Vol. VIII No. 6 April, 1962

THE JOURNAL OF GEMMOLOGY

and

PROCEEDINGS OF THE
GEMMOLOGICAL
ASSOCIATION
OF GREAT BRITAIN

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OF GREAT BRITAIN
SAINT DUNSTAN'S HOUSE, CAREY LANE
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Vol. VIII No. 6 APRIL 1962

TWO UNUSUAL LABORATORY TESTS

By B. W. ANDERSON

TWO cases recently encountered in the course of routine laboratory testing were sufficiently unusual to seem worthy of record.

The first case concerned a dark red stone of perhaps one and a half carats, mounted with two small diamonds as a three stone ring. The stone was isotropic, had a refractive index of 1·744, and showed no perceptible fluorescence under ultra-violet light or between crossed filters. A stone with these properties might well pass as pyrope garnet.

Under the microscope, however, there was seen an extensive " feather " consisting of octahedral inclusions, which virtually proclaimed the stone to be spinel, and this was confirmed by a study of the absorption spectrum in which the positions of a number of fine lines in the red were measured as well as the approximate wavelength at which the broad absorption region in the green was centred. The measurements of the lines were as follow:— 7030Å, strong; 6940, weak; 6820, strong; 6730, very weak; 6620, very weak; 6550, strong; 6480 and 6410, weak. The broad absorption extended from approximately 6000 to 4800Å, giving a central position of near 5400Å. In pyrope the narrow chromium bands are seen as a doublet at 6870 and 6850Å, sometimes with weaker lines at 6710 and 6500Å, while the broad absorption region is centred near 5700Å—that is, 300 Angstroms further towards the red than in spinel.

The high refractive index of the stone under discussion, its numerous absorption lines, deep colour, and lack of fluorescence all signified an unusual amount of chromium in this spinel. The highest refractive index we had previously observed in red spinel was 1·736, and even this was considerably above any other we have encountered, 1·730 being a more normal limit for stones of gem quality. It was most regrettable that the density of this phenomenal spinel could not be measured to complete the record. Previous experience in plotting a density/R.I. graph for these two minerals had shown that in pyrope there is a far steeper rise in density proportionately to refractive index—and though the refractive index of the lowest pyropes overlaps that of the highest spinels there is still a small density gap between the highest we have recorded for red spinel (3·611) and the lowest for red garnet (3·643). Even in the case of this exceptionally chrome-rich spinel, one would guess the density to be not more than 3·63, whereas the many garnets we know with a similar index (1·744) have a density around 3·70.

That a red spinel can attain such heights and may then show no fluorescence is worth knowing by practising gemmologists.

The second case was interesting chiefly as an exercise in technique. It concerned a hoop ring set with alternate panels of three diamonds and three emeralds, there being in all 12 stones of each species. Except for one Siberian and one Colombian stone, identified by their inclusions, the emeralds were palpably Chatham synthetic stones, as seen by their colour, inclusions, and effects under the Chelsea filter and ultra-violet light. Refractive index measurement was, however, not possible owing to the small size of the stones and to the fact that their tables were flush with the metal setting of the ring.

To overcome this difficulty an immersion contact photograph was then attempted with some success considering the difficulty implicit in such small stones enclosed in a setting. Bromobenzene was chosen as the immersion fluid, as calculation based on its previously measured dispersion showed that for the blue-violet light operative for the photograph this liquid would have an index above that of the synthetic stones and below that of any natural emerald: and so it proved. In the dark-room, the ring was fixed with plasticine to the edge of a glass dish in a slightly tilted position with one panel of the synthetic emeralds resting on or near the bottom of the dish containing the bromobenzene. A loose synthetic emerald

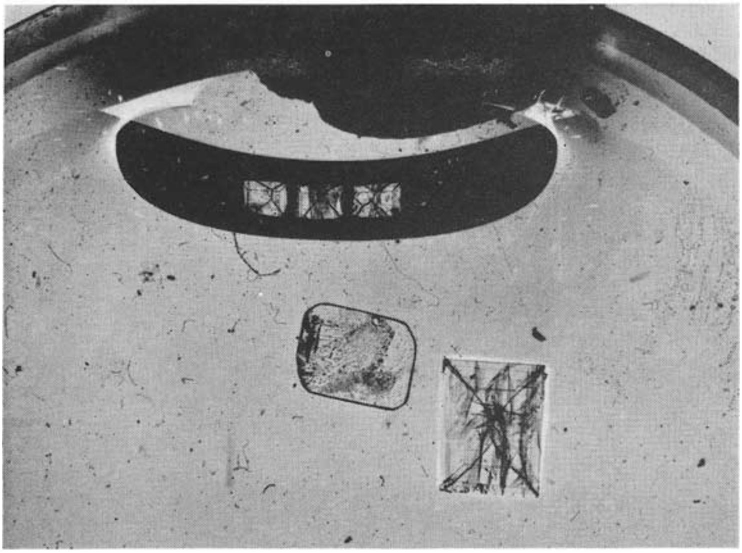


Fig. 1. *Immersion contact photograph using bromobenzene showing a panel of three synthetic emeralds mounted in a hoop ring, with a natural emerald (left) and synthetic emerald (right) as controls.*

and a Colombian stone were placed nearby in the same dish to act as indicators. A narrow beam of light was projected vertically downwards through an enlarger housing and allowed to fall on the specimens and on to a piece of fine-grained film underneath the dish—the exposure being some ten seconds. The film was developed and fixed, washed and dried, and a slightly enlarged print of this is reproduced as Fig. 1. It can, I hope, be seen quite clearly that the dark lines representing the facet edges of the loose synthetic emerald exactly match those of the synthetic emeralds in the ring. The Colombian emerald shows no such effect, and the dark surrounding border reveals that the index of this stone is slightly above that of the liquid.

A RARE SYNTHETIC

By R. KEITH MITCHELL

A SHORT while ago a good friend in America sent me a very beautiful brilliant-cut stone weighing about half a carat, sage green in colour with the lustre and fire of a fancy diamond. The refractive index was obviously well above the range of the normal refractometer and since the stone was appreciably harder than corundum it was perhaps as well that my friend had written the name of the material on the stone paper !

The gem is in fact, an extremely rare example of a material which exists only as a synthetic substance, and which, paradoxically, is manufactured in very large quantities indeed. This material is the abrasive silicon carbide (SiC) or carborundum, and the stone I now have in my collection is rare simply because crystals of a size and quality suitable for cutting are unusual. In addition, they require special cutting techniques because of their hardness, and only diamond dust is hard enough to facet and polish them. My friend, an amateur lapidary of quite exceptional skill, had to wait several years before crystals suitable for cutting were found.

The material is interesting since it provides an example of yet another method of synthesis. Descriptions of the Verneuil, the hydro-thermal and the melt-diffusion processes are already familiar to most gemmologists, but carborundum is produced on a far vaster scale than any of these in an electric arc furnace, which is quite unlike the apparatus used for any other synthetic gem.

