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GEMMOLOGICAL ASSOCIATION
OF GREAT BRITAIN
SAINT DUNSTAN'S HOUSE, CAREY LANE
LONDON, EC2V 8AB

GEMMOLOGICAL ASSOCIATION OF GREAT BRITAIN

Saint Dunstan's House, Carey Lane, London EC2V 8AB
(By Goldsmiths' Hall) *Telephone:* **01-606 5025**

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ON MONAZITE INCLUSIONS

By S. HORNYTZKYJ, F.G.A.

INTRODUCTION

It has been shown by Murata and Bastron,(1) and Jobbins *et al.*,(2) that nonopaque, nonmetamict monazite, which is a phosphate mineral of the lighter rare earths (Ce, La, Pr, Nd, Y, Th)PO_4, changes colour under special light. When monazite is illuminated with the unfiltered light of a medium-pressure mercury-vapour lamp (principal emission lines at 405, 436, 546 and 578nm), the violet and blue radiations (405 and 436nm) are absorbed as they lie in the region of general absorption in the spectrum of monazite (Figure 1). On the other hand the yellow radiation (578nm lies within the strong absorption lines of neodymium and is greatly weakened whereas the green radiation (546nm) lies in a spectral region of relatively high transmittance; hence monazite assumes the green colour of the unabsorbed component. This colour-change phenomenon is related to the rare-earth metals, primarily to

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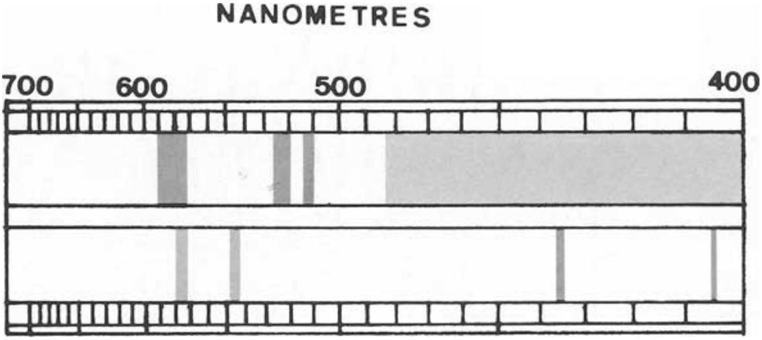

FIG. 1. Absorption and emission spectrum as seen through prism spectroscope. Above: the main absorption lines in the monazite spectrum (water-worn rolled pebble from river gravel; Lapland, North Finland). Below: the four main spectral-line radiations emitted by a medium-pressure mercury-vapour lamp.

neodymium, which cause the strong absorption lines in the yellow and green part of the spectrum of monazite. As these lines can be observed with an ordinary hand spectroscope, they have been used for recognizing monazite by field geologists.(3,4) However, to the author's knowledge all the monazite samples to which both these methods have been applied, with the exception of a study by Hornytzkyj and Korhonen,(5) have been loose grains or crystals; therefore it was interesting to see whether these methods could also be applied to monazites as inclusions. Here it deserves to be mentioned that a small parisite inclusion in a Colombian emerald was discovered with the aid of the spectroscope.(6) Parisite, which is a rare fluocarbonate of calcium and the cerium group of rare earths, $(Ce,La)_2Ca(CO_3)_3F_2$, and forms pyramidal to slender prismatic crystals, usually contains some (didymium) neodymium and praseodymium which cause absorption lines similar to those observed in the spectrum of monazite.

DESCRIPTION

According to Gübelin(7) monazite inclusions have been encountered in the following gem quality minerals, viz. topaz, garnet, iolite and sapphire. For this study about 3000 samples, which comprised rough and cut gem quality topaz, garnet, iolite and sapphire from different localities, were studied. They were first examined, immersed in suitable liquids, under a Wild Heerbrugg binocular microscope and the samples containing inclusions similar

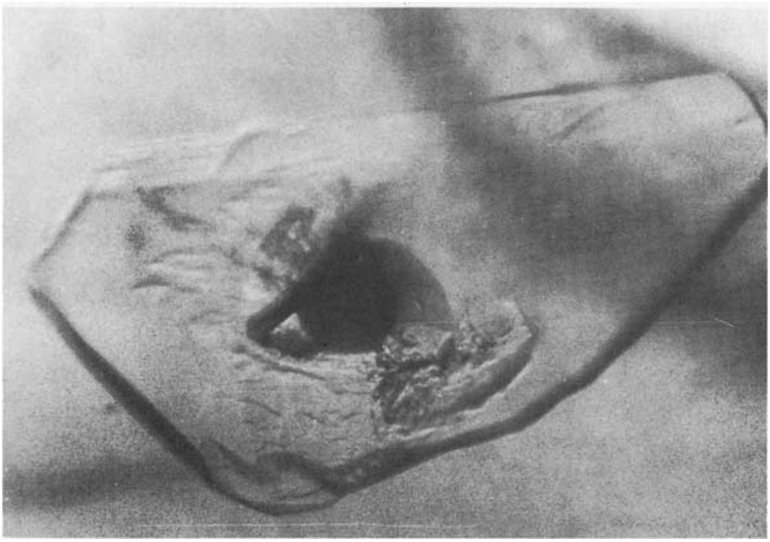

FIG. 2. Tabular crystal inclusion in topaz from Nigeria. (223 ×)

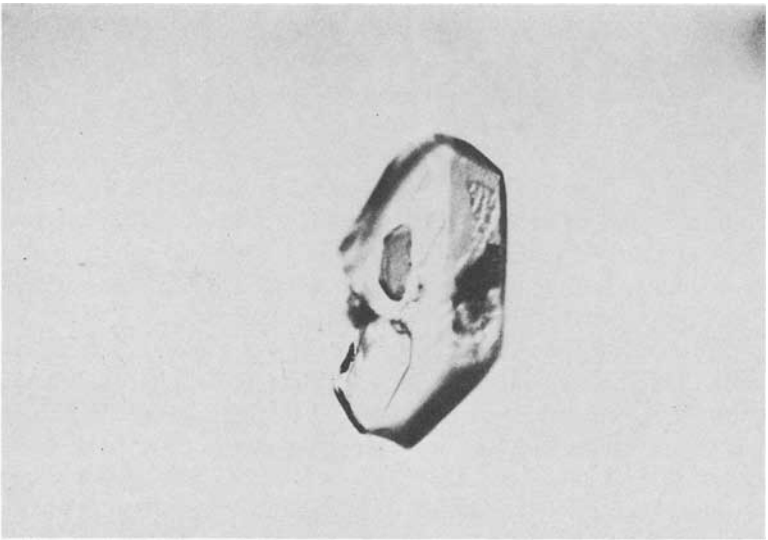

FIG. 3. Tabular crystal inclusion in topaz from Madagascar. (220 ×)

to monazite in habit and colour were placed aside. In all, 36 out of these 3000 samples seemed to contain monazite inclusions. These 36 specimens were then examined under the same microscope by the unfiltered light of a medium-pressure quartz-mercury lamp (Hanovia No. 11) directed to each specimen from below by the microscope mirror. Finally the inclusions in these specimens were sharply focused (magnification 100×) and the eyepiece of the microscope, this time Leitz SM-pol, was removed and a Rayner prism spectroscope placed on the top of the microscope.

Topaz

Flat tabular crystal inclusions of yellow colour and angular profile (Figures 2, 3) were observed in some colourless topazes from Nigeria and Madagascar. The crystal faces of these inclusions were etched to a certain degree. Between crossed polars they showed vivid interference colours and their refractive index was higher than that of their host (>1.610-1.620). By the quartz-mercury lamp the colour change was distinctive: their colour turned light green – bright green and the intensity of this green colour seemed to be dependent on the thickness and size of the inclusions. In addition, the green colour of these inclusions in topazes from Nigeria was less intense than that from Madagascar. When these inclusions were large enough, the spectroscope revealed a group of lines at about 510-520 and 570-590nm. The host mineral (topaz) showed no observable absorption spectrum.

Garnet

Orange brown, thin, tabular crystal inclusions of angular to rounded profile were met in garnets from India, Sri Lanka, Australia and Finland. All of them were surrounded by a single halo (Figures 4, 5) and displayed vivid interference colours between crossed polars. Their refractive index was close to that of their host (1.774-1.810) but higher. Under the quartz-mercury lamp their colour change varied from vague to distinctive: from greyish olive-green to greenish and in some cases to bright green. The three strong absorption bands in the yellow-green part of the spectrum of garnet (the specimens examined belonged to the pyrope-almandine intermediate series) apparently reduced the transmittance of the 546 and 578nm wavelength. The best results were obtained when the host mineral had a weak almandine spectrum. Furthermore, the

FIG. 4. Thin tabular crystal inclusion, surrounded by a single halo, in garnet from Finland. (180 ×)

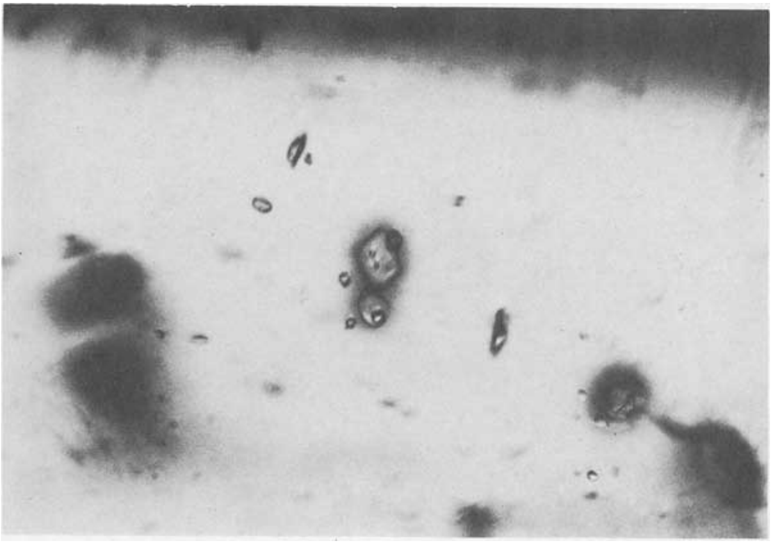

FIG. 5. Two rounded crystal inclusions, surrounded by single haloes, in garnet from India. (180 ×)

