful, so active, so mentally alert, that one somehow did not think of him as an old man, whose going might soon be reasonably expected.

For more than forty years he had rendered brilliant service to the cause of gemmology in this country, and the influence of his work here had spread throughout the world. To realise how great that service was is difficult for anyone who is not himself of that older generation.

His book, " Gemstones," first published by Methuen in 1912, and now in its twelfth edition, had achieved classic status almost from the outset, and, though popular in its appeal, set a standard of scholarship and accuracy that is unlikely ever to be excelled. The refractometer which bears his name is another enduring monument to his fame. It was the first efficient instrument to enable the jeweller to measure the refractive indices of mounted stones, and was a leading factor in establishing gemmology as an exact science.

By the high standards he insisted upon as an examiner, he ensured that the Diploma of the N.A.G., and later of the Gemmological Association, was a distinction with an enviable reputation at home and abroad. Moreover, it was mainly due to his tactful, authoritative, and persistent advocacy that the metric carat was officially adopted in this country in 1914, superseding the old " English " carat with its incredibly clumsy fractions as a medium for trade in precious stones.

When the Gemmological Association at length became a separate entity it was Herbert Smith's influence which enabled us to claim in succession such illustrious scientists as Sir Henry Miers and Sir William Bragg as Presidents of the Association. That he himself should then become our President was supremely fitting. It is good to know that he appreciated the honour keenly. On the title page of " Gemstones," after the author's name, there is no parade of distinctions to which he was entitled (D.Sc., M.A., C.B.E.) but simply the phrase " President of the Gemmological Association of Great Britain." He never considered his office to be a mere sinecure, and was a constant attender at the Council meetings of the Association and at its major public gatherings. For many years he made it a practice to visit the Gemmology classes at Chelsea Polytechnic and deliver a short informal address of welcome and encouragement to students attending their first classes there.

He never courted publicity : his manner and appearance were, in fact, somewhat forbidding. But he was a loyal and generous friend to those who were not deterred by this lack of superficial cordiality. He had a keen sense of humour and an unusual fund of true humility which made him not too proud to accept correction and advice from his juniors when he realised that this was well founded.

While his book and his refractometer remain as tangible memorials to the name of Herbert Smith, of little less importance are those intangible qualities of integrity and respect for truth which his influence and character caused to be built in to the very fabric of the Gemmological Association of Great Britain.

Dr. Herbert Smith was born in 1872. He was the elder son of the Rev. George Smith, head master of Edgbaston Proprietary School, and of Doncaster School. He was educated at Winchester and New College, Oxford, where, as a scholar of the college, he read mathematics and physics. He studied crystallography under Professor P. Groth at Munich and later took up an appointment at the British Museum (Natural History), as an assistant in the department of Mineralogy. Later, in 1931, he became Secretary of the Museum and subsequently Keeper of Minerals (1935) until his retirement in 1937. He wrote many important papers on mineralogy and crystallography and, apart from his well-known refractometer, designed the three-circle goniometer.

He was a Fellow of the Royal Astronomical Society and of the Geological Society for many years, and a life member of the Mineralogical Society of Great Britain.

Apart from his keen interest in the Gemmological Association, Dr. Herbert Smith was Honorary Secretary of the Society for the Promotion of Nature Reserves and of the Nature Reserves Investigation Committee. He was also chairman of the Wild Plants Conservation Board and a member of the executive committee of the Council for the Preservation of Rural England. Outside scientific fields Herbert Smith had many activities, which included work for the Society of Civil Servants and the Civil Service Arts Council. He was also a member of the Council of the Royal Albert Hall.

Dr. Herbert Smith bequeathed his scientific books to the Association and the oil painting of himself, which was presented to him by the Association on the occasion of his retiring as senior examiner.

B.W.A.

TWENTY-THIRD ANNUAL MEETING

A tribute to the memory of Queen Mary was paid at the opening of the twenty-third annual general meeting of the Gemmological Association held at Goldsmiths' Hall on 1st April.

The Chairman, Mr. F. H. Knowles-Brown, who presided in the absence of the President, Dr. G. F. Herbert Smith, recalled that Queen Mary had always shown great interest in the association's work and given it her support in recent years. Members stood in silence as a token of respect to her late Majesty.