It is interesting to note that this substance, like so many others, was first made accidentally. In 1891 E. G. Acheson, a chemist, was trying to produce diamonds by heating electrically a mixture of coke and clay, when he obtained what he thought was a compound of carbon and aluminium. Since aluminium oxide was already called " corundum ", he gave the new product the analogous name of " carborundum ".

However, it was quickly realized that the new material was in fact a compound of silicon and carbon, to which the chemical name silicon carbide was given. But Acheson's " carborundum ", which was first used as a trade name, has stuck and is now a " household " word throughout the machine shops of the World.

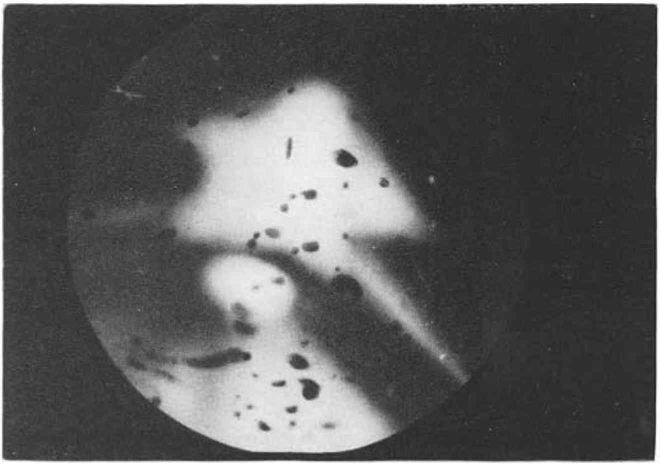
To-day this valuable abrasive is made on a large scale, usually in places like Niagara where considerable hydro-electric power is available. A mixture of low-ash coke and glass sand (pure SiO_2) is placed in a large brick box (anything up to 60ft. × 20ft. in size) a central channel is scooped out and filled with metallurgical coke, which is in contact at either end with carbon electrodes. A very heavy current of 500 volts and up to 40,000 amps is used to reach a temperature of between 2000° and 2600°C.

As the resistance of the core (SiC is a good conductor) gets lower the voltage is decreased to about 75V. The process releases considerable quantities of carbon monoxide gas, which burns on the outside of the oven and helps to reduce heat loss. The process has to be stopped before the growing core of silicon carbide reaches the brick container, since the temperatures involved are high enough to fuse any refractory brick. This results in a multicrystalline porous mass of the material in which individual crystals (which are hexagonal in symmetry) are usually minute and rarely exceed 1 cm in length. When the material is pure these are pale green in colour, but less than 1% of impurity will render them black and opaque. The major proportion of the material produced obviously is not pure, since it is intended only for use in industry.

Many readers will be familiar with spectacular crystals of carborundum to be seen in some museum collections. These are commonly iridescent in vivid hues, due to the fact that an ultra-thin film of SiO_2 forms when the crystal is heated to 1000°C in air. These museum crystals are exceptional in size and have probably grown in fissures or holes in the mass and it seems probable that air has reached them during cooling and resulted in the iridescent film being formed.

As would be expected, the cut stone in my possession shows no trace of such iridescence. The lustre is better than adamantine, and with quoted RIs of 2·648 and 2·691 (higher than diamond) the birefringence of ·043 is easily seen with a lens through the side facets. Rather surprisingly this stone appears to have been cut across the hexagonal prism so that the direction of single refraction is straight down through the table into the stone. This serves to make it very much like a green fancy diamond in appearance. A figure for dispersion is not available but it appears to be rather greater than that of diamond. Specific Gravity is about 3·20, low for a material of such refractivity, but to be expected in view of the composition. The great hardness (usually quoted as 9½ on Mohs' scale) is also to be expected.

One very interesting feature is the presence of many platey hexagonal inclusions. These appear to be negative and are evidently oriented parallel to the parent crystal since they all reflect light at one angle, and the hexagonal outlines also seem to be in parallel although the relative development of faces differs from inclusion to inclusion. One or two appear to be orthorhombic in outline, due to the almost complete suppression of two of the opposed sides of the hexagon. Most of the inclusions are opaque, but many of the larger ones are transparent for about a quarter of their area. The accompanying illustration gives a general picture of these inclusions.



Finally, bearing in mind the high prices asked and paid for synthetic emeralds and for the strontium titanate " fabulite ", one is moved to wonder how long it will be before someone sees the possibilities of this " new " gem. A small scale production under controlled conditions, directed specifically at obtaining stones of gem size and using very pure ingredients, does not seem an impossibility, and the resulting stones would be both attractive and very hard wearing !

COMPACT SODIUM LIGHT SOURCE

THE use of a light of single wavelength, which eliminates the white light spectrum, has been of great benefit to gemmologists when using the refractometer. The early gem enthusiasts used salt burnt in a gas flame, because in those days it was inexpensive and the sodium light sources then available were expensive and somewhat cumbersome.

Messrs. Rayner have recently developed a monochromatic light source with slide fitting for the Rayner standard refractometer. The illustration shows the refractometer in position. By using sodium light readings of greater accuracy can be obtained. The lamp strikes immediately it is switched on and after a maximum of five minutes gives an almost pure sodium emission. Readings may be taken within a few seconds of switching on.

The ballast choke, starter and switch are housed in a metal casing which measures $6\frac{3}{4} \times 3\frac{1}{2} \times 3\frac{1}{4}$ inches, and the lamp hood enclosing the lamp measures $2\frac{1}{2} \times 1$ inch diameter. The lamp hood has two apertures, which measure $1 \times \frac{3}{16}$ inch, and which are set opposite to each other.

The new instrument has been wired for direct connection to 110/130 or 210/240 volts a.c.

Most gemmologists consider that the three most important gem-testing instruments are the microscope, the refractometer and the spectroscope. A sodium light source is almost indispensable for use with the standard type of refractometer and the two together are likely to be known as the jeweller's pair.

Most serious gemmologists, once having taken accurate refractive index readings by using sodium light, rarely have recourse to ordinary light when using a refractometer. The extremely sharp shadow edge which is obtained makes refractometer work a pleasure and when a doubly refracting stone is being tested the behaviour of the two shadow edges can be more easily observed.

The sodium source unit, with slide fitting, costs £18 15s. 0d. A spare sodium lamp is £7. The Rayner standard refractometer is obtainable for £19 15s. 0d. (complete with refractive index liquid) and all these items are distributed by the Gemmological Association.

If the special polarizing filter for doubly refracting stones is used it is possible for each shadow edge to be taken separately. This filter, which costs £1 10s. 0d., also assists in determining whether the optical sign of a stone is positive or negative.

WHEN HOMER NODDED

B. W. Anderson

Being at present engaged in some research on the behaviour of low-type zircons, I have had occasion to dip into some of the older books on gemstones to learn what was generally known in each period of the peculiarities of zircon behaviour.