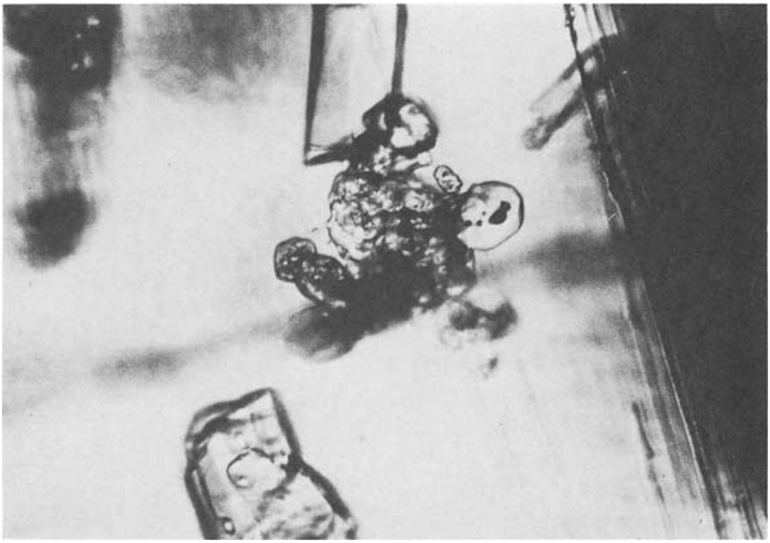

FIG. 6. Dense aggregate of thin rounded crystal inclusions in kyanite from Rhodesia. (200×)

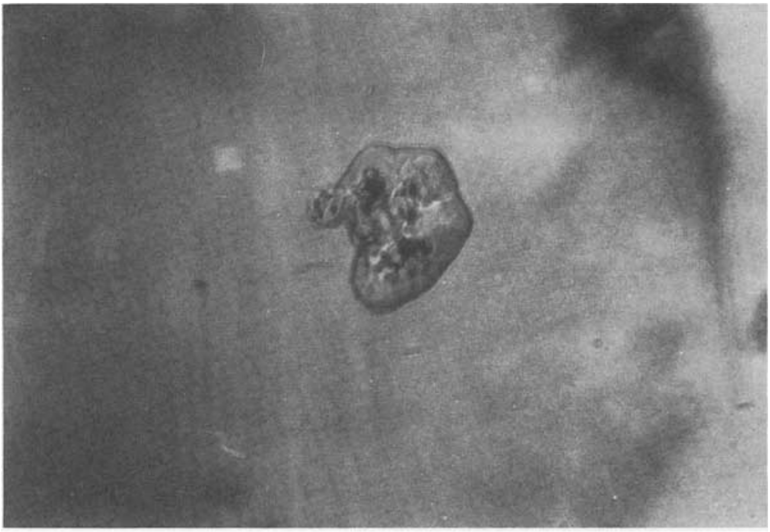

FIG. 7. Thin angular crystal inclusion in kyanite from Rhodesia. (210×)

intensity of the colour change seemed to vary according to the thickness and size of these inclusions.

Iolite

No inclusions similar to monazite were observed in specimens from Sri Lanka and Finland.

Sapphire

No inclusions resembling monazite were met in specimens from different (unknown) localities.

In addition to the before-mentioned minerals some rough and cabochon-cut kyanites from Rhodesia were found to contain inclusions reminiscent of monazite. These crystal inclusions were slightly rounded, angular, yellowish thin tabular platelets and their size was smaller than that in the two cases mentioned before. Their refractive index was higher than that of their host (>1.714-1.729) and between crossed polars they showed moderate interference colours. By the quartz-mercury lamp the colour change was distinctive: their colour turned light green. These inclusions occurred singly or in dense clusters (Figures 6, 7). When such an aggregate of crystal inclusions was large enough, the spectroscope revealed a group of lines at about 510-520 and 570-590nm. The host mineral (kyanite) showed two absorption lines in the deep blue and a line in the deep red.

SUMMARY

All the before-mentioned crystal inclusions were nonopaque, nonmetamict, tabular, angular or slightly rounded crystals of yellow or reddish orange colour. By the quartz-mercury lamp their colour change was distinctive except when enclosed in garnet. When they were large enough or occurred in sizable aggregates, the spectroscope revealed a group of absorption lines in the yellow and green part of the combined spectrum. On the face of these results it seems most probable that these crystal inclusions are monazites and that both these methods can be applied to recognizing monazite inclusions, provided however that the host mineral transmits the two radiations of the quartz-mercury lamp, the size of the inclusions in question is large enough and the lighter rare earths, particularly neodymium, are present in the right proportion to produce the absorption lines.

ACKNOWLEDGEMENTS

The author's sincere thanks are due to Mr J. R. H. Chisholm, M.A., F.G.A., for his valuable suggestions at the initial stages of this study. The author is also indebted to Professor Th. G. Sahama for his advice, interest and support in the course of this study. Thanks are also due to Mr K. T. Korhonen, M.Sc., and Mr H. Koivisto, for their assistance in this study. Last but not least the author would like to thank Miss S. Martikainen, who kindly made the photographs.

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FIRST OCCURRENCE OF GEM SPHENE IN SRI LANKA

By MAHINDA GUNAWARDENE, F.G.A., D.Gem.G.*
and HENRY A. HÄNNI,† Ph.D., F.G.A.

*Deutsche Gemmologische Gesellschaft, Idar-Oberstein. †Mineralogisches Institut der Universität, Basel

INTRODUCTION

Once more, the careful investigation of a mixed parcel of tourmalines from Sri Lanka has yielded a surprising result. This study deals with an oval, faceted, brown stone, which attracted attention because of its shining inclusions located slightly below the table facet. This feature is unknown in tourmalines. The result of a refractivity measurement was negative; that is, the refractive index must be higher than 1.8. On the basis of its specific gravity and the observed absorption spectrum showing didymium-lines, the stone was suspected to be a sphene. Because sphene of gem quality has not to date been reported from Sri Lanka, it was necessary to undertake a mineralogical and chemical investigation of this stone. At the same time, three additional sphenes from well known localities were analysed as a means of comparison. They are described in Table 1.

TABLE 1
Sample description

No. 1 Yellow-green faceted gem from Madagascar, 0.49 ct: SG = 3.52
No. 2 Green crystal fragment, Swiss Alps (too small for RI measurement)
No. 3 Emerald-green crystal from Baja California, Mexico, 4.99 ct: SG = 3.53
No. 4 Dark brown faceted gem with oval form, from Sri Lanka, 4.48 ct: SG = 3.52

CHEMISTRY

Although the chemical formula of sphene is simply $CaTiSiO_5$, this mineral normally contains small proportions of foreign elements. There is a substitution of major elements by minor proportions of rare-earth elements and others. It was observed that

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TABLE 2

Microprobe analyses of gem-material sphenes

	1	2	3	4
SiO_2	29.87	29.72	29.92	29.92
TiO_2	37.63	38.39	38.39	38.61
Al_2O_3	1.21	1.06	.82	.85
Fe_2O_3	.60	.69	.26	.45
Cr_2O_3	.21	.16	.38	.00
MnO	.23	.00	.00	.00
MgO	.09	.00	.06	.17
CaO	28.63	28.78	28.97	28.53
Na_2O	.02	.00	.00	.40
K_2O	.03	.02	.03	.03
Total	98.52	98.82	98.83	98.96
Si	0.9934	0.9844	0.9912	0.9897
Al	0.0474	0.0414	0.0320	0.0331
Ti	0.9411	0.9569	0.9564	0.9604
Mg	0.0044	0.0000	0.0029	0.0083
Fe	0.0150	0.0174	0.0064	0.0112
Cr	0.0031	0.0041	0.0099	0.0000
Mn	0.0064	0.0000	0.0000	0.0000
Na	0.0012	0.0000	0.0000	0.0256
Ca	1.0202	1.0221	1.0283	1.0111
K	0.0012	0.0008	0.0012	0.0012

Analyst H. Schwander, Basel.

oxides in weight-%; number of ions on the basis of 5(O)

1 yellow-green sphene from Madagascar

2 yellow-green sphene from the Swiss Alps

3 emerald-green sphene from Mexico

4 dark-brown sphene from Sri Lanka

The sample from Sri Lanka contains approximately 0.5% Nb. Further rare-earth elements were not detected by this analytical determination.

Ca could be replaced in small quantities by Na,Mn,Sr,Ba. Furthermore, Ti could be substituted in slight amounts by Al,Fe,Mg,Nb,Ta,V,Cr. Finally oxygen indicated a small degree of replacement by OH or F. In sphenes, traces of rare-earth elements are characteristically found. Among these, Ce and Y are common, and Nd and Pr cause an absorption spectrum in which a group of fine lines appears in the yellow region. In order to have a means of comparison of the chemical analysis of the stone from Sri Lanka, the additional three sphenes from Table 1 were analysed as well. The analyses were made using an ARL electron microprobe, operating the wavelength dispersive method as well as the energy dispersive method. The chemical standards were silicates with simple compositions (minerals) and oxides. All samples were coated with carbon in order to have a conductive surface. The analytical results are presented in Table 2. The main constituents of all samples are fairly constant; minor elements differ in small limits. The concentrations of the trace elements are too low to be analysed by the microprobe. Nevertheless the sample from Sri Lanka showed a small Nb peak, and a concentration of 0.5% was estimated. The dark brown colour is not necessarily related to the total iron content as indicated by samples No. 1 and 2, which are both lighter in colour than No. 4, yet have a higher iron concentration. Literature indicates that the brown colour is due to iron, with as little as 1% Fe_2O_3 causing a dark brown stone.

