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SYNTHETIC STAR SAPPHIRES

THE new star corundums manufactured in America by the Linde Air Products Co. have already been briefly described in the last issue of the " Journal of Gemmology." Gemmologists and dealers in precious stones all over the world are naturally intensely interested in obtaining more exact information concerning these startling new products of the Verneuil furnace. Thanks to the kindness of a leading importer of precious stones, the writer has been enabled to examine two fine specimens of synthetic star sapphire, weighing 9.20 and 7.31 carats respectively, and permission has been granted for the results of this examination to be published.

In appearance the synthetic star-stones differ perceptibly from natural star corundums. They are a bright pale blue in colour with a sharply-defined star, but the artificial " silk " (one is tempted to write " rayon ") is confined to a relatively thin layer near the crown of the stone, with the result that the arms of the star do not reach the base of the stone, which is quite clear and transparent.

In natural star sapphires the stones are usually either full of silk throughout, heavily zoned in hexagonal formation, or are so cut that the silk is concentrated towards the base of the stone with the upper part relatively clear.

Under the microscope, the usual signs of the Verneuil synthetics (curved lines of colour and included bubbles) are abundantly present. The curved lines, which can be seen with the naked eye when the stones are viewed sideways, are at right angles to the symmetry axis of the cabochon, giving rise to the surprising conclusion that the " silk " was concentrated at one side of the original boule, *not* near the upper surface as one would expect. The " silk " itself consists of short needles, dark by transmitted light, and intersecting at angles of 60°. Presumably they consist of rutile though as yet there is no proof of this. The needles are so small and fine that they are not easily discernible, though they appear quite clearly in the photomicrograph reproduced below, taken under a magnification of 60 diameters (Fig. 1). For comparison, the zonal structure of the silk in a typical natural Ceylon star sapphire was also photographed (Fig. 2).

Some idea of the relative sharpness of the asterism in the synthetic and natural stones is given in Figs. 3 and 4. These were taken under low magnification (7 diameters) by light reflected from a Beck " Intensity " microscope lamp, throwing an almost parallel beam. The specular reflection of the beam from the polished surface of the stone gives rise to the bright spot seen in each photograph. The distortions apparent in the rays of each stone are not

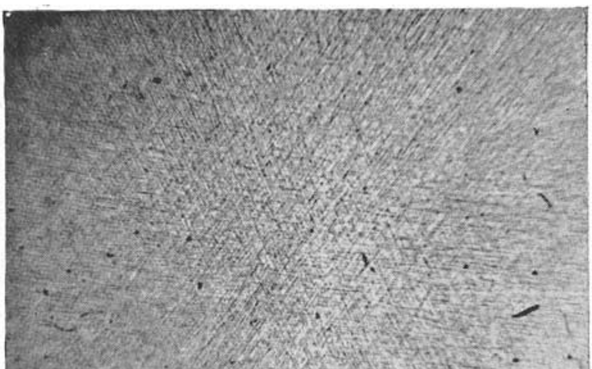


Fig. 1 — Silk in Synthetic Star Sapphire

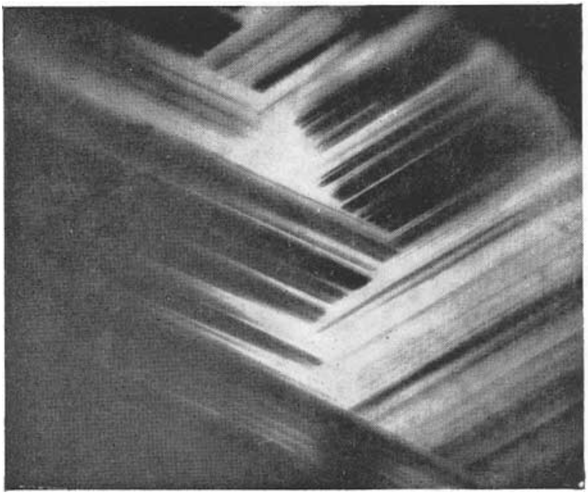


Fig. 2 — Zoned Silk in Natural Star Sapphire

noticeable when viewing the stones under ordinary conditions. The curious feathering of two of the rays in the natural stone gives an interesting indication of the underlying zonal structure.

Careful density determinations were carried out on the synthetic specimens by hydrostatic weighing in ethylene dibromide, and also on their natural counterparts. As expected, the results showed no significant differences: they are indeed chiefly notable for their consistency and are remarkably near the value 3.989 which is the density of pure corundum. For purposes of record the density figures are given below:—

Specimen	Carats	Density
Synthetic blue	9.205	3.985
Synthetic blue	7.316	3.982
Ceylon pinkish	9.928	3.984
Ceylon blue	7.485	3.989
Ceylon pale	7.895	3.986
Ceylon pale	7.945	3.987
Ceylon blue	15.132	3.987

The eye of the expert will probably be able to differentiate the synthetic star sapphires from the natural by their unusual colour, glassy appearance, and clear base. The gemmologist will be wise to examine the internal structure of any doubtful stone under the microscope, immersing the specimen (complete with setting if necessary) in a dish of monobromo-naphthalene.

With the present stars at least the following simple test is effective. Place a small drop of methylene iodide or bromonaphthalene on the rough base of the stone and view the droplet under a single bright light. Natural stones will show a clear-cut star in the drop owing to the underlying silk, whereas the synthetics will give a null effect.

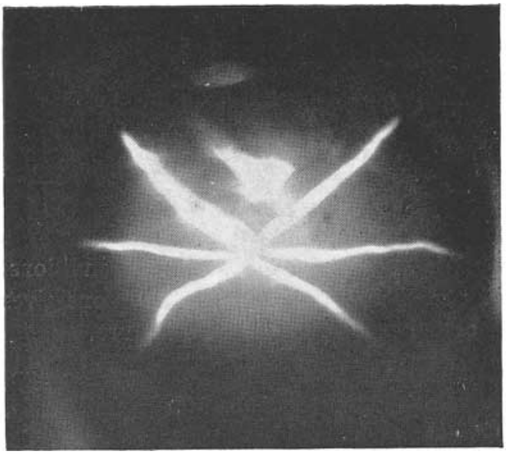


Fig. 3
Synthetic Star Sapphire
(x 7)

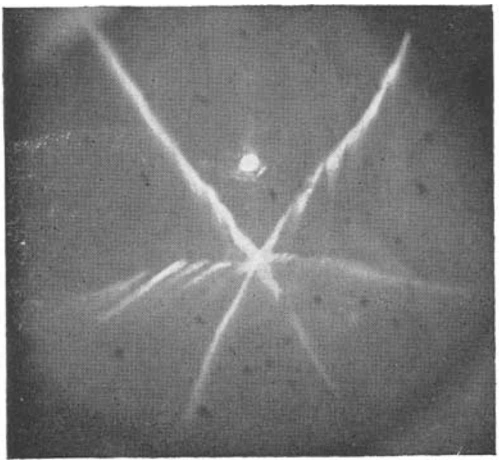


Fig. 4
Ceylon Star Sapphire
(x 7)

A TALK ON DIAMONDS

BY R. DAVID DALE

given at a Members' Meeting on 13th November, 1947, at the British Council Cinema

I VERY much appreciate being invited by your Association to be here this evening to give you some impressions on the subject of diamonds.

I may say at once that I feel certain that you, as members of the Association, and your students, know a great deal more about the technical side of diamonds than I would presume to profess, and therefore, having regard to some of the many awkward questions that I am likely to be asked at the conclusion of this, what I should like to call " entertainment," I have asked a member of our Research Department, who is one of your Fellows, to give me a great deal of moral and practical support. I refer, of course, to Dr. Stern of the Research Department of Industrial Distributors (Sales) Ltd., the company charged with the responsibility for distributing industrial diamonds. But I have used the word " entertainment " and I want to present to you this evening, not only some of the technical aspects of diamonds, but to bring before you some practical examples of the subject and to offer for your consideration some of the background of the history of diamonds. This is a subject which, as yet, has by no means been thoroughly examined.