Turning to " Precious Stones ", L. J. Spencer's translation (1904) of Max Bauer's classic " Edelsteinkunde ", I was astonished to read, in the course of a description of zircon, the following sentence: . . . " On the other hand, the refractive indices for different colours do not differ much, hence the dispersion of zircon is small and its play of prismatic colours correspondingly insignificant, so that, although in brilliancy and lustre it may compare with diamond, yet in the former respect no comparison is possible ".

It seemed unlikely that a scholar who later became so famed for his bibliographical accuracy as Spencer could have made a mistranslation (except as a deliberate act of revision), but I turned at once to the original passage in the (1896) German edition of

" Edelsteinkunde " to read : . . . . " Dagegen weichen die Brechungskoefficienten für die verschiedenen Farben nicht viel von einander ab, die Farbenerstreuung ist also gering ". . . . So the translation was not at fault.

Another passage in the same sense is to be found in Goodchild's " Precious Stones ", published not long after, and was almost certainly derived from reading Bauer's work, to which Goodchild refers specifically on several occasions. The passage runs: " The dispersion, however, is feeble so that the mineral when cut shows a lack of fire ".

The mistake cannot be ascribed to the continuance of a false tradition, since reputable authors writing *before* Bauer were quite clear on the subject. A. H. Church, for instance, in the 1891 edition of his "Precious Stones", wrote of zircon: " . . . its ' fire ', owing to its high dispersive power, comes next to diamond ", while G. F. Kunz in his " Gems and Precious Stones of N. America " (1892) states that zircon " exhibits more ' fire ' than any other known gem except the diamond ".

Reverting to books written *after* Bauer we find (as one would expect) that Herbert Smith, in his first edition of " Gemstones " (1912), has the matter right: "Of all the gemstones zircon alone approaches diamond in brilliance of lustre and it also possesses considerable fire ". To quote further authorities would be tedious and unnecessary, but one should perhaps record that Prof. K. Schlossmacher when revising and largely rewriting Bauer's " Edelsteinkunde " in 1931, states unequivocally of zircon " Die Dispersion ist stark ".

What makes this matter more extraordinary is that Spencer, who had the opportunity to revise as well as translate, and Goodchild in his own book, should follow the master in his error, since both were trained mineralogists with normal eyesight.

This is not intended as an attack on Bauer, for whose immense contribution to the literature of gems more than one generation had cause to be grateful: but it does serve, I think, as a useful reminder that even Homer can nod, and that reading and quoting authorities is no substitute for making use of one's own eyes and relying on one's own experience wherever possible, in matters which are within one's competence.

TESTING A SAPPHIRE

By A. E. FARN

I HAD considerable pleasure chatting to an Australian gemmologist recently and discussing testing methods. We each had our strong points and particular methods, but what impressed me was the question of a clean sapphire with no inclusions. How could this be determined ? Obviously an absorption spectrum was the answer, and the 4500Å line was mentioned. Now this started the question of the spectroscope and its use. First of all I must mention that having been brought up, gemmologically speaking, by B. W. Anderson, it is obvious I have used the spectroscope in routine gem testing rather more than any other instrument, except a lens. We have our own train of thought regarding gem-testing and, I suppose, because of years of practice we readily recognize many gemstones and therefore test with the obvious instrument in the shortest time. This may sound a little clever or presumptuous. It is not meant to be, but rather to help in pointing out a normal reaction and approach to routine testing.

Take for instance a perfectly straightforward sapphire in a diamond cluster surround ring; the sapphire is to be tested. A brief glance usually indicates whether the stone is genuine or synthetic. The colour, cut and appearance of the stone convey a wealth of information—which only comes with the constant handling of stones. In other words we " get our eye in ".

The next step is to use the microscope on the stone in the ring (or a lens if it is a stone of 1½ cts or more). A careful examination back and front and turning the stone will usually show an inclusion or group of inclusions such as silk, crystals, laths, twin planes, liquid feather, two phase inclusions, zoning of colour, etc. These should be ample to decide the stone being genuine and also to the experienced gemmologist the provenance of the stone. Turning the stone during examination under a microscope also gives other aspects of information, such as dichroism when the stone is viewed at right angles to the table facet, which is always a useful guide and clue to correct cutting as against haphazard cutting of a boule of synthetic sapphire (or ruby). When examining the stone the doubling of the back facets can also be seen, which eliminates paste or blue spinel.

Although these all seem fairly obvious statements the critical use of the microscope can reveal much to the expert eye.

Another useful factor is the shatter marks (due to excess heating when cutting and polishing). These are mostly seen on cheaply cut synthetic stones and although not proof positive can also be an added factor towards establishing the nature of a stone. Some people call these small erupted scars on the underneath facets of sapphire (and rubies) shatter marks and others chatter marks. I cannot recall I have ever seen such marks on a well cut natural ruby or sapphire of any importance.

Having now dealt with the stone which contains natural characteristic features, the next step is finding the stone to be perfectly " clean ". Inspection by microscope will reveal the stone to be homogeneous, and doubling of the back facets will prove that it is not paste or blue spinel, dichroism is apparent and because of the cleanliness of the stone the next thing to do is to take its refractive indices to check it being corundum. This may seem a late step to take, but normally I never bother with a stone which has typical Ceylon, Siam, Burma or Kashmir inclusions. This stone though is clean blue corundum. Here the spectroscope really comes into play. Most genuine blue sapphires have an absorption spectrum centred around 4500Å, and this is diagnostic. This band at 4500Å is lacking in synthetic sapphires.

Now, the method of measuring or seeing an absorption spectrum.

Always check the slit of the spectroscope against daylight, when the Fraunhofer lines will be seen and adjust the slit to actual sharpness. I always view spectra with red on the left and blue on the right. The best hand spectroscope for the job is the Beck 2458 prism model. The spectroscope is so immediately diagnostic that it supersedes many established methods, since it is accurate with both rough and cut material and does not wear out. There are quite a few limitations, however, to the spectroscope, as indeed there are in most instruments designed for gem testing.

To teach yourself spectroscopy it is necessary to obtain specimens of gemstones, such as almandine garnet, sapphire, ruby, zircon, chrysoberyl, emerald, spinel. Three ingredients are necessary to see an absorption spectrum easily—a light source, microscope (or condensing lens) and a spectroscope (and, of course, a stone).

After having adjusted the slit of the spectroscope by checking the spectrum in daylight, the microscope is placed in front of a light source and the eye-piece removed from the microscope so that only the draw tube, condenser and objective remain. Now take a piece of ground glass and place it over the draw tube where the eye-piece should be and switch on the light source and focus on the filament of the lamp bulb itself until it appears visible as a magnified glowing bright wire on the ground glass screen. The ground glass obviates glare and saves eyestrain and helps concentration and observation. Next place the sapphire on the glass slide of the microscope stage when it will be very readily seen in the ground glass as a blue stone (still mounted in its setting). It is obvious that the stone is now in line of light transmission and light now hitting the ground glass screen has passed through the sapphire. Take away the ground glass screen and place the spectroscope upon the tube of the microscope and look into the spectroscope. Here should now be seen a fine line like a pencil streak vertically down the blue sections of the spectrum. This line is diagnostic of genuine blue sapphire. At first there will be hitches as in all new techniques—none of them are serious and to the gemmological enthusiast they only serve as an added incentive to that goal of gemmology where one can say safely and assuredly one has seen and is able to recognize with the spectroscope the absorption spectrum of sapphire.