OPTICAL PROPERTIES OF THE STONE FROM SRI LANKA

The most attractive sphenes have a bright yellow, green or brown (blue and red are also reported) colour which does not completely obscure the strong dispersion, thus such stones produce a remarkable fire. The stone No. 4 is lacking in such fire, its dark brown colour masking this esteemed property. Because of the high refractive index of sphene we had to use a special Riplus type refractometer. The values, including the comparative stones, are shown in Table 3. Stone No. 2 was too small to get a reading.

The obvious inclusions in the stone consist of disc-shaped fine tension fissures similar to those seen in metamict zircons from Sri Lanka. These fissures are oriented parallel to each other, and no mineral grains were discovered which could have caused the defects, using both microscope and microprobe.

TABLE 3

Refractive Indices

	nα	nγ	DR
No. 1	1.910	2.070	0.160
No. 3	1.908	2.080	0.181
No. 4	1.909	2.099	0.190

The absorption spectrum is as reported in many books, the typical rare-earth spectrum. It consists of a group of fine lines in the yellow. Further lines are not seen in the hand spectroscope. Table 4 shows the absorption spectrum recorded with an ultraviolet spectrometer Pye Unicam SP 8-100 under rapid scanning conditions, but narrow band width (0.5 nm). Wavelength indications are accurate to ±0.5 nm or better. General absorption for the very dark red-brown ray starts below approximately 470 nm, the lighter greenish-brown ray below about 440 nm. The peak positions are not sensitive to crystal orientation; the absorption intensities, however, depend strongly on it.

The spectrum essentially is identical with those of yellow and green sphenes, except for the much lighter line intensities in the described brown Sri Lanka stone. The attractive green sphenes from Baja California have additional bands and lines due to chromium.

OCCURRENCE

Sphene occurs as a common accessory mineral in magmatic as well as in metamorphic rocks. In Sri Lanka it is reported from wollastonite-bearing gneisses of the Galle Series and from gneisses close to the hill country, in which it appears much rarer (H. S. Gunaratne, personal communication). Although these rock-forming sphenes do not reach cuttable sizes, it is surprising that the subject of this paper originates from a remote area near Galle.

ACKNOWLEDGEMENTS

We are grateful to Professors M. Frey and H. Schwander, in whose institute and laboratories the chemical investigations were carried out. We also wish to express our thanks to Mr E. Uhl for

TABLE 4

Absorption spectrum of sphene from Sri Lanka

The absorption spectrum consists of four line-groups

	Int.	nm		Int.	nm
Group 1	m	820	Group 3	vw	596
	vw	813		vw	593
	st	806		w	590
	m	799		vw	587
	m	795		m	586
	vw	789		w	582
				w	579
Group 2	vw	779		vw	575
	vw	776		vw	573
	vw	771		w	569
	w	764			
	st	751	Group 4	vw	536
	vw	746		vw	533
	vw	744		w	528
	vw	741		vw	524
	w	739		w	512
	m	732			

Intensities: st = strong, m = medium, w = weak, vw = very weak

providing us the comparative samples and Mr J. Häfliger from Siber and Siber Ltd for operating the Krüss ER602 Riplus refractometer. Thanks are due to Mr G. Bosshart, M.Sc., G.G., from the Swiss Foundation for the Research of Gemstones, who provided the spectroscopic data.

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AN INVESTIGATION OF SYNTHETIC TURQUOISE AND THE TURQUOISE SUBSTITUTE OF GILSON

By Dr K. SCHMETZER and Prof. Dr H. BANK, F.G.A.

SUMMARY

The so-called synthetic turquoise of Gilson consists of turquoise with one or more additional crystalline phases. The designation 'synthetic turquoise' does not correspond with the composition of the material. The turquoise substitute of Gilson consists mainly of calcite.

INTRODUCTION

For several years, P. Gilson, the French producer of synthetic stones and imitations, who has become well known for his synthetic emeralds, has offered synthetic turquoise as well as a substitute for turquoise. According to chemical and x-ray investigations of Williams and Nassau (1976-1977), Gilson's synthetic turquoise is the only product on the market which may be really called synthetic turquoise. Other substitutes of turquoise as well as the Gilson turquoise studied by the authors mentioned, consist of the same constituents as natural turquoise (CuO, Al_2O_3, P_2O_5 and H_2O), which crystallizes in the triclinic system with the formula $CuAl_6[(OH)_2|PO_4]_4 \cdot 4H_2O$.

The substitutes differ, however, from the natural gemstone in their crystal structures. Although Eppler (1973-1974) as well as Arnould and Poirot (1975) through microscopic investigations and infrared spectroscopy observed differences between natural turquoise and the synthetic one of Gilson, the reasons for these differences are yet unknown. Microscopic observation of a second crystalline phase, which occurs as matrix between turquoise spheres (Eppler, 1973-1974), indicates that one should expect additional x-ray lines in the pattern of the substance by Gilson, called synthetic turquoise. The investigations by Williams and Nassau (1976-1977) on natural turquoise from Nevada, U.S.A., and synthetic turquoise from Gilson however resulted in general in the same x-ray powder diagrams for both materials. Differences

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include only a small shift of the line at 3.28 Å to a lower d-value as well as a spreading of the same line with the synthetic material.

EXPERIMENTAL

For the present paper, three samples of synthetic turquoise (Gilson) and one sample of Gilson's substitute as well as natural turquoise from Nevada were studied for comparison. The main elements with an atomic number>11 were determined by a SEM-micrograph in connexion with an energy-dispersive system. X-ray investigations were performed by a powder diffractometer and with film methods (Guinier- and Debye-Scherrer-techniques).

RESULTS

1. Synthetic turquoise of Gilson

In all three samples of Gilson's product only the main elements Cu, Al and P, characteristic also for natural turquoise, could be determined.

The x-ray powder diagram of the synthetic material indicates several lines not yet observed in natural turquoise (Table 1). It is worth mentioning, that the d-values of the strongest of these additive lines at 3.25 and 3.22 Å are identical with the d-value of the shifted line at 3.28 Å, which is illustrated in the figure given by Williams and Nassau (1976-1977), as already mentioned. So the x-ray investigations of the synthetic material of Gilson's product, which until now has been named synthetic turquoise, show that this the strongest line of turquoise at 3.68 Å has, in the three samples investigated in our laboratory, an intensity of 60.

TABLE 1

Additional lines in the x-ray powder pattern of 'synthetic turquoise' produced by Gilson.

d[Å]	I/I_1
4.91	15
3.93	50
3.25	100
3.22	90
2.76	10
2.55	15

product consists of one or more additive crystalline phases in addition to turquoise. Using the d-values given in the ASTM-Index for Al- and Cu-phosphates or Al- and Cu-hydroxides and hydrates showed a similarity of several of the d-values of Gilson's synthesis, which do not belong to turquoise, to those of the crystalline phase $AlPO_4 \cdot 1.1—1.3\ H_2O$ (ASTM 15-265). But it was not possible to assign the two strongest additive d-values to any certain crystalline phase. The results can be explained by comparing the data of Williams and Nassau (1976-1977): both series of 'synthetic turquoise' of Gilson contain, besides turquoise, one or more other crystalline phases. Less matrix is contained in the sample of Williams and Nassau than in our samples.

The synthetic turquoise of Gilson consisting of synthetic turquoise and further crystalline phases must be regarded as a mixture which, until now, has not yet been described in nature. The term 'synthetic turquoise', therefore, does not designate the composition of the material. According to the rules of nomenclature, it should not be used.

2. *Turquoise substitute of Gilson*

In the substitute of turquoise produced by Gilson, Ca has been determined as the main element as well as traces of Si, P, S and Fe. The x-ray powder diagram shows lines of calcite as well as some additive lines of minor intensity (Table 2). The lines with d-values

TABLE 2

Additional lines in the x-ray powder pattern of calcite produced as turquoise substitute by Gilson.

d[Å]	I/I_1
4.91	5
2.784	7
2.751	5
2.629	10
2.191	4

the strongest calcite line at 3.035 Å has an intensity of 100.

of 4.91 and 2.629 Å can be caused by $Ca(OH)_2$. An assignment of the other weak lines is difficult without knowledge of the mode of manufacturing of the substitute. The imitation of turquoise produced by Gilson can be regarded as a mixture of mainly calcite and other crystalline phases.

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NOTES FROM THE LABORATORY— THE ENJOYMENT OF GEMMOLOGY

By A. E. FARN, F.G.A.

The Gem Testing Laboratory of the London Chamber of Commerce and Industry

To me the enjoyment of gemmology is *not* hastening towards the 'Diamond Eye' with a colourless stone, neither is it placing a green subtranslucent stone upon the spectroscope stand to check whether it is jadeite-jade or californite, etc.

Rather it is to employ the eye (an intricate piece of equipment) aided by a 10× lens. 'The first impact of a gemstone upon the eye is its colour'—this sentence being the subject of a talk I gave in Idar-Oberstein in 1979.* The conference itself was an international affair † in which every variety of gemmologist seemed to be present. Geologists, mineralogists, physicists of world repute rubbed shoulders and in so doing by this very attrition added a little polish to each other by the garnering and dissemination of knowledge. Every variety of gemmologist was present. Quite a sweeping statement! What in fact is a gemmologist?