Mr. F. E. Lawson Clarke, the Honorary Treasurer, presenting the accounts, said there was a small surplus. It was, however, considered necessary to increase the Fellowship subscriptions from one guinea to 30s. 0d. next year. The present rate had been maintained since 1947.

Mr. Knowles-Brown in reviewing the events of the year said the most important happenings had been the establishing of branches. For some years it had been felt that this was desirable, because it gave an opportunity for those who could not get to London to meet together and further the work of the association. Three branches had been formed, two in Scotland and one in the Midlands. Already a great deal of work had been done. At a recent Birmingham meeting of the Midlands branch the attendance was seventy, which showed the extraordinarily good support. He thanked those who had helped to get the branches going.

Dr. Gübelin's lecture on diamonds had been notable and a twelfth edition of Dr. Herbert Smith's book had been issued with new material, together with a new publication from their vice-chairman, Sir James Walton.

The report and accounts were adopted.

The officers of the association were re-elected and it was agreed to send a letter to the president, Dr. G. F. Herbert Smith, hoping that he would soon be recovered from his illness.

Mr. F. Ullmann congratulated the Vice-Chairman on his book which was so helpful to students.

The retiring council members were re-elected and the Chairman in thanking all council members for their help said there had been a very good attendance at the council meetings.

Mr. G. Myers suggested that a lapel badge should be available for members who wished to wear it. Some members, he said, had expressed the view that such a badge was superfluous, but he thought it was needed for the reason that some Fellows like himself were behind the counter. Other assistants who were not gemmologists sometimes gave information to the public that was inaccurate. He had heard members of the public told that there was no difference between a diamond and a zircon except price. If an assistant were to wear a badge the public would notice it and have confidence in it, or, receiving inaccurate information, could take up the matter. Horologists wore a badge showing their proficiency. A badge would give a better understanding between the laymen-customer and the gemmologist.

Mr. Fishberg supported the idea and said he had taken the liberty of having a badge made for display which had been used in the retail business. It had been noted by the public, who had thus learned about the association.

Mr. F. Ullmann expressed opposition to the wearing of badges, saying it would lower the status of the association. Professional men, doctors, lawyers and so on, did not wear badges. If a man knew his subject, this was apparent to all. Mr. S. Redknap pointed out that it was a fallacy to think that examinations alone made an expert. He knew many people in the trade who had not passed examinations but who had forgotten more than he would ever know. Experience was necessary in the making of a gemmologist. Theory was not all.

The Chairman said the question had been raised before. The matter would be considered by the council if the meeting wished it.

Sir James Walton referring to the point made about the professions, said that the public could look up the qualifications of a doctor or surgeon in a reference book. Gemmologists had no such directory. He hoped to see a trend towards all people in the trade becoming qualified members of the association until any who were not would be working under a handicap.

On a vote being taken on whether the council should consider the introduction of lapel badges, it was heavily defeated.

MR. S. F. BONES

The death occurred in London in May of Stanley Frederick Bones, who was Honorary Treasurer of the Association from 1947 until his resignation on account of health in 1951. He obtained his Fellowship Diploma in 1946 and, after his election to membership gave much time to serving the Association.

NETHERLANDS GEMMOLOGICAL ASSOCIATION

At the annual general meeting of the Netherlands Gemmological Association (Nederlandsch Genootschap voor Edelsteenkunde) held in Amsterdam on 4th May, the following Officers were elected :—President : Ing. J. Hammes, F.G.A. ; Treasurer : D. Dresme, Jr., F.G.A. ; Secretary : D. Vos, F.G.A. Messrs. A. Bonebakker, F.G.A. and A. Schaap, F.G.A. were elected to serve on the Council of the Association.

TALKS BY MEMBERS

Parkinson, K. : " The testing and discrimination of precious stones." Sheffield and District Branch of the British Horological Institute, 27th May, 1953.

Meader, N. A. : " Famous gems of the Crown Regalia." Boscombe and Southbourne Rotary Club, 21st May ; *ibid.*, Bournemouth Seroptimist Club, 8th June, 1953.

Leak, F. : " The Coronation Jewels," Canadian Club of Bristol, 11th June ; *ibid.* Patient's Staff, Bristol Mental Hospital, 25th June.