The hitches one will encounter will be varied. Firstly a light of sufficient intensity is necessary—of 150 watt upwards. Secondly, it is possible to put too small a specimen on the stage and so flood the tube of the microscope with light as to blind oneself to the comparatively weak affect of the absorption band. This is easily and speedily remedied by placing the stone on a piece of cardboard with a hole punched through to allow the stone to sit in and thus allow only light through the stone and blank off all extraneous light. Another hitch can be in the variety of strengths of bands seen at 4500Å.

The Australian sapphires score heavily here since so much iron is in their composition that the band is virtually a complex centred at 4500Å up to 4600Å (which appears as a block more than a pencil thin vertical line) in the blue portion of the spectrum. Ceylon sapphires are the reverse having rather a medium to weak spectrum and here it pays to turn the stone in order to get the strongest possible concentration of transmitted light. Needless to say one needs practice, it being quite easy to say what should be seen whereas in practice at first it may not be so readily seen. There are one or two tips which will help. When dealing with a sapphire and the blue end of the spectrum—if a line seems vague it does help to tilt the spectroscope to the right, remembering that the law is red on the left, blue on the right. This tilting seems to enhance or bring into stronger or better focus those vaguer lines at either end of the spectrum.

It is better to commence the study of absorption spectra of sapphires with natural stones in order that the spectrum can be seen and its position fixed in one's mind's eye. Then as one becomes more familiar and assured in one's diagnosis it is possible to extend and extemporize, and to obtain diagnostic results from variations of the set-up of lamp, microscope and spectroscope. A word of warning here on high wattage lamps; these generate a fair amount of heat, especially when focused and condensed through the microscope onto the stage glass slide. If this small focal spot of heat is projected to a stone and left for a while the stone could suffer damage—at least one good turquoise suffered this way. One well-established method of overcoming this trouble is to use a glass chemical flask such as can be purchased at any laboratory suppliers. The flask filled with water acts as a condensing lens and as a cooling filter to the heat rays from the filament of the lamp. A second flask filled with a solution of copper sulphate can act as both cooler, condenser and colour filter and will often help accentuate weak lines in the blue portion of the spectrum since the copper sulphate solution cuts out the red end of the spectrum. The copper sulphate solution is made up from distilled water and ideally is kept just below saturation point or else crystallization will occur with temperature variation of room heat. As one grows more proficient one can vary the depth of copper sulphate filter and keep them labelled as being suitable for various wavelengths.

Gemmological Abstracts

Gübelin (E. J.). *Ekanite.* Gems & Gemology, Vol. X, No. 6, pp. 163-179, Summer 1961.

A very full account of the new metamict mineral named ekanite. The stone is said to come from Ellawala, north-east of Ratnapura in Ceylon. It is found in the illam which lies at a depth of 35 to 40 feet. The stone, which has an appearance like that of kornerupine, is a greenish-brown to yellowish-green in colour. It is usually rather turbid and is in some cases asteriated or chatoyant. This optical effect was found to be due to clouds of tiny inclusions with definite orientation. The types of inclusion present are described. The refractive index—the stone is singly refractive—is 1·595, and the dispersion 0·0183. The density was determined as 3·28. Two weak and blurred absorption bands were observed at 6551Å and 6375Å. Chemical analysis showed that Ca, Th, Si, Al and Pb were present, but neither the rare earths nor zinc were detected. The stone was first thought to be a glass. The stones were found to be strongly radioactive and comments are given of the radioactive intensities for the α, β and γ rays. There was a general intensity comparable to that of a fresh watch dial. Discussion is made on the probability of the original mineral from which ekanite evolved. The age of the mineral assessed from thorium lead dating method is given. This article is a very full exposition of the new mineral. (J.G.VIII, 3)
14 illus., 2 tables. P.B.

Benson (L. B.). *Developments and highlights at the Gem Trade Lab in Los Angeles.* Gems & Gemology, Vol. X, No. 6, pp. 187-190, Summer 1961.

Describes the wearing to barrel-shape of a string of cultured pearls which was probably due to acid exudation from the skin of the wearer and the cosmetics used. Some of the pearls were more lustrous than others and these were less affected. Comments are made on a high type of green zircon and on a cloudy peridot.

" Cape May diamonds " are rock crystal from Cape May in New Jersey, but one such stone tested was found to be a synthetic white spinel.
2 illus. P.B.

Bastos (F. M.). *The gemstones of Brazil.* Gems & Gemology, Vol. X, No. 7, pp. 195-201, Fall 1961.

An account of the gem resources of Brazil. The gemstones found in each of the main States of Brazil are discussed. The stones mentioned are the agates from Rio Grande do Sul, from which state is also found much amethyst and rock crystal, diamonds from Parana, and diamonds, sapphires and emeralds from Goiás and Mato Grosso. Espiranto supplies citrine quartz and andalusite, and in Bahia there is found amethyst, sodalite, amazonite and prase (?) which is a heat-treated quartz. In the states of Rio Grande do Norte and Ceara, garnets, aquamarines and amethysts are found. Minas Gerais is the most fruitful producer of gem materials, particularly of all colours of beryl. Greenish beryl is heat-treated to produce the blue aquamarine and yellowish pink beryl to improve the colour to a good pink. Other stones from Minas Gerais are tourmaline, citrine, garnet, euclase, chrysoberyl, peridot, andalusite, opals and some corundum, feldspar, brazilianite, kyanite, topaz and diamond.
4 illus. P.B.

Crowningshield (R.). *Developments and highlights at the Gem Trade Lab in New York.* Gems & Gemology, Vol. X, Nos. 6 and 7, pp. 180-186 and 191; 216-223, Summer and Fall 1961.

Reports on star-sapphire doublets with cobalt-coloured dye between, on crackled synthetic rubies and on a carved pearl shell. Vivianite, williamsite and andalusite are discussed and comments made on their absorption spectra. Mabe pearls are discussed. This seems to be a term used for cultured blister pearls. Purple clam pearls and abalone pearls are mentioned. Early pearls with non-fluorescent cores are reported. There is an interesting record of a series of experiments on the reaction of pearls to vinegar and eau-de-Cologne. A coated diamond crystal and a cabochon of the mineral carnotite are described.
31 illus. P.B.

VIERTHALER (A. A.). *Wisconsin diamonds.* Gems & Gemology, Vol. X, No. 7, pp. 210-215, Fall 1961.

The origin of the diamonds found in Wisconsin and the history of the diamond finds there is given and mention is made of some of the diamonds found in the locality.

4 illus. P.B.

WEBSTER (R.). *Corundum in Tanganyika.* Gems & Gemology, Vol. X, No. 7, pp. 202-205, Fall 1961.