Gemmology, the study of gemstones, is the broad discipline of the gemmologist embracing crystallography, optics, chemistry, physics, etc.: a gemmologist knows perhaps a little of each of them. It is also possible to be a specialist in the gemmological field. Famous among them must be B. W. Anderson and spectroscopy, Edward Gübelin and inclusions, Robert Webster on x-ray fluorescence to name but a few. Certainly gemmology—to coin a phrase—'has a broad spectrum'. Basically, to me that spectrum must be the visible one which the eye can determine. Even here we have individual limitations and human factors. Some people cannot see very well in the red end of the spectrum, others find it nigh on impossible to see 'alpha' or even 4370Å in jadeite. I must hasten to explain that 'alpha' was used freely in the 'good old days' of Ångström Units for the 4155Å line in the Cape spectrum of diamond.

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*The first impact of a gemstone, *Z.Dt.Gemmol.Ges.*, **28** (4), 188-90, 1979—Ed.

† See *J.Gemm.*, **XVII** (3), 206-9, 1980.—Ed.

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Although there are individual limitations on eyesight, generally speaking most of us ordinary people see rubies as red, sapphires as blue and emeralds as green. The subtlety though is in the *impact* of that colour; upon opening a stone paper containing a loose stone or being shown a coloured stone in a ring the eye registers the colour and sends *that* message to the brain. Most of us in the trade will automatically react and recognize (for want of a better word) a Verneuil synthetic ruby. Generally this Verneuil has too much chromium and it is cut at random—a fatal combination giving the garish colour of a typical synthetic ruby.

This impact effect is the result of practice and practical handling of gemstones. It is a scoring point tradespeople have over narrower specialists in gemmology.

When I first started work in the Laboratory, not having had any real training except six years in the Army, I was totally depressed upon engagement to find that our commissionaire could tell cultured pearl necklaces from natural as they came through his hands. He would say to B. W. Anderson 'John Smith has sent in a single-row cultured pearl necklace' or '(someone else) has sent in a pair of natural pearl ear-pendants!'

Because of war conditions, with B. W. Anderson being on his own, the sergeant had to help Anderson much more than his duties demanded and he handled goods so much that he 'got his eye in'.

It takes time and plenty of goods, but slowly it comes and you find yourself deciding the nature of a stone *before testing.* It is very, very gratifying to find that your instinct and eye have responded to that first impact of a gemstone.

Lots of people unfortunately do not have the opportunity to handle the stones that we in the laboratory have. We are indeed fortunate—sometimes (although we restrain ourselves) it seems we ought to pay for the pleasure of looking at such treasures!

Dwelling upon gemmology from a trade point of view, an extension of the first impact of a gemstone is afforded by that primary weapon, the 10× lens. This to a gemmologist is as a rifle was said to be to a soldier—his best friend! Many ex-service readers will agree that there are some aspects of weapon training that did not endear them to their rifle! However, it is hoped that the enthusiastic gemmologist will be a volunteer and not a pressed man. Although change is inevitable with the advent of more and more sophistication in the manufacture of synthetics and artefacts requiring considerable technical skills in the use of equipment, the 10× lens must surely keep its place in the gemmologists' fight and be used in the preliminary encounter with the enemy.

I had once considered writing an article upon the sartorial garb of a gemmologist and intended a plea for the conventional three piece suit, the idea being that a waistcoat is the ideal practical garment for the retention of (for right handed people)—

10× lens in bottom right pocket,
Chelsea filter in bottom left pocket,
Stone gauge in top right pocket,
Radiological protection badge in top left pocket, (I realize, of course, that most gemmologists do not possess x-ray sets).

Enjoying gemmology, the challenge of 'What is it?', the ability to spot a green metamict zircon by its colour and zoning are rewards offered to the enthusiast. I find considerable pleasure in trying to go through a whole necklace and prove every 'pearl' cultured by dint of demarcation lines of nacre and mother-of-pearl and/or 'varicose veins' particularly at the drill holes. Thin-skinned cultured pearls have a regularity about them plus that gleam of artificial dentures, and if the necklace is rotated sometimes a flash of extra lighting will indicate the zonal nature of the mother-of-pearl bead barely covered by a lick of nacre. B. W. Anderson used to say these cheap quality cultured pearls had a sucked look like some sweets of long ago which used to change as you sucked them, necessitating an examination between saliva-dripping fingers (happy days!).

Garnet topped doublets can be detected by the join on a facet of the hard garnet and soft glass: when polished, the difference is seen by reflection. Perhaps one of the easiest examinations is that of a pink pearl: 'flame structure' is the term used to describe this unique pattern which really has to be seen and once seen is easily remembered. Ivory (elephant) has its lines of Retzius—somewhat akin to engine-turning—but one needs a polished rounded surface to see them fully displayed. Strangely enough one of the cleverest breakthroughs in gemmological synthesis, that of opal, is in itself fairly characteristic in structure. The effect seen by lens is variously described as lizard-skin or chicken-wire effect.

Before the advent of synthetic opal we seldom really *looked* hard at the surface, since opal was unique and needed no expert to tell what it was. Certainly successful synthesis causes us to look that much harder at gems. The 10× lens scores many times because of its *low* power. Very recently one of our more extrovert clients came in to see me. He brashly stated that despite a 'distinction' in gemmology and twenty years in the trade he had spent hours on a sapphire in a cluster ring. Could I help? The stone was about five carats and open at the back. Over a sheet of matt white paper with a 60-watt bench-lamp shining down upon the paper it was easy to see the curved lines looking through the stone at a steep angle. And in any case it *looked* wrong.

Microcline feldspar (amazonite) is a very easy material to prove by 10× lens, the flashes (schiller) from myriad cleavages being almost a hallmark. Stained blue jasper imitating lapis lazuli has islands of porosity revealing deeper penetration of colour and sometimes reflection from quartz crystal impregnations.

The first impact of a gemstone apart from colour can be its heft, which is a sensory perception of density. An important colourless stone recently brought to us should have weighed about 5½ct as a diamond. It felt very heavy in the hand and weighed just over 11ct: we knew it could not be diamond. Horsetail feathers in a green stone which has a certain amount of fire can indicate demantoid garnet. The out-of-focus look seen in some colourless zircons is easily resolved as the exceptional doubling of back facets (plus heft). Golden brown hessonite garnets with their heavily included apatite crystals (once thought to be diopside) are another beautiful effect easily seen by the 10× lens. Aventurine quartz with its fuchsite mica platelets—these have a very distinctive structure totally divorcing it from emerald. Hardness has an effect upon polish and reflection. Reflection and hardness result in lustre; these effects which impinge upon the eye give clues to a stone's nature. The hardness of chrysoberyl compared to quartz helps determine a cat's-eye by the nature of the reflected ray. Chrysoberyl cat's-eye has a fine sharp silvery ray compared to the best of quartz, which usually has a coarser, wider ray and a softer look. The surface lustre again looks to be harder and finer in polish than that of quartz.

Most imitations of gemstones look wrong, and where they are simply imitations little difficulty arises in detection. Usually imitations are too good in colour or too strong in colour. Nature seldom blesses us with superb qualities in colour—thus the rarity aspect of a gemstone. Our laboratory has to use non-destructive methods (for obvious reasons); this leads to careful examination of stones as a preliminary approach. The use of a 10× lens and the first impact of a gemstone are two of the main facets in the approach to gem testing.

Gem testing for me is practical gemmology in all of its forms. We do, of course, use sophisticated equipment and techniques, because our customers mostly buy and sell 'subject to test'. Since we are trade oriented, merchants bring us their difficult stones usually in a hurry. This 'hurry up' attitude rampant throughout the trade makes us *lens conscious,* because many merchants, fully intending a full test to be made on their goods, will often tell us of their hurry (having held the goods for days) and then finally submit them for test with a question as you open the parcel or packet—'What do you think?'. . . Out comes the 10× lens and the first impact has been made by the colour—a mental note suggests synthetic sapphire, etc., a cursory inspection gives added information, and the merchant is assured of when he can expect a result and its possibility. This aspect of gemmology in a laboratory is characteristic of trade requirements, speed and service. The impact of the gemstone and the demands of trade push forward the need to be able to assess goods rapidly. Thus in full circle practice—practice and yet more practice—makes perfect.

'The first impact of a gemstone is its colour'; the continued examination of stones after this is to me in fact enjoying gemmology.

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OBSERVATIONS ON SOME SCAPOLITES OF CENTRAL TANZANIA

By Prof. Dr GIORGIO GRAZIANI ,
Institute of Mineralogy and Petrography, University of Rome.

and Prof. Dr EDWARD GÜBELIN, C.G., F.G.A.
Meggen, Lucerne, Switzerland.

ABSTRACT

The authors deal with some colourless and yellow scapolites from Central Tanzania and their numerous inclusions, many of which are euhedral and variously corroded growth tubes of different sizes. Electron microprobe analyses show in them a high iron content. The other inclusions consist of pseudo-hexagonal plates of pyrrhotite with metallic lustre.

The chemical composition of these scapolites is determined. Optical observations were conducted: refractive indices and density were defined. The physical chemical growth conditions with respect to pyrrhotite and dehydration of lepidocrocite are inferred.

INTRODUCTION

The study of scapolites proved to be of considerable interest owing to the varying interdependence of their crystallographical, optical and compositional aspects (Shaw, 1960). Moreover these minerals are interesting for their evident chatoyancy and cat's-eye effects, which can be attributed to the presence of thin, hollow channels or to liquid-filled channels and to long needles of double-refractive crystals, all following the main axis of scapolite. Sometimes, patches of specular iron, also following the general orientation, could be observed (Eppler, 1958).