RECOVERY OF DIAMONDS

Diamonds originated, according to the best accepted theories, in the times, some eons ago, when the eclogite or strata some many miles beneath the earth's surface erupted in molten form and passed through the crust of the earth. The resulting lava flowed over the earth's surface and in it were tiny particles of carbon which were subjected to an atomic degree of pressure and heat. It was these particles which were thus converted into diamonds, and today you have at a number of points on the earth's surface—Brazil, Venezuela, British Guiana, Gold Coast, Sierra Leone, Portuguese West Africa, Belgian Congo, Tanganyika and last, but by no means least, the Union of South Africa and the mandated territory of

South West Africa, what are known as alluvial diamond deposits. These in pursuance of the theory are assumed to be the diamonds which remained after the lava had been weathered away. By contrast, in South Africa, Tanganyika, the Belgian Congo, you have what are known as the actual diamond pipes composed of blueground or Kimberlite, which are vertical cylinders descending into the earth's surface and which are that portion of the lava which cooled in position when the eruptions ceased.

ROMANCE OF BLUEGROUND

I have brought a film with me which was produced by a news reel company in South Africa. It is called "Romance of Blueground" and illustrates far more graphically than I can describe the processes by which diamonds are actually extracted from these pipes. I would particularly draw your attention to this amazing property of diamonds whereby they have an affinity for grease or adhere to grease while none of the other minerals to be found in the blueground do so adhere, with the result that the process of extraction is one of the simplest methods of mineral recovery.

CHINESE LEGEND

It is rather interesting to contrast this property of diamonds, which was only discovered early in this century, with a legend from ancient Chinese mythology in the days when China was Cathay and India was unknown, at any rate to the ancient Chinese. They had a theory that far away to their west in what must, in fact, have been India, there was a mythical valley of diamonds, and they tell of how carcases were rolled down into this valley and in due course eagles swooped down into the depths of this almost bottomless pit and bore off morsels of the fat flesh from the carcases. Specially detailed parties of men traced the eagles to their eyries and there, from among the remnants of the fat flesh, found stones which were diamonds. It seems quite clear to me that, in common with those to-day who wish to conceal simple processes, the discoverers of the affinity of diamonds for grease hid their knowledge very well under the cloak of allegory.

Now, with this rather strange story in your minds, I will not detain you further from seeing this film, and I give you the film produced with the full co-operation as technicians of De Beers Consolidated Mines Limited, "Romance of Blueground." (Here the film was shown.)

I hope that that film has given you an insight into the methods of recovery of diamonds.

I think you would like to know that at the moment another film of general interest on the subject of diamonds is being produced, which will carry the same message with one or two stories, which we consider to be eminently worthy of record. Our organization is supplying the technical advice.

INDUSTRIAL DIAMONDS

Now that you have a picture of the recovery of diamonds in your mind, I want to show you a few practical examples and I propose to deal first with the industrial diamond, the diamond which represents some four-fifths of the weight of all diamonds recovered and which is so much in demand in industry to-day. There is no difference structurally, of course, between the industrial diamond and the gem diamond. It is only classified as the former when, for reasons of colour or flaw, it is unsuitable for use as a gem. But please do not have the idea that all industrial diamonds are flawed. On the contrary. The stones which are required for jobs involving great stress have to be flawless, although the colour is immaterial. The best example of what I mean is the Die stone, of which you see some here, stones which will be drilled by means of an oscillating needle dressed with diamond dust bound in olive oil. These dies are used for drawing wires of great fineness. All the electric light bulb filaments in this room will have been drawn through a diamond die. Wires used in connection with the valves of radio and for numerous radar operations are drawn by diamond dies, and I have got here a spool of the finest wire drawn in this country, a shade over a 2,000th part of an inch in diameter, and for purposes of comparison it is affixed to a card alongside one of my own hairs, which is approximately nine times as thick as the wire in question. It was, I think, Winston Churchill who, during the war, asked a girl operative engaged on drawing these wires, " Do you find your work interesting? " Her reply was, " Yes, I do, but it is rather difficult putting a wire you cannot see through a hole you cannot feel."

Another instance of the power of the diamond, this time in the form of powder, was illustrated by the competition which existed between the War Production Board of America and the

Ministry of Supply in this country during the recent war. Whenever there was any new development on either side, they tended to send it across to the other with some such message as " Can you beat that? " I am told that an American firm sent across an ordinary steel drill bit of the unusually small diameter of one-sixty-fourth of an inch. After consultation with one of our engineering firms who used a fine needle dressed with olive oil and diamond dust, they were able to return it to the Americans drilled neatly through the centre from one end to the other with the comment, " What do you know about that? "

TURNING MOTOR CAR AND AEROPLANE PISTONS

But, of course, the use of the industrial diamond is by no means confined to stunts such as this, and it would be impossible in the time at my disposal to go into the many and practical uses of the industrial diamond. But one example I should refer to—that of turning pistons for motor car and aircraft engines—a use which had a very great bearing on the results of the recent war and which is of great importance in the world to-day. I have brought with me as an illustration the piston of a Rolls Royce Merlin engine. When you examine it you will be able to see from the inside the normal surface of the whole piston as delivered in the rough by the casters. The finish, as shown, is obtained by the diamond in one operation on each surface ; special diamond tools are used for the piston ring grooves and the great beauty of the use of the diamond is the very low pressure necessary to carry out the turning, which results in a mirror finish, so that, in fact, there is a negligible amount of burring at the corners of the piston ring grooves when the tool passes across them.

FUNCTIONS AND CLASSES OF INDUSTRIAL DIAMONDS

Without going into too much detail, I will explain some of the functions and the classes of industrial diamonds which you see before you.

Crushing Boart, which in itself represents four-fifths of the total industrial output, is in every way a diamond, but cannot be used except in crushed form as diamond powder of various sizes. In this form it is used for impregnating into bonded abrasive wheels, as I have already indicated, bound in olive oil for drilling purposes and in the same form for sawing through gem diamonds and for polishing them. You will see here a model of a diamond saw. The actual method is that the phosphor bronze disc (about 3/1000ths inch thickness) revolves at 4,000 r.p.m. ; the edge of the disc is kept dressed with olive oil and diamond dust, and it is actually the diamond dust which cuts its way through the diamond to be sawn. The perspex models which you see illustrate what happens at this stage.

(Mr. Dale then described the cutting of an octahedral diamond into a brilliant, using the models by way of illustration.)

GEM DIAMOND CUTTING (STYLES)

We have thus brought ourselves to the gem diamond. The style of cutting which you see illustrated here is the " brilliant," with 32 facets and the table on the top and 24 facets on the pavilion or under part. What is known as a " culet " used to be cut across the bottom, but modern practice has eliminated this as it tends to give the impression of a small hole or black spot at the base of the stone. This style of cutting is in conformity with the mathematical angles which give the greatest effect to the diamond's power of light refraction, the angle on the top 41° between the girdle and the edge, and between the girdle and the pavilion 39°.

But, of course, gem diamonds are by no means always cut in the brilliant style. Broadly speaking, the factor which guides the cutter when deciding the method of cutting any particular rough diamond is: what is the largest clean stone or stones that he can get out of the particular piece of rough. In this regard people have sometimes asked me why a larger stone than the pear-shaped brilliant of 516½ carats was not cut from the 3,106 carat Cullinan. The answer is that there were two spots of carbon in the otherwise perfect blue-white stone and the cutters had to cleave the stone through these spots, and, for your interest, I have here a photograph showing the Cullinan cleaved into three, the pear-shaped brilliant having been made from the largest piece. There is also the original agreement between King Edward VII and Messrs. Levy Brothers appointing them as inspectors of the cutting of the Cullinan.

To revert to the styles of cutting, I would like to say that throughout these styles, however unusual, the cross section through the stone will reveal the same use of these angles between the upper portion of the stone and the girdle, and the lower portion of the stone and the girdle. The most usual style after the brilliant is the emerald-cut or square type of cut with corners off, thus giving it eight sides, and the square-cut, which has pointed corners. Both the emerald-cut and the square-cut are found either in the square shape with equal sides or the oblong shape with length and breadth. I may say that there are three off-shoots of the brilliant —the pendeloque or pear-shaped to which I have already referred and which you see in the model of the large stone from the Cullinan ; the marquise, which is boat-shaped as if the brilliant had been pulled outwards from diametrically opposite points, and the rarer type—the half moon—where a brilliant would appear to have been cut in half, being given facets down the edge which is cut.

Some of the French cutters specialize in a wide variety of fancy shapes, three, four, five and six sided. The latter are particularly useful to the manufacturing jeweller who wishes to execute mosaic or floral designs.