A report on the corundum crystals found in Tanganyika. The ruby crystals occur in a green zoisite rock, which is used as an ornamental stone, called anyolite. The article mainly describes the crystals found in the Gerevi Hills of Tanga Province. The sapphire crystals from this locality are squat hexagonal prisms. The colour along the " c " axis is bright blue but is marred by a yellow core, which seems to be characteristic for Gerevi Hills sapphire. The density was found to be 3·99. No refractive indices are given as no polished material was available. The absorption spectrum shows the 4500Å complex distinctly. The fluorescence under long-wave ultra-violet light was distinctly reddish with the yellow core glowing with a strong orange light (cf. Ceylon yellow sapphire). The inclusions consist of irregular oval crystals, often in groups, and long needles or canals parallel to the prism and rhombohedron. Ruby crystals from this locality assume a more rhombohedral habit. They are of fair colour. The density of two specimens gave a value of 3·98. Absorption spectra and fluorescence in both stones examined were rather weak. The area is now said to be under the control of a group of Greek prospectors.

3 illus. P.B.

JOHNSON (P. W.). *The gem minerals of Baja California.* Lapidary Journ., Vol. XV, No. 4, pp. 456-466. 1961.

Short descriptions of the gem minerals of a district divided into a Federal Territory in the south and a state of the United States of Mexico on the north. Many gem minerals are found, an occurrence of sphene in abundance being the most important discovery in the early 1950's.

S.P.

DAKE (H. C.). *Synthetic garnets produced.* Mineralogist, 28, 11-12, p. 236. 1960.

Garnet has been produced from common hornblende by the General Electric Company. The method used is similar to that of diamond manufacture. A metal dehydrator, such as tantalum, must be present. By changing the type of hornblende the Company claim that any one of the seven varieties of garnet may be produced. According to the inventors the synthetic product cannot be distinguished from natural stones by chemical, physical or X-ray crystallographic tests. (J.G.VIII, 4)

S.P.

MAHAJAN (B.). *Gem cutting in India.* Lapidary Journ., Vol. XV, No. 4, pp. 410-413. 1961.

Gem cutting in India is inexpensive. In addition to primitive-looking simple tools the Indian cutter also uses the diamond saw and steel and copper laps. Many women drill and polish beads. Much of the work is most skilful and there is scarcely any waste of material.

S.P.

TOLANSKY (S.). *A notable growth spiral on synthetic diamond.* Nature, Vol. 190, p. 992, 10th June, 1961.

A well-defined single growth spiral has been observed on an incomplete cube face of a synthetic diamond made by de Beers, Johannesburg. The height of the spiral step is about 1300Å. Such spiral growths are rare.

R.A.H.

MILLEDGE (H. J.). *Coesite as an inclusion in G.E.C. synthetic diamonds.* Nature, Vol. 190, p. 1181, 24th June, 1961.

Coesite has been identified as inclusions in synthetic diamonds from the G.E.C. Laboratories. This supports the view that any crystalline SiO_2 found in natural diamonds can be expected to be a high-pressure form rather than quartz. Any reported inclusions of quartz are probably in reality instrusions.

R.A.H.

GÜBELIN (E.). *Rubin mit synthetischem hydrothermalem Ueberzug.* Ruby with synthetic hydrothermal coating. Zeitschr. d. deutsch. Gesell. f. Edelsteinkunde, No. 35, pp. 7-12. Spring 1961.

A description of the hydrothermal process developed by R. A. Laudise and A. A. Ballman of the Bell Telephone Laboratories. The author has investigated two synthetic rubies, said to have been produced by Chatham by his hydrothermal process. The physical constants were the same as those of genuine rubies. The largest part of each stone consisted of a genuine core. The synthetic coating was comparatively thin. Under the microscope, therefore, inclusions in the core could be misleading. The synthetic skin, however, was full of minute gas bubbles with a sharp division between core and skin. The overall picture was more indicative of growth from a melt than of a hydrothermal process.
4 illus. W.S.

THURM (R.). *Das Krüss-Juwelierspektroskop.* The Krüss jewellers' spectroscope. Zeitschr. d. deutsch. Gesellsch. f. Edelsteinkunde, No. 35, pp. 12-14. Spring 1961.

Description of a new German prism spectroscope arranged for gemmological work by Dr. P. Krüss. A condensing lens is fitted in front of the slot, making the instrument dustproof. The stand is inclined like the Mitchell stand. It seems that the arrangement allows for inspection under reflected light only.

W.S.

GÜBELIN (E.). *Beryll mit synthetischem Smaragdüberzug.* Beryl with synthetic emerald overgrowth. Zeitschr. d. deutsch, Gesellsch. f. Edelsteinkunde, No. 37, pp. 6-12. Autumn 1962.

The author investigated a series of " Emerita " stones, i.e. beryls with a synthetic emerald coating, produced by J. Lechleitner. A blue aquamarine and a yellow heliodor of good colour assumed the same emerald colour when they were provided with a sufficiently thick synthetic emerald layer. The physical constants did not permit differentiation between genuine stones and Lechleitner synthetics, but microscopic inspection gives clear indications to the gemmologist. Seven photomicrographs of great interest show typical inclusions in the coating. One illustration shows a side view of a beryl with hydrothermal emerald coating. The " mantle " is clearly visible as a dark rim under the polarizing microscope at 10 × magnification. Indicative is the termination of the inclusions in the coating at the surface of the core. In some cases this surface appears covered with " dust particles ", which were in reality euclase and phenakite crystals. Two-phase wedge-shaped inclusions in the coating and the familiar system of cracks, which at times assume a net-like appearance, appeared to be diagnostic features.

(J.G.VIII, 2) W.S.

THURM (R.). *Sternkorunde.* Star-corundums. Deutsche Goldschmiede-zeitung, Vol. 60, No. 1, pp. 18-19. 1962.

In 1947 the Linde Air Products Co., produced the first synthetic star-corundums. The recognition of this type of stone is easy. A drop of methylene iodide placed on the back of the stone shows a star in the real but not with the synthetic corundum. Soon the Germans made a synthetic stone which was recognizable by the concentric composition seen under slight magnification. Both corundums have a very sharp star, the American star being thinner, the German star being broader. All these synthetics are distinguished from the genuine stones by their crystal inclusions, feathers, etc. A new synthetic star-sapphire is now available, which is much more difficult to determine, but small bubbles arranged in long chains, as in the American synthetic corundums, are present. There is also some difference when the stones are viewed under crossed nicols, the new synthetic showing interference rings. For the last six years star-rubies and star-sapphires have been found in Mysore in India. The material is very opaque, but the star is good. They are not more expensive than synthetic star-corundums.

E.S.

BURKART (W.). *Indien-Ceylon Impressionen.* Impression of India and Ceylon. Deutsche Goldschmiede-zeitung, Vol. 60, No. 5, pp. 294-295. 1961.

Short illustrated description of a journey to India and Ceylon. Pictures show the mines in Ratnapura, the washing of the gem-containing " illam ", the sorting of the rough gems, a gem auction and the sawing and polishing in Ceylon.

E.S.