The scapolite from Tanzania has a particular interest due to its high birefringence and evident chatoyancy and asterism effects. These were recently attributed to needle-like channels, rigorously iso-oriented, with a brownish-red or orange-red colour. SEM observations revealed the presence of iron as single chemical component of the inclusions; consequently, the presence of iron oxides or hydroxides was suggested (Schmetzer *et al.*, 1977).

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In Tanzanian scapolites, coming from Umba, however, prismatic channels have already been observed, filled with both transparent and brownish-red matter. These channels mostly started from the bottom of triangular etch pits (Zwaan, 1971). Moreover, the scapolites from such area showed an unusually high birefringence, which allowed them to be classified as intermediate members of the Marialite-Meionite series (Krupp and Schmetzer, 1975; Bank, 1978).

It seemed appropriate to conduct this study in order to determine the nature of the different kinds of crystals included in this mineral, particularly the filling of the tubes, and to formulate hypotheses on the genetic modalities of the host mineral.

EXPERIMENTAL

The specimens consisted of two cut crystals (*ca.* 4.0 × 5.0 × 3.0 mm), one yellowish and the other colourless, in which numerous mineral inclusions of various shapes could be observed.

In particular, the former (Figure 1) was furrowed by numerous channels (*ca.* 0.2 × 3.0 mm) of yellowish-red colour. A large number of thin channels were also present, with the same orientation as the previous ones and both parallel to the optical axis of scapolite. Generally in this direction, sporadic black laminae were found, with metallic lustre and pseudohexagonal habit.

The second specimen (Figure 2) featured also a multitude of inclusions, mainly consisting of the previously-described laminae with metallic lustre, but of considerable size (*ca.* 0.4 × 0.4 mm), perfectly euhedral and with hexagonal habit, as well as thin channels.

Furthermore, both specimens were traversed by numerous healed fractures, often sealed by a light yellow or colourless matter. Such fractures, very numerous in the colourless specimen, crossed the channels, nearly connecting them, and, very frequently, departed from their end forming a wide halo.

It was deemed appropriate to characterize the embedding scapolite, some minute inclusion-free fragments of which were isolated.

The experimental data for both specimens are shown in Tables 1 and 2, for the yellowish and colourless specimens respectively.

TABLE 1. Microprobe analysis, optical properties and x-ray data of the yellowish scapolite from Central Tanzania.

		Numbers of ions on the basis of 12 (Si, Al)		
SiO_2	44.88 wt.%	Si	6.918	12.00
TiO_2	—	Al	5.082	
Al_2O_3	27.97	Ti	—	4.27
FeO*	0.19	Mg	0.133	
MnO	—	Fe	0.024	
MgO	0.58	Mn	—	
CaO	17.20	Na	1.157	
Na_2O	3.87	Ca	2.841	
K_2O	0.56	K	0.110	
H_2O^+	0.92	H	0.946	
H_2O^-		C	0.838	0.90
CO_2†	3.98	S	0.035	
SO_3	0.30	F	—	
F	—	Cl	0.026	
Cl	0.10			
	100.55	70.3		
O ≡ Cl, F	0.02	100 × (Ca + Mg + Fe + Mn + Ti)		
Total	100.53	(Na + K + Ca + Mg + Fe + Mn + Ti)		

ε = 1.557 ± 0.003	a = 12.107 ± 0.005
ω = 1.587 ± 0.003	c = 7.583 ± 0.003
δ = 0.030	c/a = 0.626
ϱ_{obs}. = 2.716 ± 0.005 g/cm³	ϱ_{calc}. = 2.709 ± 0.005

*Total iron as FeO.

†:Dosed with a Carbon dioxide analyser.

Optical observations were carried out. In particular, the refractive indices were determined, obtaining very similar values for both specimens and a high birefringence.

X-ray powder diffractograms were performed in order to determine the cell dimensions, whose values proved to be very similar for both specimens. Furthermore, the correlations proven by Burley *et al.* (1961) were tested and a close agreement was found between the angular separation (Δ) of the (400) and (112) peaks with composition and the average of refractive indices. Density was measured on a Berman microtorsion balance, which provided data slightly lower for the first than for the second specimen. These

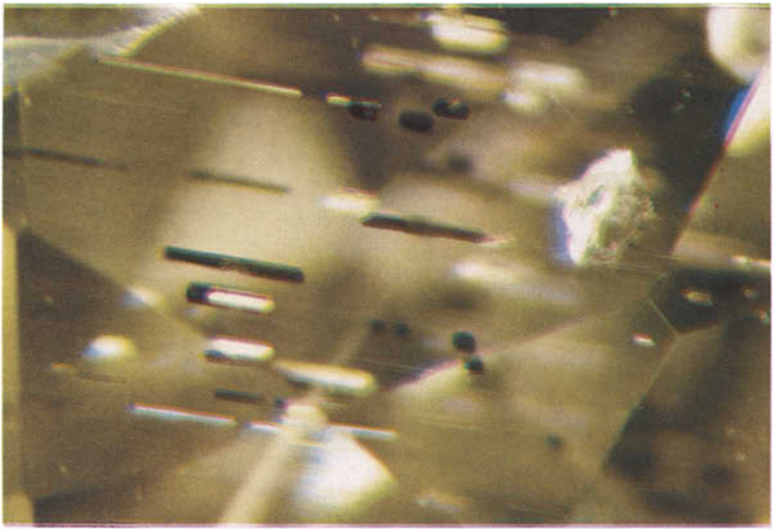

FIG. 1 Scapolite from Central Tanzania. Sample 1. Growth tubes following regularly the *c*-axis of the embedding mineral. × 25.

FIG. 2 Scapolite from Central Tanzania. Sample 2. Pyrrhotite plates are nearly perpendicular to the *c*-axis of the embedding mineral. × 20.

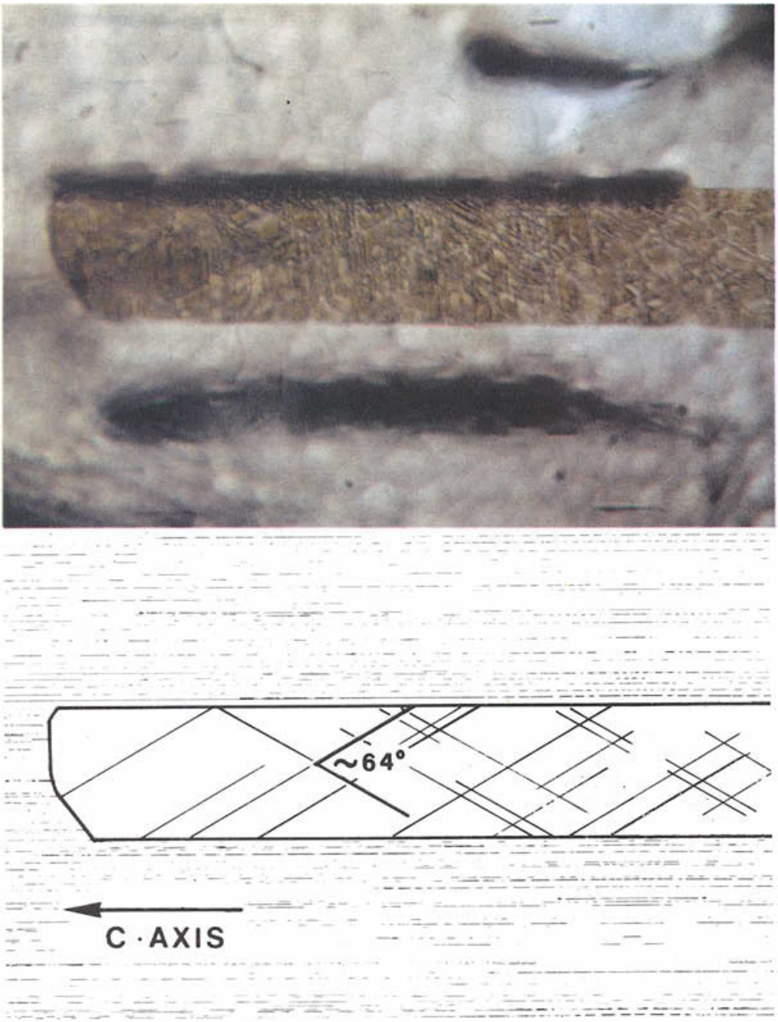

FIG. 3 Scapolite from Central Tanzania. Sample 1. Above: a growth tube filled with regularly shaped lepidocrocite plates. × 80.
Below: outline of the (201) planes forming an angle of nearly 64°.

TABLE 2. Microprobe analysis, optical properties and x-ray data of the colourless scapolite from Central Tanzania.

		Numbers of ions on the basis of 12 (Si, Al)		
SiO_2	44.87 wt.%	Si	7.441	12.00
TiO_2	—	Al	4.559	
Al_2O_3	25.40	Ti	—	4.34
FeO*	0.21	Mg	0.134	
MnO	—	Fe	0.027	
MgO	0.59	Mn	—	
CaO	14.84	Na	1.479	
Na_2O	5.01	Ca	2.421	
K_2O	1.43	K	0.278	
H_2O^+ H_2O^-	0.28	H	0.284	
CO_2†	2.46	C	0.511	0.57
SO_3	0.26	S	0.030	
F	—	F	—	
Cl	0.12	Cl	0.031	
	99.47			
O ≡ Cl, F	0.03			
Total	99.44			

$$59.5 = \frac{100 \times (Ca + Mg + Fe + Mn + Ti)}{(Na + K + Ca + Mg + Fe + Mn + Ti)}$$

ε	=	1.556 ± 0.004	a	=	12.085 ± 0.002
ω	=	1.582 ± 0.003	c	=	7.577 ± 0.002
δ	=	0.026	c/a	=	0.627
ϱ_{obs}.	=	2.709 ± 0.005	ϱ_{calc}.	=	2.690 ± 0.005

*Total iron as FeO.