DIAMONDS AS DOLLAR EARNERS

The diamond appeals to the eye, it is rare, is readily portable and its value remains reasonably constant in normal times and tends to increase almost in direct sympathy with the depreciation in currency values at a time of inflation. This is one of the reasons why to-day, in America particularly, and in many countries throughout the world which are obsessed with troubles, such as India and China, the demand for diamonds has never been higher. This state of affairs explains why the sales which have been taking place in recent months have been maintained at a rate which constitutes a record for any similar period in the entire history of the Diamond Industry. A high proportion of these sales are made direct to the U.S.A. for dollars. Indirectly, the rough diamonds that go to other centres in the sterling area where cutting takes place (South Africa and Palestine), also earn dollars for the sterling bloc, as 75 per cent. to 80 per cent. of the resulting cut stones go to the dollar area.

Diamonds in 1946 exported from this country to the United States were by far the highest dollar earner and brought in rather more than one quarter of all the dollars earned by goods exported from this country to America.

FILM

On a previous occasion I was charged by my directors with the task of organizing a film show for our own staff, with a certain amount of commentary where necessary, and they felt with me that it would be interesting to have a short film on the subject of an industry which is very closely allied with our own, an industry which was built up late in the 19th century in South Africa by the pioneers who had built up financial resources as a result of the diamonds found in Kimberley. Therefore, I present for your entertainment and interest a film on Goldmining. (Here followed Walt Disney's " Donald's Gold Mine," a R.K.O. Donald Duck film.)

CONCLUSION

With the conclusion of that highly instructive film, I would like you to regard my remarks as being at an end, but Dr. Stern and I would welcome any question from you, either technical or of general interest, on the subject of diamonds, and between us we will do our best to answer them.

I suggest that with the chairman's permission, when the questions have been concluded, those people who wish to examine the exhibits at closer range come forward and ask any questions on these of our staff who are here to assist you.

Thank you very much for having given me the opportunity of coming here to-night and I hope that what I have said will provoke some discussion among you.

" COCO - NUT PEARLS "

A report in *Nature* (Vol. 160, No. 4071, November, 1947) gives details of recent work of Dr. A. Reyne, who has published " On the Structure of Shells and Pearls of *Tridacna squamosa* (Lam.) and *Hippopus hippopus* (Linn.) " (*Arch. Neerl. Zool.*, 8, 206 ; 1947).

Dr. Reyne points out that the so-called " Coco-nut pearls " claimed to have been found in a coco-nut are true *Tridacna* pearls, the chief inorganic component being aragnoite. It is thought that deception by local natives on Celebes was responsible for the original claim that pearls had been found in coco-nuts.

A Useful Aid to
GEM SPECTROSCOPY

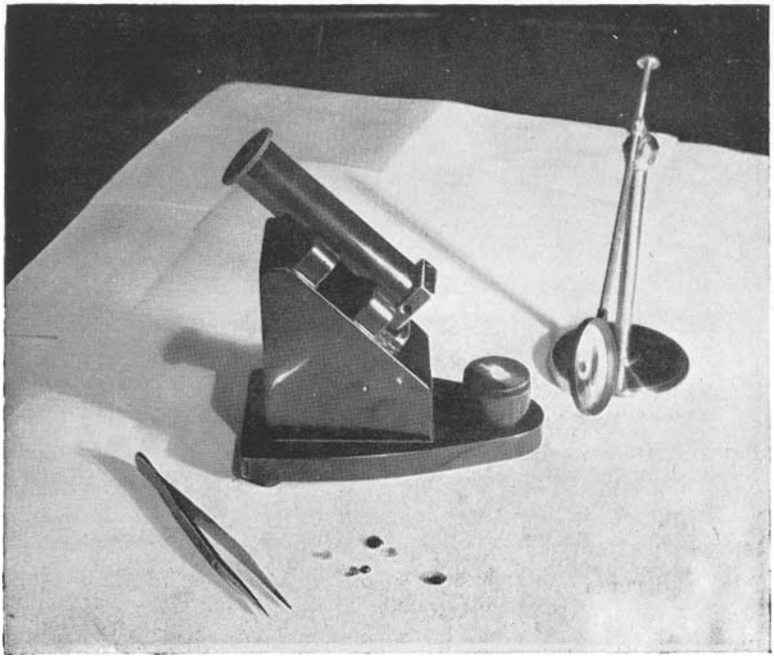
By
R. KEITH MITCHELL
F.G.A.

THANKS largely to work done in this country, absorption spectroscopy has achieved a very important place in gemmology. An invaluable and speedy aid to the identification of many gems, the small hand-spectroscope ranks to-day with the refractometer and the microscope in importance among gemmological instruments.

Up to now the most generally successful method of using the instrument has been to employ the lens system of a microscope to pass light through the specimen and collect the resultant light for examination. Briefly, this method consists of placing the stone on the microscope stage and passing a concentrated beam of light through it by means of a substage condenser. This transmitted light is then collected in the objective and the draw tube of the microscope becomes filled with its bright glare. The spectroscope is then used in the place of the normal microscope eyepiece.

An alternative method is to use the scattered light obtained when the stone is placed table down on a suitable surface with a strong beam of light directed into it from one side at an angle of approximately 45° ; the spectroscope being held at a similar angle with the slit close to the stone on the other side. This method is obviously less elaborate and, since the light path within the stone is longer and because less extraneous light reaches the instrument, it tends to give somewhat more intense spectra. They are, however, much marred by transverse lines caused by the close proximity of the spectroscope slit to the stone. The holding and directing of the instrument also calls for some small skill and can give rise to difficulties.

These objections to the method have now been almost entirely overcome by the construction of a simple stand for the instrument. This, as will be seen from the accompanying illustration, holds the instrument steady at an angle of 45° with the slit directed at the



centre of a small rotatable table. The stone to be examined is placed table-facet down on this surface and a strong beam of light focused on it by means of a bull's-eye condenser and an intensity lamp or other suitable source. Light is reflected internally from the table-facet and emerges in the direction of the instrument, where its spectrum can be examined.

The fact that the spectroscope is removed some 2-3 inches from the stone eliminates to a very great extent the troublesome transverse lines experienced when ordinary scattered light method is used. One beam of light is examined at a time and the stone may be rotated on the stand to obtain the clearest spectrum.

A limited number of these stands have been made up and are available at 18s. 6d. each. They are constructed to take the Beck spectroscope No. 2458 recommended by Mr. B. W. Anderson in "Gem Testing," but will take other instruments of the same tube diameter. Slight alterations can be made to take other tube diameters. The stands are strongly constructed of wood and admirably finished in black lacquer.

X-RAYS and the JEWELLER

By *JOHN VINCENT, F.G.A.*

THE following may be of some interest to practical gemmologists. In the course of business, a ring was brought in to the laboratory of Messrs. John Vincent Ltd., of Weymouth, for examination and test. The ring in question was a large diamond cluster with an opaque black stone cut in the form of a brilliant of approximately five carats with a metallic lustre. This stone was reputed to be a black diamond, but there was some doubt as to whether this was so. Apart from a negative reading on the refractometer and a test for hardness the instruments in the laboratory were of no use. The stone being opaque, it was impossible to test in polarized light ; the spectroscope was of no use for the same reason, and the specific gravity could not be obtained owing to the fact that the stone was mounted. A definite decision had to be obtained without delay as it was a question of the owner obtaining redress if the stone was found to be other than a diamond.