GÜBELIN (E.). *Farbe und künstliche Farbänderung von Diamanten.* Colour and artificial colouration of diamonds. Deutsche Goldschmiede-zeitung, No. 2, pp. 59-62. 1961; No. 3, pp. 130-133. 1961; No. 4, pp. 204-207. 1961; No. 5, Vol. 60, pp. 282-285. 1961.

The differences between the naturally blue diamonds and those which were artificially coloured blue proved to be interesting. The differences between Type I and II are discussed in detail. The colour of the artificially blued diamond seems to be less stable than the naturally blue stone. The first becomes green when heated to 550°C. Natural blue stones can be heated to 1250°C without losing their colour. This leads to the assumption that the colour-centre of the natural blue diamond was formed together with the diamonds millions of years ago. It is likely that the study of the alteration of properties of the diamond which can be brought about by disturbing its lattice will lead to a better knowledge of the internal structure and those properties which depend on this, i.e. absorption, colour and luminescence.

E.S.

EPPLER (W.). *Einschluesse im Diamant II.* Inclusions in diamond II. Deutsche Goldschmiede-zeitung, Vol. 60, No. 9, pp. 543-547. 1961. (Translated from Journal of Gemmology, VIII, 1, 1961.)

Inclusions of garnet, ilmenite, olivine, apatite, gaseous inclusions, healing cracks and sometimes negative crystals occur in diamonds. The solid inclusions were examined after their removal from the host crystal. Very probably other inclusions could also be found in diamond. Graphite and quartz was not found, but only industrial diamonds were examined, the origin of which was not known. The article is illustrated with 24 photomicrographs. (Part I was published in Deutsche Goldschmiede-zeitung, No. 8, pp. 462-465. 1961.)

E.S.

VLASOV (K. A.) and KUTUKOVA (E. I.). *Emerald mines.* Pub. Acad. Scie., U.S.S.R., pp. 250, figs 118. 1960.

A detailed description of beryl (including emerald) and other gem minerals which occur in the middle Urals is contained in this volume. About eighty minerals are described and the genesis of the Uralian emerald occurrences is considered in detail.

S.P.

CHUDOBA (K. F.). *Zur Deutung der Amethystfarbe.* An explanation of the colour in amethyst. Der Aufschluss, No. 9, pp. 233-248. 1961.

After having listed the peculiarities of colour in amethyst and having reviewed previous work on the subject, the author summarizes general opinion which assumes that the violet colour is caused in the first instance by iron but also by radiation. Occasionally the Fe pigment plus radiation is considered as the probable cause of amethyst colour. To investigate the problem more closely, the author chose striped amethyst specimens with alternate layers of violet and white (i.e. colourless) quartz, allowing the study of colour producing factors of two colour varieties of quartz on one and the same crystal. Microscopical investigation, spectrometric analysis, X-ray radiation, X-ray diffraction and density determinations showed good co-ordination between the different specimens. Amethyst lost its colour between 475 and 525 deg. C. and resumed its violet colour after exposure to X-ray radiation. White quartz did not change its colour when treated in the same way. Important factors were the amount of Fe (determined by spectrometric methods). Previous syntheses showed that Fe^{2} or Fe^{3} ions caused only green to nearly black or yellow to brown colours, i.e. iron alone cannot cause amethyst colour. Colourless faces too can contain iron. In this case they became amethyst-coloured after exposure to X-ray radiation. It can be assumed, therefore, that amethyst colour as radiation colour depends on the presence of iron in the quartz lattice. The co-ordination of absorption spectra of natural and synthetic amethyst allowed the conclusion that also in nature iron in combination with exposure to radium causes amethyst colour. The alternate layers of amethyst-coloured and white quartz in the same specimen were caused therefore by different Fe content. Dependent on a certain critical value, one layer became amethyst coloured and the other white when exposed to natural Ra rays. A factor may have been the rate of growth, the white layers having grown quicker, as shown by the wealth of inclusions. Detailed speculations are made on the accommodation of the Fe in the quartz lattice. The analogy to the replacement of Al^{3} ions by Fe^{3} ions in smoky quartz is discussed. In this connexion the preferential accommodation of Fe ions in distinct zones of the growing crystal is mentioned. This phenomenon explains the different concentrations of colour in natural amethyst crystals. It also explains why natural colourless quartz becomes smoky brown when exposed to X-ray radiation; the small iron content had not been activated before into colour centres. Finally the different colour changes of amethyst of various localities under heat treatment are mentioned. No final explanation can yet be given.

W.S.

WURMBACH (I.). *Farbänderung von Diamant durch Bestrahlung.* Colour change of diamond through radiation. Zeitschr. d. deutsch. Gesellsch. f. Edelsteinkunde, No. 38, pp. 3-12. Winter 1961/62.

Interesting survey of literature with bibliography. Natural alpha rays emitted from radium bromide (Crookes 1909, Lind and Bardwell 1923) cause a blue-green radio-active layer of 0·002 mm thickness. Cyclotron bombardment (alpha particles, deuterons and protons: Ehrmann and Bermann, Crookes 1942; Scherrer 1948; Hamilton & Coll. 1950) causes a blue or green coating. Gamma rays from ^{60}Co radiation affect the whole stone and ^{60}Co causes a green or blue-green colour. The colour can be removed through heat treatment at 450 deg. C. Electron bombardment causes a blue colour which becomes paler at 300 deg. C. and turns via green into yellow at 550 deg. C. Neutron bombardment (in a nuclear reactor) causes a green colour. Heat treatment (250-900 deg. C.) results in yellow to brown hues. Three absorption curves are shown and available methods discussed for the differentiation between treated stones (especially blue ones) and natural diamonds.

W.S.

PENSE (J.). *Elektronmikroskopische Untersuchungen zur Fasertextur des Achates.* Electron microscopical investigations of the fibrous structure of agate. Zeitschr. d. deutsch. Gesellsch. f. Edelsteinkunde, No. 38, pp. 12-20. Winter 1961/62.

The author specializes in the investigation of the fibrous nature of agate especially with regard to its property of absorbing or rejecting dyes. The resolution power of optical microscopes is not sufficient to reveal the relevant pores. The electron microscope offers the resolution power required for this work, and the author discusses the difficulties encountered before obtaining satisfactory replicas of etched surfaces.

6 illus. W.S.

BOOK REVIEW

Leechman, F. *The Opal Book.* 255 pp., 9 colour plates, 10 photos, maps and drawings. 42s. (45sA.). Ure Smith, Sydney, 1961.

A concise and readable account of opals and opal mining past and present. Apart from detailed information about the nature of opal (including theoretical considerations about the cause of the display of colour) the notes on the occurrence of opal, in Australia, Europe, the Americas and Honduras are excellent. Mr. Leechman has pleasantly re-captured the tales of early days in the Australian opal fields. The story of the old-time miners is fascinating.

The merit of the book is that it is an authoritative work, adequately illustrated, about opal from the mine to a beautiful gem of adornment. Myths and legends are also discussed and there are brief accounts of some famous opals. The appendices form a useful section of the book and include a glossary and hints on opal polishing. The bibliography is particularly helpful. Also at the end of the book Mr. Leechman shows an awareness of the poetry about opals.