† Dosed with a Carbon dioxide analyser.

values are in close agreement with the relation proposed by Shaw (1960) as a function of Meionite content.

In order to investigate the chemical composition of these scapolites, the samples were analysed by an electron microprobe Jeol-50A, using a series of natural and synthetic standards. The analytical data shown in Tables 1 and 2 derived from the average of five different positions for each sample where the absence of inclusions was ascertained.

The CO_2 content was measured by means of the method described by Scarano and Calcagno (1975). The ignition loss was calculated by difference measuring the weight loss of the scapolites after heating at 800°C. For the two specimens, Meionite percentages of 70.3 and 59.5% respectively, were obtained. As a result, these are two Mizzonites, two intermediate sodic-calcic end-members of the Marialite-Meionite series.

Based on the values of lattice constants and on chemical composition, density of these scapolites was calculated as if they were totally free from inclusions. Knowing the volume of the samples and the experimental and calculated values of density, it was possible to obtain the total percentage volume of inclusions, since the specimens are mainly characterized, the first, by growth tubes and the other by laminae, which correspond to the percentage volumes of 0.4 and of 0.9% respectively.

Optical observations were then conducted, at considerable enlargements, in order to better characterize the inclusions.

In the yellowish scapolite, the channels, of sizeable diameter (max. 0.2 mm), evidenced fillings made up by scaly aggregates with a colour varying from yellow to brownish-red and variously mixed. In particular it was possible to recognize some fracture-free euhedral channels and other channels with irregular contour from the ends of which fractures departed radially. The first channels were almost exclusively filled with lamellae, often forming palmate or plumose aggregates of clear yellow colour (Figure 3a).

The laminae (0.04 × 0.03 mm), which were like flattened lamellae, with pseudohexagonal contour, were lying on a plane parallel to a prismatic face of the embedding scapolite and thus to the table. It was observed that the laminae intersected along two preferential directions which formed an angle of 64°±30′ (Figure 3b). These observations were carried out using a universal stage in order to orient the channels normally to the direction of observation.

In other euhedral channels, however, it was also possible to note, among the previously described laminae, sporadic and minute groupings of lenticular plates of brownish-red colour as well as wide homogeneous clear-yellow transparent areas (Figure 4).

The channels with not well-defined shape, instead, involved brownish-red laminae and yellow areas (Figure 5).

In addition to the already described laminae with pseudohexagonal contour, the colourless scapolite also included sporadic channels filled with yellow laminae identical to those identified in the previous sample.

FIG. 4 Scapolite from Central Tanzania. Sample 1. A growth tube with yellow lepidocrocite plates and Fe_2O_3 ones showing a bright red colour, and the yellow transparent areas, healed by the yellowish fluid. × 100.

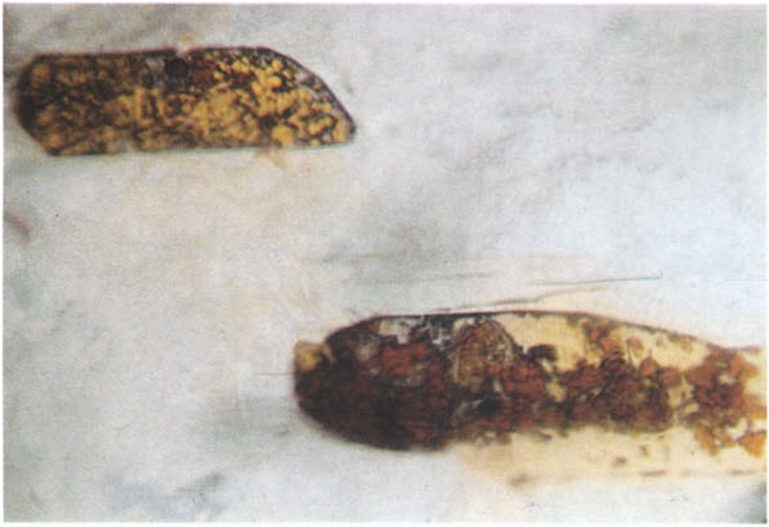

FIG. 5 Scapolite from Central Tanzania. Sample 1. Two typical growth tubes. The first (above) with partially dehydrated lepidocrocite; the second (bottom) shows an irregular shape and a complete alteration of lepidocrocite. Around this tube is evident a yellow halo in the area intersected by the healed fractures. × 110.

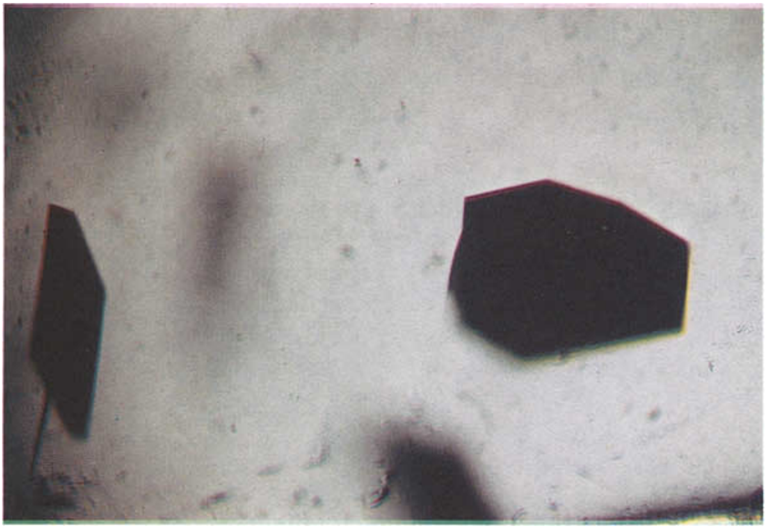

FIG. 6 Scapolite from Central Tanzania. Sample 2. Hexagonal pyrrhotite plates. ×60.

With a view to characterizing these inclusions, electron microprobe analyses were performed. It was thought useful to cut the samples obliquely with respect to the elongation axis in order to analyse a wider surface of the channel filing and thus to diminish the matrix effect due to the embedding scapolite. Particular care was taken during lapping, since the scales making up the filling were easily abraded. The electron microprobe analyses showed the almost exclusive presence of iron in both red and yellow scales. Consequently, they were ascribed to iron oxides or hydroxides, in agreement with the results reported by Schmetzer *et al.* (1977). In the colourless sample, as well as in the previous sample, the wide and thin, black, pseudohexagonal laminae, even if sporadic, revealed the presence of iron, sulphur and copper in weight percentages of 61.76, 37.35 and 0.29% respectively. The corresponding Fe/S ratio proved to be equal to 0.95. It was therefore considered to be a cupriferous pyrrhotite (Figure 6).

RESULTS AND CONCLUSIONS

The two Mizzonites examined, which have very similar physico-chemical characteristics, stand out due to the presence of the same type of inclusions. These, however, are preferentially distributed in each specimen. Indeed, the growth tubes represent the near-totality of the inclusions in the yellowish scapolite. But they are also associated with rare pyrrhotite laminae, whereas the opposite situation occurs in the colourless crystal. As a result, it is permissible to infer that the genetic conditions of both specimens should be very similar.

In yellowish scapolite, both clear yellow and brownish-red scales can be generally correlated. In effect, if they reveal the same chemical composition in the electron microprobe, they can be referred to different mineralogical species. In particular, the yellow laminae which, as a first approximation, might be considered as more or less hydrated and not better identifiable iron oxides, can be interpreted as lepidocrocite, considering appearance, colour and idiomorphous habit.

This hypothesis is corroborated by the fact that the planes (201) of this mineral form an angle of approx. 64°. On the other hand, both the evaluation of the wide angle between the optical axes, estimated at approx. 80°, and the pleochroism confirm this identification.

The tabular reddish scales have a more uncertain identification, since they may be referred to both haematite and maghemite. The uneven distribution of these mineralogical species and the presence of haloes preferentially surrounding irregular-contour channels suggest a logic sequence of transformations of these iron compounds. Indeed, it can be supposed that the filling was originally lepidocrocite which was subsequently dehydrated with changing environmental, physico-chemical conditions.

Such variation is testified by the presence of radial fractures, sealed by mother fluid, whose iron enrichment determined the presence of yellow haloes (Figure 5). Haematite or maghemite were thus produced by lepidocrocite dehydration, thus determining the progressive corrosion of the channels and consequent formation of transparent yellow-coloured areas and of the haloes surrounding the channels. This sequence is documented in Figures 3, 4 and 5.

The presence of the pseudohexagonal laminae of syngenetic pyrrhotite containing copper permits the estimation of the lower temperature limit, at not high pressures, to which the formation of these scapolites can be related. Such limit can be located around 700°C (Roseboom and Kullerud, 1958).

During this phase, the growth channels were presumably full of an iron-rich liquid phase which, with decreasing temperature, crystallized scapolite on the inside surfaces of the channels and subsequently lepidocrocite. A rapid variation of the physico-chemical conditions was likely to produce the fractures through which the mother fluid penetrated into the embedding crystal.

On the other hand, the presence of haematite or maghemite produced by lepidocrocite dehydration suggests temperatures in excess of 350°C (Kulp and Trites, 1951). More exactly, if temperature remained not higher than 500°C, maghemite would be obtained, while if this limit was exceeded, haematite would have been segregated.