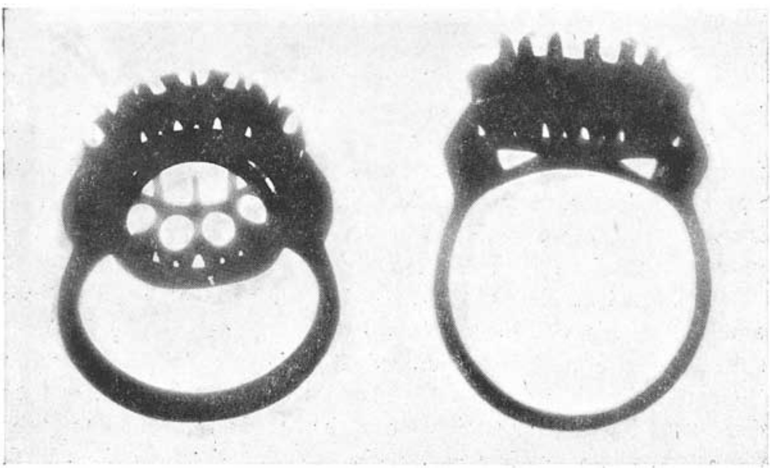


Fig. 1

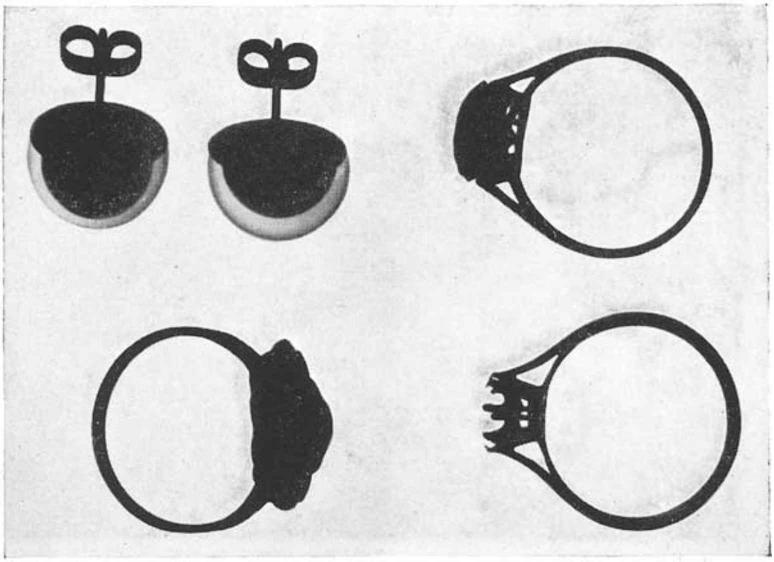


Fig. 2

A local dental surgeon was contacted by phone and it was explained to him that an X-ray photograph was required of the ring, the situation was discussed, and he agreed to help. The ring, together with a copy of Mr. Anderson's " Gem Testing " marked at page 111, was sent round to the surgery, with the result that the dentist, intrigued by the test put forward in the text-book, brought the X-ray negatives of the ring round to the shop premises himself within half an hour. Prints were quickly obtained from the negatives and it was seen that the large central stone was indeed a diamond.

When the customer returned in a few hours, the result of the test was explained to him by means of the photographs and the text-book. The photographs are figured herewith and show the transparency of the central black diamond and the surrounding diamonds quite clearly.

(The exposure for Fig. 1 was 1 second, anode distance 9.5 inches, film—Pan super XX Dental.)

Further experiments have been carried out on various articles of jewellery. Fig. 2 shows a single-stone diamond ring, a colourless zircon ring, a paste cluster ring, and a pair of cultured pearl ear-studs. (Exposure time 1.5 seconds, anode distance 11 inches.)

HANDBOOK

—— of ——

GEM IDENTIFICATION

By RICHARD LIDDICOAT

Reviewed by B. W. Anderson, B.Sc., F.G.A.

THE author of this new " Handbook "* is Director of Education in the Gemological Institute of America, and has been assisted in his project by his colleagues Robert M. Shipley and Drs. Holmes and Switzer ; thus there should be no doubt that this book represents the authentic voice of the G.I.A. in the matter of gem identification. At first sight the book seemed to conform so closely not only in its scope but in its general arrangement to the recent British work " Gem Testing " that the reviewer might be excused for supposing that the book was deliberately modelled on his own production.

Closer inspection, however, revealed considerable differences. American gemmology, after leaning at first rather heavily on pioneer work done chiefly in Germany and Britain, has been in the last decade developing its own ideas, its own techniques and its own instruments. In this " Handbook," for instance, the first American-made jewellers' refractometer is described and illustrated. This instrument, the " Erb and Gray," would seem to compare very well with our own " Tully," which it resembles in having a rotating hemisphere, though in this case supported by a pedestal from below. Its price (a matter of purely impersonal interest to present-day Englishmen) is given as approximately $140.

Other gem-testing equipment, for the most part devised and issued by the G.I.A., which is mentioned and illustrated includes the Diamondscope (a binocular microscope fitted with special substage lighting, giving either direct or dark-ground illumination ; the Gemolite (a simplified monocular version of the above) ; the

* *Published by the Gemological Institute of America. Los Angeles, 1947*

Shipley hand polariscope ; and the new G.I.A. Pearloscope—a microscope equipped for the endoscopic and pearlometric types of test for drilled pearls with facilities for the simple examination of pearls by transmitted light which the French employed in the old " Lucidoscope " and which the Americans call " candling."

The book opens with chapters on the determination of hardness, specific gravity, and refractive index. The use of " Carbona " (commercial carbon tetrachloride) is suggested as an alternative to water for hydrostatic weighing. Despite its low surface tension, this liquid is not really suitable for the purpose, as its great volatility upsets the stability of the balance. Moreover, the undiscriminating use of a single correction factor of 1.59 when using this liquid is hardly conducive to accurate results, as even in pure carbon tetrachloride the density varies appreciably with temperature, and even at a fixed temperature commercial samples will inevitably vary considerably.

Mr. Liddicoat is rightly very insistent on the careful handling of the refractometer and gives meticulous instructions on how to avoid causing damage to the delicate glass of the hemisphere or prism during use. Immersion methods for refractive index determinations are also briefly described. A good chapter on " Magnification " is followed by " The Use of Characteristic Imperfections as a Means of Gem Identification." This forms a useful introduction to one of the most beautiful and valuable techniques available to the gemmologist. It is well illustrated by photomicrographs from the incomparable collection formed by Dr. E. Gübelin.

The book indeed is plentifully illustrated throughout, but there is much duplication, the most curious case being Figs. 84 and 85, where anomalous double refraction in synthetic spinel is pictured on successive pages from prints apparently taken from the same negative in reversed position. The photograph used for Figs. 69 and 83, showing flask-shaped bubbles in synthetic spinel, is both ugly and unrepresentative, while the chain of bubbles shown in Fig. 77 is far more typical of paste than of synthetic ruby.

There is a chapter on Pearls where simple tests are described and a brief account is given of endoscopic and X-ray methods.

" Instruments Essential to Gem Testing " is the title of the last chapter in the first section of the book. The refractometer, polariscope, magnification, and specific gravity are listed as essential tests, while " less frequently used " instruments include the " Gemological " (i.e. polarizing) microscope, ultraviolet lamp, the dichroscope, emerald filter, spectroscope, hardness points and plates, sodium lamp, and X-ray equipment.

To the spectroscope Mr. Liddicoat devotes only one brief paragraph: " . . . Its principal use is the distinction between spinel and pyrope when their properties overlap. Since its applicability to gem testing is limited and its manipulation rather exacting, it has not been widely used in this country."

Herein lies probably the greatest difference between the American and British schools of gemmology. In this country we have come to regard the spectroscope as the third most important gem-testing instrument, the other two, of course, being the microscope and refractometer. Its value lies in its low cost, portabliity, and above all in its ability to provide the most rapid positive means of identifying the gemstones most used in jewellery, whether these be mounted or unmounted, cut or rough. It provides in many cases a most valuable means of separating natural from synthetic sapphire, and is operative on stones such as zircon and demantoid garnet which are beyond the range of the refractometer.

The use of the spectroscope would vastly simplify and shorten the painstaking systematic schemes laid down for the identification of gems in their different colour groups which are given in the second portion of the " Handbook."

For the jeweller the practical value of the book is reduced by the author's assumption that the stones under test will always be available in the unmounted state. It may indeed be sometimes necessary to remove a stone from its setting to enable a decisive optical or density test to be made, but to the true gemmologist this must always be regarded as something of a defeat.