Mr. Leechman concludes that opal " is not simply a hardened jelly, not completely an amorphous solid but a jel which contains here and there patches where crystallization is just commencing. It is not a pure jel either. Small percentages of aluminium, calcium, magnesium, sodium and potassium are inherent ; natural opal, perfectly pure, does not exist ".

It was the aim of Mr. Leechman, an Englishman who has travelled extensively in Australian opal fields in search of his material and who is also an experienced lapidary with his own opal workshop in Sydney, to record the story of opal in a reliable and straightforward manner and he has succeeded admirably. His book will be appreciated by many gemmologists and all who regard opal as one of the most fascinating and beautiful of gems.

S.P.

Sir Charles Hardinge. *Jade, fact and fable.* 67 pp., 10s. Luzac & Co., Ltd., London, 1961.

Soon after the First World War, Sir Charles Hardinge began to collect jade carvings as an extension of an earlier hobby of collecting models of animals in stone.

After forty years of patient and costly accumulation, the Hardinge collection of Chinese carved jades and other hard stones became one of the finest in the country, and in 1960 it was generously presented intact to the Gubelkain Museum of Oriental Art in the University of Durham.

Being a collector of jade and a man of intellectual curiosity it was natural that Hardinge should delve into the voluminous literature, and soon be confronted with the confusions, contentions, misconceptions and mistakes which have made an initially difficult subject still more complex. One source of confusion is the fact that the same term " jade " has been (and still is) applied to two distinct mineral species, now distinguished as nephrite and jadeite, as first established by Damour in 1863: and further owing largely to an indiscriminate translation of the Chinese character Yü by the word " jade ", a number of other minerals have wrongly been accepted as such in the older literature, clouding the issue still further.

These facts have contributed to the difficulty of being sure of the origins of the jade material used by different cultures. Despite the 2000 years' preoccupation of the Chinese people with jade, it seems certain that their supplies came not from any source in China proper but from Chinese Turkestan (nephrite) and Upper Burma (jadeite) only. The source of Maori jade presents no problems; but the origin of the jadeite (often brilliantly coloured) used by the ancient Mexicans is a mystery only partly solved by the recent discovery of a deposit of this jade in Guatemala. Still more difficult to discover are the places where stone-age man found the material for the celts, axes, etc. (which often consist either of nephrite or of a form of jadeite) found scattered over many parts of Europe.

Sir Charles Hardinge has over the years transcribed and read with a critical eye some millions of words in original papers on these and other jade subjects, and corresponded with mineralogists and museum authorities in many parts of the world in an attempt to arrive at the true facts about the history of jade. For our great benefit he has been persuaded to carry out the difficult task of distilling this disordered mass of information and misinformation and giving us the essence of the matter within the compass of sixty-seven pages.

The first part of the book consists of a learned yet very readable account of the facts and problems still unsolved connected with the history and prehistory of the jade minerals. The second part is headed " The Lists ", and consists of the more credibly reported finds of the jade minerals, (1) *in situ*, (2) as unworked eccentrics and rollers and (3) shaped by prehistoric man. In each case the type of jade, where known, is indicated, and the sources are listed under the different continents. The book concludes with a list of references to the literature used in the text.

The author devotes several pages to a discussion of the name jade, which is derived, through the French, from the Spanish " piedra de yjada " (stone of the flank) which is said to have been first used in a book by the physician Monardes in 1569; and of the name nephrite, which was derived from " lapis nephriticus ", a latinised version which in the 17th century came to replace piedra de yjada as the standard name for jade (there are apparently no words for the material in classic Greek or Latin). Both versions of the name refer to the same widely-held superstition that these stones served as a cure or palliative for kidney troubles, either worn as an amulet, applied to the afflicted part, or ground and swallowed as powder.

More than a century after the supplies from Mexico had died out the first examples of jade from the East began to reach Europe. It was assumed that this was the same material as Mexican jade, and the same names were applied. It remained for the French chemist Damour, in 1863, to prove, after a series of careful analyses, that the Chinese jades consisted of two distinct minerals, only one of which could be correlated with the Mexican variety.

Early in his career as a " jadeologist " Hardinge was struck by the fact that, after his discovery, the terms *jade* and *jade néphritique* (nephrite) were applied by Damour to the amphibole material from China which had never been associated with the kidney-cure legend, while he used the modified term *jadeite* for the pyroxene mineral, with which, in its Mexican form, the legend had been strongly associated. Hardinge maintains that the names should have been reversed, and in this book refers to Damour's " mistake " and later to his " solecism " in making his suggestions.

To the reviewer these strictures seem to be unjustified. The fact is that Damour was only in a position to act as godfather to *one* of the jade minerals, the pyroxene: the other had already been christened. This can be shown by referring to standard texts dating shortly before Damour's announcement, such as Dana's Manual of Mineralogy (1862), which describes under " nephrite " what was undoubtedly amphibole jade, and Bristow's Glossary of Mineralogy (1861) and also to older works such as Phillips' Mineralogy (1819). These texts all refer to the kidney-cure legend as a reason for the name.

Rather more surprisingly, the French savant M. J. Brisson, in his tremendous work " Pesanteur spécifiques des corps ", which was published in 1787, gives three density determinations of " jades " which he made with specimens in the King's cabinet. These are: jade blanc, 2·950; jade vert, 2·966; and jade olivâtre, 2·983; all typical nephrite values.

Damour thus had no choice but to adhere to the name jade or jade néphritique for the amphibole, and his difficult task was to find a suitable name for the mineral which, although it had been known and used for centuries, was " new " in the scientific sense. To divorce the pyroxene entirely from the name jade would be to deprive it of is birthright : hence the decision merely to add the customary mineral termination " ite " was a reasonable compromise.

Unlike jadeite, nephrite is not the name of a distinct mineral species, but is descriptive of the compactly fibrous forms of tremolite or actinolite, or of specimens intermediate between the two: it is thus a most convenient term in practice. In short, though Sir Charles Hardinge would prefer the terms " amphibole jade " and " pyroxene jade " where a clear distinction is required, the gemmologist is quite content to use the long-accepted and clearly understood terms nephrite and jadeite, untroubled by the unsound bases for these names as the mineralogist is untroubled by the false presumption contained in such a name as " pyroxene " itself.

It may seem that in a short review a disproportionate amount of space has been given to this matter of nomenclature; but it is, after all, one of the main themes of the book itself. All those who are interested in jade from the historical, cultural, or archaeological angle will want to read and own this unpretentious but important little book. It contains more true substance than many of the larger, lavishly illustrated tomes which have been published on this fascinating subject.

B.W.A.

ASSOCIATION NOTICES

MIDLANDS BRANCH

On 19th October, 1961, the Branch held an interesting stone quiz devised by Mrs. Middleton.