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'KORITE'—FOSSIL AMMONITE SHELL FROM ALBERTA, CANADA

By WILLOW WIGHT, B.A., F.G.A.

National Museum of Natural Sciences, National Museums of Canada, Mineral Sciences Division, Ottawa, Ontario, Canada

'Korite' is the latest of three names which have been given to the iridescent shell of fossil ammonites found in southern Alberta, Canada.

This type of fossil shell on matrix was first advertised as 'ammolite' in 1969 as a lapidary material, although ammonites have been known from Alberta since the beginning of the century. 'Calcentine' was sold during Calgary's Centennial year, 1975, as quartz-topped composite cabochons mounted in gold jewellery (Crowningshield 1977; Zeitner 1978). Now we have 'Korite' from Korite Limited, of Calgary, Alberta. Their original rough material was obtained from the Kormos farm on the St Mary River, south of Lethbridge, Alberta. They now hold claims on several other farms as well.

AMMONITES

Ammonites are extinct molluscs of the class Cephalopoda, subclass Ammonoidea. They have been studied extensively because their abundance and world-wide distribution make them very useful to palaeontologists as index fossils. The univalve, coiled shell is comparable to that of the modern *Nautilus,* of the subclass Nautiloidea, a presumed relative.

The modern *Nautilus* lives at moderately shallow depths in the south-west Pacific Ocean. Ancient ammonoids, however, ranged in oceans and seas over the world, their fossil remains being found in rocks representing marine deposits from the Devonian period to the end of the Cretaceous period some 65 million years ago. (Arkell *et al.* 1957; Miller and Furnish 1957).

The Alberta ammonites which are providing the gem material have been identified as *Placenticeras meeki* (Figure 1). Found in the

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FIG. 1 *Placenticeras meeki* (27 × 21 × 6cm)

dark-grey shale of the Bearpaw Formation of south-central Alberta, they are about 71 million years old (Upper Cretaceous). The average specimen is about 20-25 cm in diameter with a shell thickness less then 6 mm (Sinkankas 1976). Another smaller and rarer species, *Placenticeras intercalare,* also provides some iridescent shell.

It should be emphasized that only broken pieces of shell are used; no complete ammonite fossils are cut up to be polished as gems. The Provincial Government of Alberta requires that any fossil material with scientific value for stratigraphic, taxonomic or display purposes be preserved and that permits be obtained for collecting. Much fractured shell occurs loose or within calcareous shale nodules or ironstone concretions. The proportion of gem-quality shell is small. Less than 5% of all ammonites found yield any gem material, and only about 20% of that shell can be used.

Ammonoid shells consist predominantly of aragonite and proteinaceous organic matrix (conchiolin) arranged into three

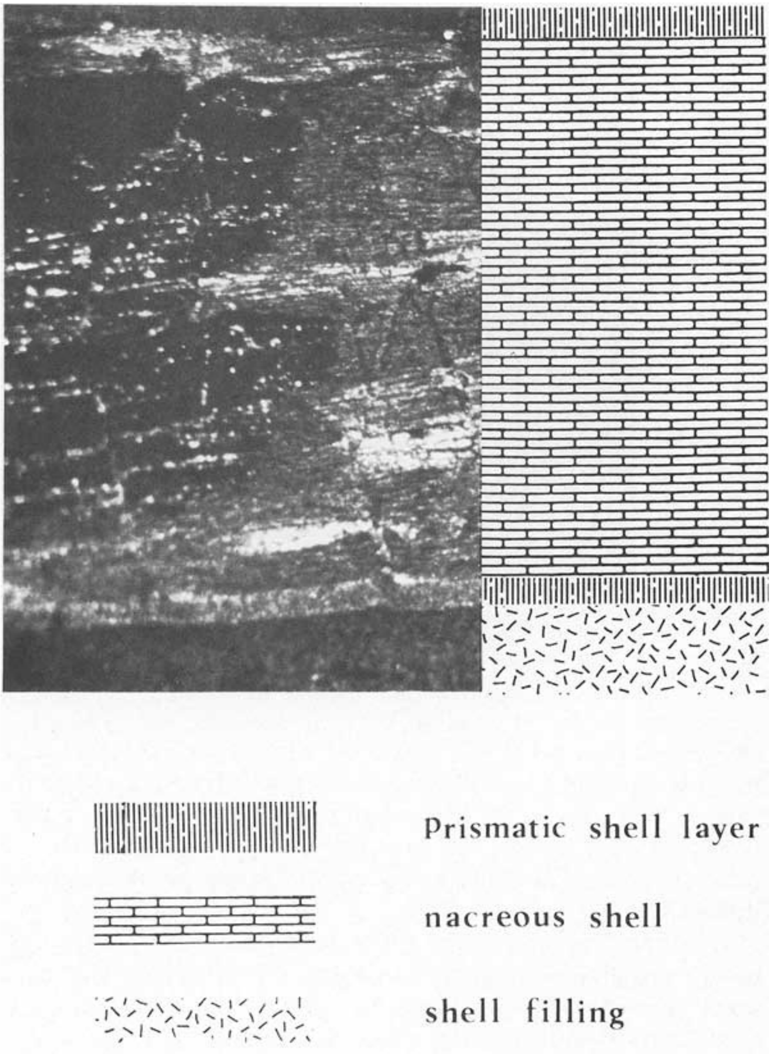

FIG. 2 Ammonite thin-section showing the three layers of the shell. Shell is 2.3mm thick.

layers (Figure 2): a thin outer prismatic layer, a nacreous layer, and an inner lining of prismatic habit (Kennedy and Cobban 1976).

DESCRIPTION AND PROPERTIES OF GEM 'KORITE'

The gem material is actually the nacreous layer of the ammonite shell. It presents a brilliant iridescence, predominantly red and green, but some pieces show all the spectral colours. Most pieces show a red and orange iridescence when the incident white light is perpendicular to the shell surface, and green when it is almost parallel. Blue and purple are rarely seen. Some of the shell is well preserved, but much of it has been cracked and subsequently re-healed during the long years of fossilization. In many of these pieces, the appearance is similar to that of a stained-glass window with small patches of brilliant colours framed by darker, non-iridescent lines (Figures 3, 4). Under the microscope, in transmitted light, the thinner pieces of shell are light brown in colour with a very fine-grained granular texture (Figure 5). There are often dark-brown inclusions (probably conchiolin).

X-ray diffraction analysis confirmed the composition of the iridescent nacreous shell layer to be chiefly calcium carbonate in the form of aragonite. The crack-filling material of the fossil shell is also aragonite, but it fluoresces bright yellow under long-wave ultraviolet light and a less intense yellow under short-wave rays. Thin-sections studied in polarizing light show the unbroken shell to be extremely fine-grained; the crack-filling aragonite is much coarser and secondary in origin (Figure 6).

Trace elements detected by spectroscopic analysis of the *Placenticeras* nacreous layer were strontium (0.48%), iron (1%), silicon (1%), titanium (0.6%), aluminium, barium, chromium, copper, magnesium, manganese and vanadium. Other analyses indicated a water content of 0.44% (by heating) and an organic material component of 5.34% (by loss on ignition). In comparison, *Nautilus* shell is composed of aragonite with traces of strontium, magnesium, aluminium, iron, silica, calcium phosphate and 2.03% conchiolin (Stenzel 1964). Modern, nacreous mother-of-pearl shell contains about 85% aragonite, 12% organic material and 3% water (Poirot 1965; Sinkankas 1959; Webster 1975).

Refractive indices were measured on polished pieces of 'Korite' with a Rayner Dialdex refractometer and sodium light.

FIG. 3 'Korite' cabochon surrounded by four 'Korite' triplets (NMNS 20788-792). Large cabochon is 30 x 40mm.

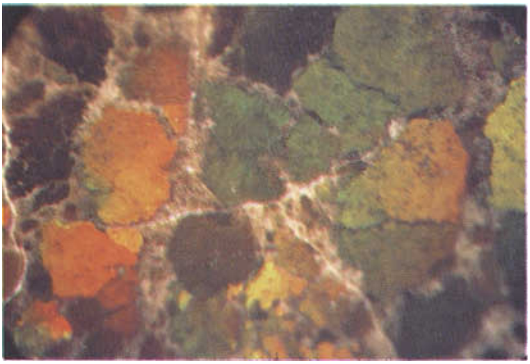

FIG. 4 Polished 'Korite', iridescent ammonite shell. Reflected light. Field is 16mm across.

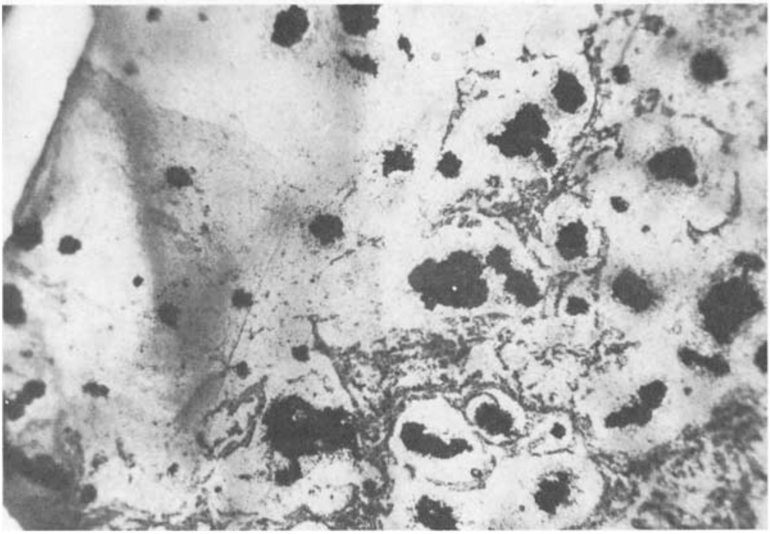

FIG. 5 Iridescent ammonite shell in transmitted light is light brown with dark-brown blobs of conchiolin. Field is 0.35mm across.