The values for refractive index and density given in the book are for the most part unexceptionable, but there are some which require revision. The reviewer well knows the near impossibility of deciding on a single representative figure for each species in the tables of these constants, but in choosing such a figure for stones which show considerable variation, it is often a mistake to use a value which is the arithmetic mean between the extreme limits of the recorded range—such a reading is apt to be quite unrepresentative. For example, the great majority of peridots have a density near 3.34, and the fact that certain brown or yellow iron-rich types may be as high as 3.48 does not justify 3.40 as an average value, as given here. In the same way, the yellow and pink gem varieties of topaz have refractive indices 1.630 and 1.638, values for the colourless stones being in the region of 1.61-1.62. The figures 1.619-1.627 given in this book tally neither with one nor the other. Again, a refractive index of 1.726 is definitely higher than normal for natural spinel and is indeed very near the usual value for the synthetic material. Concerning the latter, Mr. Liddicoat is not correct in stating (p. 111) that the ratio $1MgO:1Al_2O_3$ " is usually true of synthetic spinel, but in some cases it is made with a ratio as high as five parts of aluminium oxide to one part magnesium oxide." Such syntheses can admittedly be made, as we learnt from a classic paper by Rinne,* but in practice the German and Swiss manufacturers find that boule growth is best with a ratio of $1MgO:3.5Al_2O_3$ in the initial materials and adhere closely to this ratio in commercial practice. For this we have not only the authority of Dr. W. F. Eppler,† who for years has been associated with its manufacture, but also the cumulative evidence of innumerable refractometer readings on this very common synthetic gem, which show practically no variation. One has less occasion for frequent determinations of the specific gravity of synthetic spinel, but all such, of whatever colour, that have been measured have been very near to 3.63, and the values 3.7 to nearly 3.75 suggested by Liddicoat seem improbably high.

The book concludes with a useful summary of the properties of the gem species with a column suggesting those gems with which each may most readily be confused. There is also an excellent index.

We hope that Mr. Liddicoat will consider it a compliment that his book has been accorded a long and critical review. The subject is one which closely concerns the readers of this journal, and a just consideration of the merits and demerits of the " Handbook " could hardly be given in shorter space.

* F. Rinne, " Neues Jahrbuch Mineral, etc., Abt A.," 1928, vol. 58, pp. 43-108.

† W. F. Eppler, " Industrial Diamond Review," September, 1947, p. 259.

Canadian Gems and Gem Localities

Part I

GEMS OF THE BAY OF FUNDY

By D. S. M. FIELD

A descendant of an old United Empire Loyalist family which migrated to the Bay of Fundy region of Nova Scotia in 1873, the author of this series was born in 1917, and spent much of his boyhood collecting and studying the minerals and gem crystals found in great abundance along the Bay. Much of the information given in Part I is based upon personal observations.

BLOMIDON

THE Bay of Fundy region of Nova Scotia yields some of the finest gem crystals of amethyst and other minerals to be found in Canada. This is particularly true of Blomidon, not far from Parrsboro, N.S.

Blomidon, and indeed all the North Mountains extending from Brier Island to Cape Blomidon ; three of the Five Islands, Two Islands, Isle Haute, and all the capes on the north shore of the Bay of Fundy, are composed principally of basaltic trap resting upon amygdaloid, which in turn rests upon a new red sandstone.

This latter peculiarity, wherein a hard, compact rock rests upon a soft and yielding material of more recent formation, may also be noted in several localities in Scotland and Mexico.

The name " Blomidon " (allegedly derived from the words " Blow me down," in allusion to the high winds frequently encountered there in the stormy seasons) is locally applied to the great mural precipice extending for a distance of some fifteen miles between Capes Blomidon and Split (see illustration and map).

Here may be seen some of the most picturesque scenery in the Province. Great vertical columns of basalt crown the summit of the precipice, which rises in some places over six hundred feet above the sea, its face washed here and there by lace-thin waterfalls cascading gracefully to the narrow beach beneath.

Lower down, the trap becomes declivous, permitting small bushes and trees to cling precariously to the slope, and to the heaps of débris lying at the foot of the cliffs, washed at their base by the sea.

The majesty of the towering heights, and the silence of the lonely place (broken only by the intermittent screams of seagulls) is almost frightening. Here and there along the sandy beach one may come upon tiny, abandoned fishermen's shacks, but they are few, and because of the sad state of disrepair into which they have fallen they can offer the collector little shelter from the winds and rains which drive in so frequently and unexpectedly, to lash the coast in the spring of the year. Although the vernal season is the most dangerous time to search for gems on storm-swept Blomidon, it is also the season which affords the hardy collector his most lucrative harvest.

Every spring great masses of gem-freighted rock, weakened by the frosts of the preceding winter, make avalanches which cover the narrow beaches to the sea with fragments of rock and crystals of amethyst, cornelian and moss agates, jasper and hornstone, bloodstone and spar, and many others. These minerals thus may

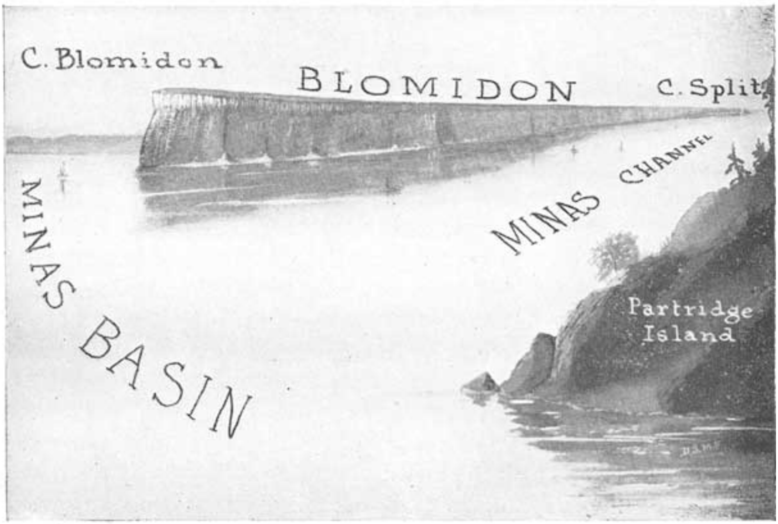


Fig. I — Blomidon, as seen from Partridge Island, Parrsboro, N.S.

be conveniently collected from the loose piles of rock at the base of the cliff, and indeed each spring one may find eager collectors searching the débris for specimens which, except along the Bay of Fundy, would cost them great labour and expense.

Here may be found some of the prettiest specimens of moss agate in the world, and of a transparency and perfection elsewhere unknown. Some pieces are so fine when polished that it is difficult to believe that the dendritic stainings are not actually organic plants embedded in blocks of crystal plastic.

Huge pieces of agate—including the comparatively rare fortification and scenic varieties—are also to be met with. Some of this material compares favourably in its natural state with the artificially stained agate from other countries ; for the ribbons of red cornelian in much of the Blomidon material contrast sharply with adjoining layers of cream and white chalcedony.

Eye agates, in large masses weighing nearly a hundred pounds, are also of frequent occurrence. Dr. Abraham Gesner, of Parrsboro, N.S., writing in 1836, gives an interesting account* of his discovery of some of this material, following a great avalanche from the top of the precipice, in the spring of 1834:—

> " The noise of the downfall was heard many miles along the opposite coast. Being acquainted with the circumstance, we hastened to the spot, and were richly rewarded for our trouble. . . . Among the numerous and beautiful minerals obtained during the first visit to this interesting locality was the onyx agate. A large mass, weighing upwards of eighty pounds, had been dislodged, and lay among the ruins of the cliff. This agate exhibits distinct and parallel zones of different colours ; these zones consist of circles of white cacholong, alternating with small rings of pale red cornelian. When these agates are polished they are extremely beautiful, and resemble the eyes of certain animals."