In November over 40 members visited the stone cutting department of Shipton & Co. Ltd. of Birmingham, when members saw the cutting of various stones in process. Some of the members were given the opportunity to try stone cutting and polishing themselves and each visitor was given a piece of amethyst geode on departure.

On 6th February, 1962, the Branch heard Mr. B. W. Anderson speak on " The spectroscope and its uses in gemmology ". Mr. Anderson began by remarking that although various aspects of spectroscopy had been discovered in the 17th century, the impact upon gemmology, and its possibilities in gemstone identification were not realized until recently. He illustrated his talk with slides of numerous absorption spectra, especially those of zircon and diamonds which had been subjected to irradiation.

Over one hundred members and students were present at the talk which was held at the Jewellers and Silversmiths' School, Birmingham, by kind permission of Mr. R. Baxendale, the headmaster.

The annual dinner of the Midlands Branch was held on 14th March, 1962, at Quinton, near Birmingham. Mr. W. Bowen, Branch Chairman, presided, and welcomed Mr. and Mrs. Rex Joseph, Mr. and Mrs. R. Baxendale and Mr. and Mrs. H. Bishop as principal guests. In proposing the toasts of "The Guests" Mr. Brown called for greater co-operation and liason between various sections of the jewellery trade and between the various trade associations. Mr. Joseph replied on behalf of the guests.

TALKS BY MEMBERS

Betts, G. N. : " Jewellery ", The Women Drivers Association, Huddersfield, 9th January, 1962; "Gemstones", Association of Home Economists of G.B. Leeds, 15th January, 1962; Buttershaw St. Pauls Young Wives, Bradford, 17th January, 1962; "Precious Stones", Headingley Townswomen's Guild, Leeds, 12th February, 1962 ; Bolton St. James Young Wives' Group, Bradford, 22nd February, 1962; " Jewellery ", National Savings Movement, Keighley, 15th March, 1962 ; " Gemstones ", St. Francis Ladies' Fellowship, Fixby, Huddersfield, 5th April, 1962; " Precious Stones ", Rishworth Women's Institute, Halifax, 17th April, 1962.

Havem, U. (Miss) : " Genuine and synthetic gemstones ", Gaa Norwegica (association of geological students) and Proton (association of chemical students), University of Oslo, 16th November, 1961, and 25th January, 1962.

Gillougley, J.: " Gems of the sea ", Paisley Business and Professional Women's Club, 12th February, 1962.

MEMBER'S MEETING

Members who responded to the invitation to participate in the meeting and exhibition arranged at the Goldsmiths' Hall on 22nd February, 1962, found that this was an occasion when knowledge and information was most easily digested in an atmosphere of social conviviality. Students from the Northern Polytechnic had a field day but there was also a good gathering of qualified gemmologists, all of whom spent an interesting evening seeing new things, meeting old friends and making new ones.

The exhibits included quite a remarkable number of " first time ever " items about which much had been heard but only few people had actually seen. Thus, for instance, the rows of test tubes filled with synthetic industrial diamonds. Such boart is only rarely seen by the gemmologist and this was undoubtedly the first time it had been on display in relatively large quantities.

The emphasis was mainly upon synthetic stones, more of which are coming on to the market, so that the gemmologist could make firsthand acquaintance with some of the latest types. Examples included some that were comparatively well known to the expert such as strontium titanate but there were also the Lechleitner emeralds made in Austria. These consist of colourless or pale coloured aquamarine or yellow beryl, cut and polished, upon which is deposited by hydrothermal methods a coating of synthetic emerald. Its surface is then lightly polished.

Then there was lapis-coloured sintered synthetic spinel produced as an imitation of lapis-lazuli. The matrix, it was explained on the informative cards that described all the exhibits, is made of grains of synthetic spinel, which is pigmented with cobalt oxide. The grains are then pressed together and sintered in an oven. The method of creating an imitation of a moonstone from synthetic spinel was also shown together with examples of Prof. Eppler's synthetic emeralds.

These exhibits did demonstrate the fast moving developments produced by scientists which call for effort—or an exhibition of this kind—to allow the gemmologist to keep pace.

From Japan had come the latest in non-nucleated cultured pearls. The ingenious method used in growing these is by inserting into the body of the Japanese freshwater mussel, a small piece of mantle. But they can be distinguished because they fluoresce brightly under ultra-violet light and an X-ray picture of them shows distinctive markings.

Then there were old friends, spinel doublets, and demonstrations of the newer technique of producing imitation star-stones by scratching on the base of either synthetic ruby or glass cabochon, three sets of fine lines crossing each other at 120 degrees.

Knowledge was conveyed and brought up to date in other directions.

There were examples of stones that have been found in unexpected places and from new sources. Ekanite, for example, a new mineral discovered in 1953 by Mr. F. L. D. Ekanayake in Ceylon. It takes its name from its discoverer. Examples of nephrite, ruby and sphene were also on view from Rhodesia, Tanganyika and California, respectively.

For gemmologists who are also acquainted with electronics and very ultra-short wave radio there was a lot of interest in the work that the General Electric Company is doing in growing synthetic rubies for the first time at their Research Centre for " Maser " and " Laser " apparatus. These rubies are produced from a lithium fluoride melt and may be used in micro-wave transmission and reception.

More within the region of the practical man of the trade was an illustration of the way that diamond jewellery may be "finger-printed". This can be carried out by putting a piece of such jewellery under an ultra-violet light and photographing the different intensities of fluorescence that are then displayed.

The simple method of identification by immersion contrast was also shown. Here were photographs that showed how a number of different stones, placed in a liquid of known refractive index and illuminated with a single overhead light, looked when photographed from below. The stones with a higher refractive index than the liquid having bright faceted edges and dark borders and the reverse for those with a lower refractive index. A mirror can be used instead of a film.

Simple and slightly more elaborate electrical conductivity apparatus was also shown which the amateur could make up for himself. It consisted of a simple electrical circuit using a dry battery, a clip and probe to make contact with a stone and a pair of headphones. Slightly more complicated, but still easy to assemble, was a mains circuit using a neon type tester. Such a piece of apparatus would be of use in checking a diamond that had been coloured by electronic radiation, such as a sample shown.

As a contrast, perhaps, from such simple apparatus, there was a " Gemolite " microscope with a " zoom " lens. It had come, of course, from the United States and is a lovely instrument with which one can scrutinize the smallest aspect of a stone in " close-up " degree that reminded one of the television camera. It is extensively used by members of the Gemological Institute of America.

And not only did the exhibition bring its visitors right up-to-date with the results of world wide research and development, but there was the reminder that its leading personalities are equally abreast of the times. For these, with the promise that it will be out in May, were some of the proofs of the new book by Mr. Robert Webster on gems, their sources, description and identification.

The exhibits were of interest and value, but when to these can be added the meetings and conversations of the evening, it can be said that this was one of the high-spots of the Association's new year.

The Council of the Association is indebted to Mr. Robert Webster, who undertook the major work of arranging the exhibition and to the staff of the G.A., who suggested it.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Printed by F. J. Milner & Sons Ltd., Brentford and London

Vol. VIII
No. 6
April, 1962

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