Dr. Gesner goes on to describe the amethyst-lined geodes, vugs, and surfaces also to be found there:—

> " Large blocks of amethyst had been broken by the downfall of the cliff, and lay among the broken masses. In several instances perfect geodes of that beautiful mineral were obtained. These geodes, when whole, appear like balls of

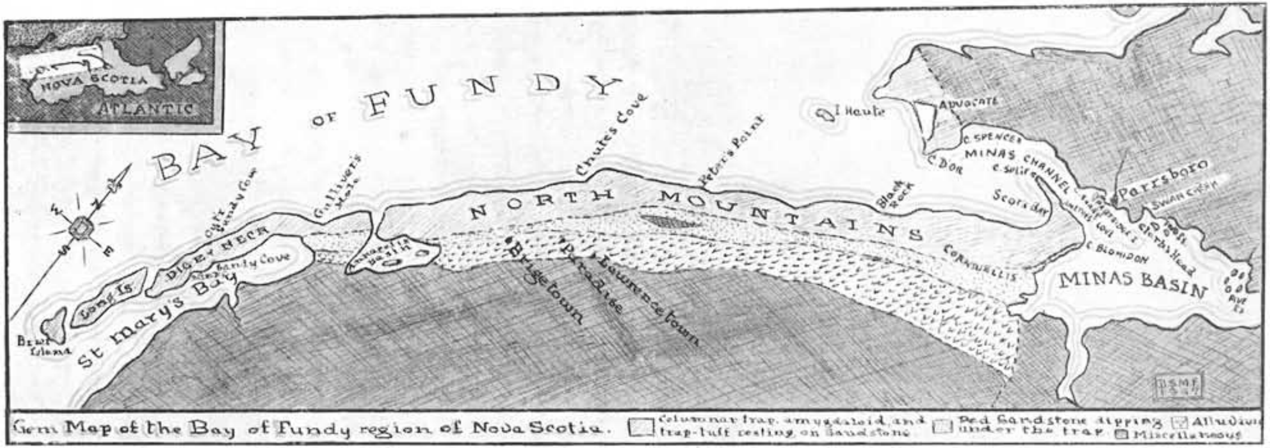

NOVA SCOTIA
ATLANTIC
BAY OF FUNDY
NORTH MOUNTAINS
MINAS BASIN
MINAS CHANNEL
Parrsboro
St Mary's Bay
DIGBY NECK
Long Is
Sandy Cove
Gulliver's Hole
Chutes Cove
Peter's Point
Black Rock
I Haute
Advocate
C Spencer
C Dor
C Split
Scots Bay
C Blomidon
Cornwallis
Brigetown
Paradise
Lawrencetown
Annapolis Basin
Geol Map of the Bay of Fundy region of Nova Scotia.
Columnar trap, amygdaloid and trap-tuff resting on sandstone
Red Sandstone dipping under the trap
Alluvium
Miscellaneous

Fig. 2

quartz, indented all over their external surfaces with botryoidal cachalong, which often encloses the geode ; but when broken the mass often presents large crystals of amethyst, of a deep violet-blue colour. Frequently also the shell of the geode is composed of riband jasper or agate. The amethyst also occurs in cavities in the amorphous trap ; a single block when opened with a blow of the hammer, presented a surface a foot square, perfectly covered with splendid crystals of that mineral: some of these crystals measure an inch in diameter, and when they are perfect are six-sided prisms, terminated by six-sided pyramids. The amethyst found along this shore is seldom surpassed in beauty. . . .

Apophyllite . . . also appears, partially filling the cavities in geodes of quartz and amethyst ; the pearly lustre of the apophyllite, contrasted with the purple crystals where it is embedded, forms a pretty variety, and furnishes rich and elegant specimens. Amethyst, agate, and apophyllite, are sometimes found combined, each affording an instance of the singular process by which they have arranged their particles during the process of crystallization. Almost all the geodes containing this mineral, and those in the neighbourhood, are coated and curiously indented with botryoidal cacholong."

Quantities of amethyst, cacholong, and agate pebbles, worn smooth by the attrition of the waves, lie scattered among the sands of the beaches ; so it is rare indeed that even the veriest tyro departs from Blomidon without a goodly variety of specimens for his collection.

Unlike the opaque, encrusted specimens so characteristic of Canada's Lake Superior region, the amethyst crystals of Blomidon contained in freshly opened vugs and geodes, are possessed of a high natural polish.

Most are transparent in part and are a deeper shade of purple toward the end of the crystals. Some cavities in the rock are dressed or covered with minute, closely crowded crystals of rich colour, giving a rough spiked surface with many reflecting facets. These surfaces are often roughly fashioned along the edges and set locally in their natural state.

Many specimens of amethyst from this district are sold to tourists—principally from the United States, but little or no credit is given the country of origin once the crystals have been cut and polished into gems or worked into ornamental objects.

Geodes and vugs lined with splendent amethyst crystals are utilized quite commonly for fireplace decorations in the summer cottages at Parrsboro and other tourist resorts along the Bay. The writer has seen geodes weighing twenty pounds or more used as doorsteps or garden decorations in Parrsboro and vicinity.

The local inhabitants place little value upon even the finest specimens ; consequently they unknowingly fall easy prey to the tourist in search of " bargain " specimens. The writer recalls having seen a portion of a geode from Blomidon entirely composed of snow-white opaque cachalong marked with lemon-yellow circles or eyes, and containing a cavity lined with splendent drusy amethyst crystals, each slightly less than a quarter inch in diameter. This specimen weighed approximately four pounds, and was sold to a visitor from the United States for about as many dollars.

A woman living on Victoria Street in Parrsboro has a necklace of deep purple, faceted amethyst set in antique natural gold The rough was collected at Blomidon by her daughter, and cut in the United States. The largest gem in this graduated necklace measures about five-eighths of an inch across, and the smallest is about one quarter inch in diameter. The necklace is composed of about forty round brilliant-cut stones in all.

With the exception of those striped with red cornelian and white chalcedony, the agates of Blomidon exhibit softer colours than do those from other American localities. Many are of a deep seal brown colour grading in portions to a pale translucent brown or buff colour. When cut in the domed form (the so-called " cabochon " cut), and set in rings, brooches and pendants, they make extremely attractive jewels—particularly if natural gold be utilized for the mounting. Dr. Gesner mentions a variety found at Blomidon imitative of the gay dancing figures made by our Indians with the quills of the porcupine on boxes made of birch bark.

Bloodstone and prase are rarely found at Blomidon, but specimens from that locality do turn up occasionally.

A slight curve in the wall of the mighty precipice, between two projections of basaltic rock—nearly opposite Cape Sharp—is known locally as Amethyst Cove ; and it is here that the greatest variety of crystals and masses are generally found. However, its reputation as the ideal collector's spot is hardly true with regard to the summer visitor, since it is principally in the spring of the year that the best crystals are to be found here. By summer time the piles of rocks have long since been picked over and looted of the most important specimens. Occasionally falls of rock occur during the summer also, so the itinerant collector and tourist would do well to visit any part of the cliff.

The most eligible and only really efficient mode of exploring the Bay of Fundy is by means of a small motor boat ; for aside from the difficulty of transporting large specimens, the collector is constantly endangered by a combination of insurmountable precipices and rapidly flooding tides, which rise in some places as much as sixty feet and more. This is the highest rise and fall of tide in the world.

Apart from the ever-present danger of being caught by the tide and having the doubtful privilege of clinging precariously for hours to a crevice above a raging sea, near Cape Split a mass of basalt extends out into the sea, so that it cannot be passed by way of the narrow beach—even at low tide—without the aid of a boat.

While it is the writer's purpose to describe only gems and ornamental materials of interest to the gemmologist-collector, justice to this locality cannot be done without appending a short list including other outstanding Blomidon minerals.

The following list,† prepared by Dr. Henry How (1827-1879) —Professor of Chemistry and Natural History in the University of King's College, Windsor, N.S.—may now be found somewhat imperfect, since the havoc wrought by the tremendous tides of the Bay of Fundy is continually changing the outlines of the coast and exhausting the old localities, but at the same time bringing to light others equally rich in mineral treasures.

The names of those minerals which can be obtained in good specimens are italicized:—

Analcime, agate, amethyst, apophyllite, calcite, *chalcedony,* chabazite, gmelinite (ledererite) (rare), faröelite, hematite, magnetite, *heulandite,* laumonite, fibrous gypsum, malachite, *mesolite,* native copper (rare), *natrolite, stilbite,* psilomelane, thompsonite, *quartz.*

PARTRIDGE ISLAND

Six miles north of Cape Blomidon, across the Bay of Fundy —and four miles east of Cape Sharp—rises lofty Partridge Island, celebrated for its numerous minerals, its summer hotel, and picturesque scenery.

Like Blomidon, this island (which, incidentally, is really a peninsula, linked as it is to the mainland by a stretch of solid beach) is composed principally of basaltic columns resting upon amygdaloid and sandstone.

On the western side, the three-hundred foot cliff has become undermined in several places by the action of the waves at high water, and hangs frowning accusingly upon the collector who dares to loot the treasures hidden among the fragments at its base ; for was it not at Partridge Island that the Great Glooscap, God of the Micmac Indians, cached his bowls of precious beads when the hated pale-faces intruded into his domain?

Situated some two miles from the thriving port of Parrsboro, and connected with the mainland by a motor road along the beach, Partridge Island enjoys the unique feature of ready accessibility by automobile from Parrsboro to the very base of its eastern cliff.

The minerals and gemstones found at this storied locality enjoy a world-wide reputation, not only for their variety and perfection, but also for their astonishing beauty as cabinet specimens.

As long ago as 1605, ten large crystals of deep purple amethyst were sent from Partridge Island, by the early colonists of Acadia, to Henry IV of France. This king, greatly impressed by the magnificence of the material, caused the crystals to be fashioned into jewels for his crown, and they maintained their exalted place in the French regalia for several centuries.

On rare occasions, opal and semi-opal have also been found there. The writer has two outstanding specimens (one of which has been partially cut and polished into a 12 x 15 mm. gem) which exhibit a splendid play of brilliant greenish gold colour with overtones of pale violet. Were it not for the iridescence of the specimens, they might be taken for pieces of ordinary beeswax. The rough piece is entirely free of matrix and measures approximately 20 x 23 x 10 mm. Dr. Gesner mentions having found nodules of opal similar to these during one of his visits to Partridge Island in the 1830s. Specimens of fine quality are extremely scarce, however, and as far as is known, this is the only occurrence of precious opal in the Dominion.

Several veins of jasper and hornstone are to be found on the western side of the island, and botryoidal cacholong—a variety of opal which will adhere to the tongue—is obtainable with ease, in rich and striking patterns.

Splendidly marked cacholong frequently encloses geodes of amethyst and moss agate, cornelian, etc. Large specimens of hornstone may also be picked up along the shore. These would doubtless yield attractive collector's gems if cut and polished in cabochon form.

Good amethyst is now becoming rather scarce at Partridge Island, and nothing but an avalanche from the top of the cliff will replenish the dwindling supply of good material. Generally speaking, the Partridge Island amethyst has never been so fine as that from Blomidon. However, specimens of exceptional size—if not of quality—may still occasionally be found there.

The amethyst most frequently found at Partridge Island now might better be termed amethystine quartz, for it is in the form of masses of straight concentric crystals, banded with quartz and agate, and is suitable only for sawing into ornamental slabs. This variety—if strengthened with plate glass or plastic sheets on the back—would make beautiful jewel caskets or facings for clock cases, and if made thin enough, the slabs thus fortified could be utilized as panels for modernistic lampshades and other artistic objects of a similar nature.

In addition to the purely gem material mentioned above, the following striking cabinet specimens are of notable occurrence at Partridge Island:—

CALCITE.—As large and regular crystals, often transparent and of a light straw to golden yellow colour. Sometimes as perfect rhomboids an inch and a half in diameter.

STILBITE.—In large, wine-coloured crystal bundles, curiously studded with crystals of calcite, or tipped with delicate bright red heulandite.

CHABAZITE.—In colourless, transparent, rhombic crystals ; also in colours, varying from golden yellow to a bright red, which, although rather soft (H. 4-5), would furnish matchless and quite unusual cabinet gems if cut and polished.

OTHER BAY OF FUNDY LOCALITIES

CAPE D'OR.—Exceptionally fine, large crystals of apophyllite ; fair quality Malachite (often with dendritic veins of shining native copper running through it) and obsidian ; also good quality, richly patterned red and yellow jasper, especially as beach pebbles at Horseshoe Cove. Large cavities in the amygdaloid of this district are frequently occupied by transparent crystals of analcime.

Whilst the cliffs at Cape D'Or cannot compare in height with those at Blomidon (although at one point they reach 400 feet), the rugged grandeur of the headlands, bluffs, and arches in the vicinity of Horseshoe Cove provide some of the most beautiful scenery in America. This beauty, combined with a wealth of mineralogical specimens not mentioned in this paper, make Cape D'Or a veritable paradise for the tourist—mineralogist and general collector.

SPENCER'S ISLAND.—Ideal crystals of clear quartz in prisms and bi-pyramids ; ribbon jasper ; and hematite in shining crystals and crystal groups.

CAPE SHARP.—Deep violet amethyst in geodes and vugs.

CLARK'S HEAD.—Hematite in fair quality ; also dark green prehnite in fine crystals.

SWAN CREEK and TWO ISLANDS.—Colourless and wine, yellow and red chabazite (acadialite) in crystals of exceptional quality and size. These would supply splendid cabinet gems, if cut. Analcime enclosing native copper and fine moss agate are also found here.

MCKAY'S HEAD, just east of Two Islands.—Siliceous sinter replacing crystals of amethyst or quartz (rock crystal), in delicate cherry red and pale amethyst colours. The groups of this mineral found at McKay's Head are unrivalled by any in the world.

CAPE SPLIT.—Exceptionally large geodes of rock crystal ; red thompsonite banded with green rings ; also bloodstone.

SCOT'S BAY.—Very fine moss agate, sagenite, and chalcedony ; also amethyst in fair to good quality.

THE NORTH MOUNTAIN COAST.—Amethyst, agate, chalcedony, jasper, bloodstone, hornstone, opal-agate, etc. Exceptionally fine apophyllite is found at Peter's Point and Chutis Cove.

PARADISE, BRIDGETOWN and LAWRENCETOWN.—Smoky quartz in immense crystals buried in the topsoil. Some are perfectly transparent, with only a tinge of colour ; others are of a rich yellow colour (natural citrine) ; but most crystals are brownish yellow grading to purple-brown, and in this respect resemble specimens from the Cairngorm Mountains in Aberdeenshire, Scotland.

Crystals also occur in weathered pegmatite or coarse granite which, as it decomposes, leaves the ends of the immense crystals sticking out of the rock, from which they can easily be prised loose with the aid of a pen-knife or chisel.

Specimens weighing 100 lbs. or more were once upon a time piled up with the common stones of the fields ; but few, if any, remain. Dr. Henry How (" Mineralogy of Nova Scotia," 1869) mentions having examined a smoky crystal from this locality, which measured 13 inches in height and six in diameter. Shortly after their discovery in the early part of the 19th century, many were sent to the United States and Scotland, where they were highly esteemed. A single crystal yielded an Edinburgh cutter gems to the value of £400.

DIGBY NECK.—Fine amethyst, agate, hematite, chabazite, stilbite, rock crystal, etc. The hematite is in splendent " museum-type " crystals and crystal groups. Quartz " cat's-eye " may also be found here ; and yellow and red striped jasper is abundant. At Mink Cove, chabazite in one-inch crystals is of frequent occurrence.

* Gesner, A. H.—" Remarks on the Geology and Mineralogy of Nova Scotia," Parrsboro, Nova Scotia, 1836.

† From: " How, Henry.—" Mineralogy of Nova Scotia," King's College, Windsor, Nova Scotia, June, 1868." This list is not by any means a complete one for Blomidon.

WORLD GEMMOLOGICAL NEWS IN BRIEF

■ ■ ■

BRITAIN

A New Gemstone

E. P. Bottley, the well-known Chelsea mineralogist, showed, at the exhibition and reunion of the Geologists' Association held at the Geological Museum, South Kensington, on Friday, November 7th, four faceted gemstones cut from an albite/oligoclase feldspar found in Kenya.

The specimens, three trap-cut and one mixed-cut, were nearly colourless with a tinge of blue or of yellow. They contained crack-like flaws which were probably due to incipient cleavage, as the mineral is known to have three directions of cleavage—a perfect basal, a good one parallel to the brachypinacoid and a poor cleavage parallel to the prism. The lustre was seen to be vitreous tending to pearly and the stones appeared to be much inferior to quartz in brightness.

As yet no opportunity has been afforded to examine the properties of this gem, but from the information that the mineral is an albite/oligoclase much can be assessed. Albite, the soda feldspar ($NaAlSi_3O_8$) is one end member of the soda-lime feldspars known as the plagioclase series, while anorthite, the lime feldspar, is the other end member. Replacement of the albite molecule by anorthite in all proportions produces a complete series. If not more than 10 per cent. of anorthite be present it is correct to call the mineral albite ; if between 10 per cent. to 30 per cent. of anorthite is incorporated the mineral is the variety oligoclase.

It may be assumed that the new gemstone contains approximately 10 per cent. to 15 per cent. of anorthite, and, as both the specific gravity and the refractive indices rise with increase of the anorthite molecule a fair estimate of the constants of the stone may be made. Pure albite, or rather the purest found in nature, has refractive indices of 1.525-1.536, with a specific gravity of 2.62, while the values for anorthite are 1.576 to 1.588 and 2.76 respectively. Oligoclase with 20 per cent. of anorthite has refractive indices of 1.538-1.547 and density of 2.65 ; therefore, assuming 15 per cent. of anorthite in the composition of the new gemstone, the refractive indices would be 1.535-1.544 and the density 2.64.

As the optical orientation of the plagioclase feldspars changes with the composition the sign of refraction alters, being positive for albite, turning to negative when 16 to 17 per cent. of included anorthite molecule is reached and reverting again to positive when the anorthite molecule reaches 40 per cent. The probability, therefore, is that the sign of refraction of the new gemstone is positive. The plagioclase feldspars crystallize in the triclinic system and have a hardness of $6\frac{1}{2}$.

That the gem can be anything but a curiosity cannot be gainsaid. For the collector, yes ; for the jeweller it can have no claim.

Since the above note was penned there has come to our notice that such a stone was known some seven years ago. In March, 1940, the late Major H. J. Beadnell obtained in Nairobi a pale bluish-white trap-cut stone weighing $3\frac{1}{2}$ carats. The stone was in appearance similar to the Bottley stones, and, like the last mentioned, the locality where it was found was Kenya. It was further stated to be a mineral known to geologists as albite/oligoclase. This Beadnell stone was carefully examined and the following data obtained: refractive indices $= \alpha 1.535$, $\beta 1.539$, $\gamma 1.544$, positive in sign and a 2V of 83° to 86°. The density was found to be 2.63. Thus the stone has approximately 90 per cent. of albite and 10 per cent. of anorthite, and the Bottley specimens will probably be in agreement with this.

AUSTRALIA

Our affiliated organization, the Gemmological Association of Australia, has recently widened its constitution in order to provide better facilities for the teaching of gemmology. Control of the Association is now vested in a Federal Executive which consists of representatives elected from each State Branch and the Secretary.

The rapid growth of the Association in Australia is most encouraging, and it is hoped that the revising of its Constitution will prove of benefit to all interested in gemmology.

By R. Dick-Larkam, B.Sc. (Eng.), A.M.I.Mech.E., F.G.A.

Cameo and Intaglio

THE art of engraving and carving stones is of great antiquity and was indeed known to primeval man, as it was he that discovered that a scratch could be made on one stone by means of another. Without doubt it did not take him long to find out that if he then pressed this piece of stone on some soft, plastic substance, such as a lump of clay, that an impression would be left which was identical to the scratch, except that it was raised instead of being sunken.

In all probability it was in some such way that the principle that underlies the seal was first discovered. It was this discovery that has made possible one of the articles that have been almost indispensable to mankind ever since.

Seals were even more a necessity to the ancient races than they are to-day. Previous to the Roman period the idea of the lock and key was not evolved, and it was only by means of affixing the impression of some hard object which had previously been carved with some recognizable design, that the privacy of property could be maintained.

Quite naturally different races and peoples of the earth, having different arts, signs and symbols, evolved seals in various shapes and applied their separate arts of decoration. The two most common are doubtless the "Scarab" and the "Cylinder" or modifications of the latter.

The scarab was to the Egyptians a symbol emblematic of eternity, and took the shape very similar to our beetle (which in actual fact it was copied from, beetles being by the ancient Egyptians worshipped as gods). It was oval, and on the underside, which was flat, it had engraved any particular pattern or cypher which the owner might think unique. The cylinder seal, as the name implies, was not unlike a miniature garden roller, and around the outside was engraved the pattern or subject which the seal was to impose upon the wax or other soft substance. In operation, as can be readily understood, the principle was similar to an ordinary garden roller, usually having a hole through the axis of the cylinder in which to insert a stick.

Naturally these seals were made of a hard material and for the aristocratic classes valuable stones of the day were often used. Such stones as garnet, feldspar, lapis, turquoise, cornelian, amethyst, emerald, and in the East jade, were perhaps the most common. Although in the East also, calcite, soapstone, serpentine, and other soft stones were used, but it may be assumed that owing to their softness they were not so highly prized, although, due to the same property, the engraving was often of a much superior character.

The art of incising hard stones with elaborate designs reached the highest degree of perfection at the hands of the Greek artists. Upon stones which as a rule were almost flat they engraved representations of personages and incidents of their beautiful mythology in such a remarkably clever manner as to place the work on a par with many of the contemporary arts. The engraved stone or intaglio was often literally a subject picture displayed by hollowed out and carefully shaped incisions made upon the surface of the stone, and the subject was seen to even greater advantage in bas-relief upon any soft substance against which the object was pressed. These stones, although of great beauty, were in principle intended as articles of utility for sealing.

In contrast to these it was not until later that the cameo, or stone carved in bas-relief, was first executed. This stone was not utilitarian, but merely an ornament, and very likely owed its origin to the delightful impressions of the intaglios appealing to some wealthy personage of ancient days as an object of adornment if carved in hard stone.

It was in the Roman era that cameos first came into their own, as these people had a great love for them, employing the Greek craftsmen for their execution. They were produced in great numbers, portraying subjects connected with pagan mythology, and were distributed in quantities throughout Europe and handed down from generation to generation through the middle ages. In Roman times it does not seem to have been the habit to carve the portraits of living people, although a few are of warriors and celebrities.

Through the middle ages the art waned and, as with all things connected with arts, languished in Europe ; although many old cameos and intaglios were kept, and often used for adornment and sealing. In spite of the fact that the ancient carving depicted mythological and pagan superstitions, these were now translated into some Christian or kindred meaning.

It was not until the 15th century that the arts showed signs of renewed vigour, and with this movement came the rebirth of the carving of hard stones. At first copies of old works were undertaken, then after it had regained stimulus the production of original works were begun. During the 16th century the cameo received a very prominent place in jewellery and was often very exquisitely set.

During this period many royal and notable personages caused their portraits to be carried out in bas-relief upon hard stone, and many may still be seen in collections of art works. But the renaissance soon died, for in the seventeenth century all that was produced was in both technique and artistic skill far inferior to that which had preceded it.

The apeing of all things classical that became an obsession in the eighteenth and nineteenth centuries brought about another great revival of the cameo and intaglio, and it was at this time that many of the more wealthy people started forming collections of ancient carvings, which, of course, included any cameos or intaglios that could be procured. As can be expected, this led to innumerable forgeries of the original works being disposed of as Greek or Roman.

On account of the great demand there appeared craftsmen who were in many cases undoubtedly equal in skill to their classical precedents, and could no doubt have produced original works of equal merit with those previously executed ; but, however, they mostly contented themselves with sedulously copying the old engravings, even if their productions were not sold fraudulently as the ancient articles. There were, however, a few artists who resisted the temptation of being copyists and of making a great deal of easy money by clever forgeries by declaring that their work was of equal merit with any of a previous age and must necessarily be paid for accordingly. These men made their names famous by taking up this attitude, and their carvings are recognized as being entirely equal to those of any previous time.

It is sad to think that the glyptic art which existed from a date which history fails to reach, with only the short eclipse during the middle ages, down to modern times, should be allowed to flicker practically out, but this was its sad fate in the thirties of the last century ; and although isolated cases of its revival have been made, there is no general tendency in that direction. This may be due to the fact that the severity of the modern day in reaction to the Victorian and pre-Victorian lavish adornment has little place for the intaglio and less still for the cameo, which in themselves usually present the appearance of fancifulness.

Association Notices

(continued from opposite page)

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TALKS BY FELLOWS

W. A. Peplow. Stourbridge Soroptimist Club, November 5th, 1947 Title: "Gemstones."

H. A. Reese. Southport Scientific Society, 13th November, 1947. Title: "Gemstones." Also Liverpool Geological Society, January, 1948.

James Gilloughley, Greenock and District Catenian Association, Gourock, 13th November 1947. Title: "Diamonds."

T. Bevis-Smith, Central Y.M.C.A., London, 29th November, 1947. Title: "Synthetic Stones."

ANNUAL SUBSCRIPTIONS

Fellows and Members are reminded that Annual Subscriptions became due on 1st January, 1948. Remittances should be sent to the Secretary of the Association according to the following rates:—

Fellows, £1 1s. 0d.
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Cheques should be made payable to the "Gemmological Association of Great Britain."