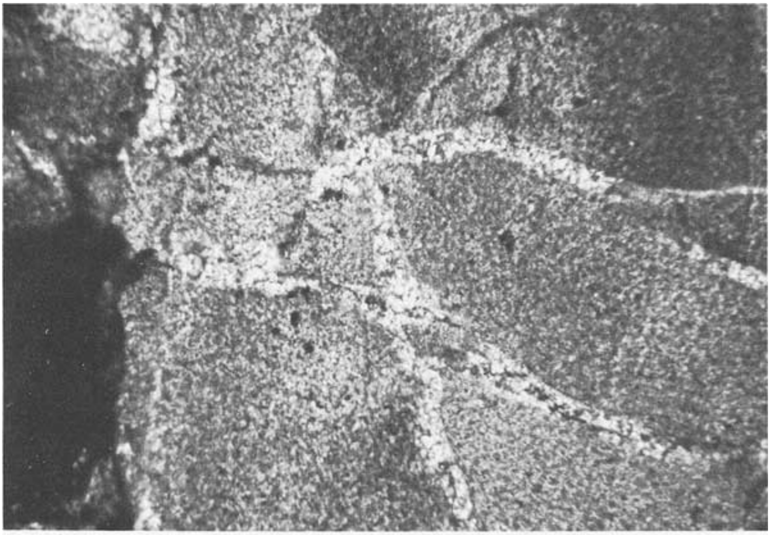

FIG. 6 Transverse section of iridescent ammonite shell showing healed fractures. Transmitted polarized light. Field is 1.4mm across.

Refractive indices of 'Korite' compared with those of aragonite and Recent aragonite shell.

	α	β	γ	birefringence
Ammonite shell *Placenticeras* (9 specimens)	1.512 to 1.528		1.662 to 1.672	
Average	1.520		1.670	0.150
Aragonite (Deer, Howie & Zussman 1962)	1.530	1.680	1.685	0.155
Recent Mother-of-Pearl Shell (Bøggild 1930)	1.523	1.659	1.662	0.139
Recent Mother-of-Pearl Shell (NMNS 20625)	1.520		1.655	0.135

The specific gravity of gem 'Korite' by means of heavy liquids was between 2.67 and 2.85. The specific gravity as determined by hydrostatic weighing was 2.80±0.01. The reported SG of modern nacreous shells is 2.75 to 2.80 (Poirot 1965), lower than the SG of aragonite (2.93) because of the presence of organic conchiolin (SG 1.34) and water. Hardness on the Mohs scale is about 4.

NACREOUS SHELL STRUCTURE AND IRIDESCENCE

The structure of the nacreous layer of mollusc shells has been well investigated (Gregoire 1962; Stenzel 1964; Watabe 1965). The nacreous layer is composed of closely-packed, tabular, hexagonal crystals of aragonite oriented with their *c*-axes vertical to the shell surfaces, and united into thin lamellae. The organic matrix conchiolin (a complex mixture consisting of poly-saccharides, polypeptides and scleroprotein fractions) is interposed between these lamellae as thin horizontal sheets, and between the crystals as vertical walls, giving a brick-wall type structure. The thickness of these lamellae in the nacreous layer is of the same magnitude as the wavelengths of the spectral colours which make up white light. Thus, when white light is incident upon these regularly-spaced thin layers, diffraction occurs, and flashes of spectral colours are seen (Pfund 1917; Fox 1966). Mother-of-pearl and abalone shells are well known for their beautiful iridescence.

'Korite' viewed in transmitted light is a non-iridescent, light-brown colour (Figure 5). Thin-sections of the iridescent shell show the nacreous structure described above (Figures 7, 8). Fossil shells vary greatly in the degree of preservation of their original components, depending on the conditions to which they have been subjected. Many have altered from aragonite to calcite (the more stable structure for calcium carbonate), and many also have lost organic material. It seems that gem 'Korite' has altered very little; there is no evidence of calcite. The nacreous structure has been preserved and diffraction of light takes place to produce the vivid spectral colours seen in reflected light. The main change seems to have been the fracturing and re-healing of the shell. This results in iridescent patches of various sizes surrounded by non-iridescent lines produced by the re-healing process, i.e. a 'stained-glass' effect.

LAPIDARY TREATMENT

Simple cabochons, usually with a flat top, can be cut and polished very successfully from the thicker, more consolidated pieces of the ammonite shell, particularly if some shell-filling matrix remains attached. Since most of the shell is thin, brittle and somewhat splintery, it is prepared as triplets, with a natural shale backing and a quartz cap. This produces a gem which is durable and very satisfactory for any piece of jewellery. The fossil shell itself has a hardness of about 4 on the Mohs scale, so that care is needed to prevent scratching.

CONCLUSION

Shells, of course, have been used by man for adornment for centuries. Fossils such as petrified wood, silicified dinosaur bone, silicified coral and fossil ivory are commonly used in jewellery. Fossil shells used as gem material include silicified *Turritella* in agate from Wyoming and lumachelle, iridescent bivalve mollusc shells in dark-grey or dark-brown marble from the lead mines of Bleiburg, Austria and Italy. Lumachelle is the only fossil shell known to approach 'Korite' in intensity of colour.

'Korite' is a very beautiful and interesting gem material, certainly the most attractive ever found in Alberta. Its appearance has been compared to that of black opal, but the only similarity is that spectral colours are produced from a regular, microscopic,

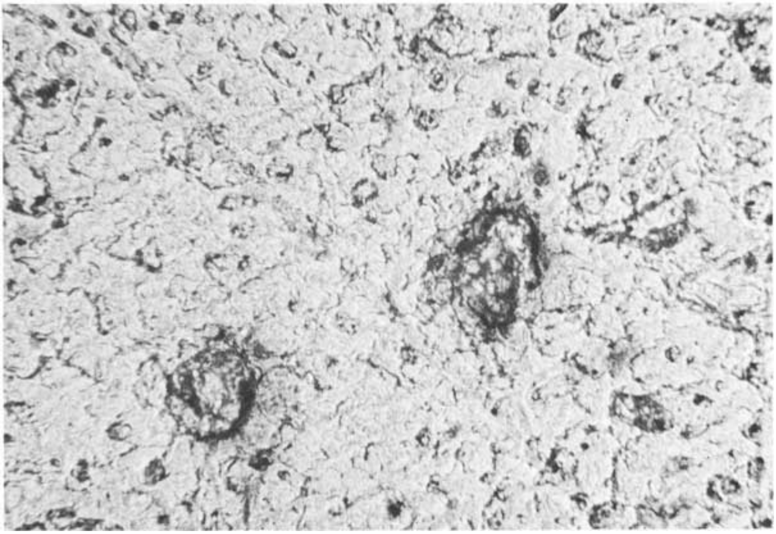

FIG. 7 Transverse section of 'Korite' shell showing hexagonal crystals of aragonite typical of nacreous layer. Field is 0.35mm across.

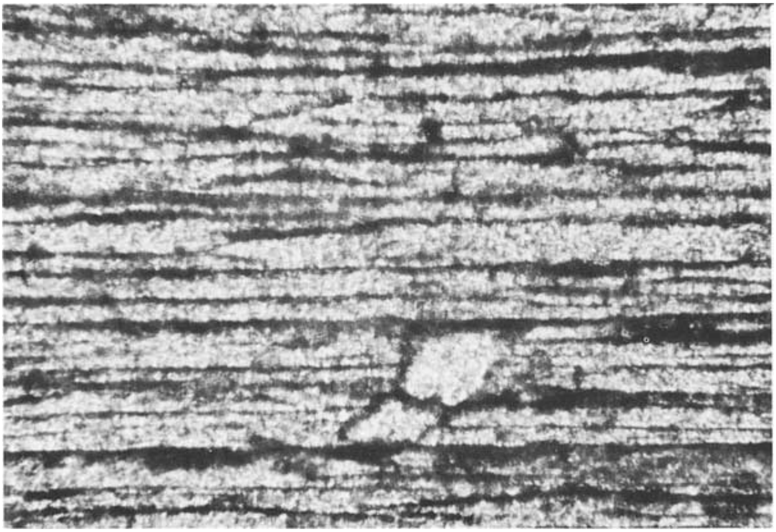

FIG. 8 Vertical section of 'Korite' shell showing 'brick-wall' structure (light aragonite and dark conchiolin) typical of nacreous layer. Field is 0.35mm across.

internal structure. Both opal and 'Korite' are spectacular, each in its own way. 'Korite' is certainly more bright and brilliant than any modern shell, even the vivid abalone.

ACKNOWLEDGEMENTS

I wish to express my appreciation to the following people who have assisted with this project: R. Williams, J. D. Grice, R. Waller, G. Van Velthuizen and G. Runnells, all of the Mineral Sciences Division; J. Topping, of the Invertebrate Zoology Division; E. T. Tozer, of the Geological Survey of Canada; and R. Alyea, of Alyea's Jewellers.

Special thanks are due to R. Vandervelde and Korite Limited, Calgary, Alberta, for the donation of specimens to the National Museum and for initiating this project.

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[*Manuscript received 21st August, 1980.*]

GEMMOLOGICAL ABSTRACTS

BALITSKY (V. S.). *Synthetic amethyst: its history, methods of growing, morphology and peculiar features.* Z.Dt.Gemmol.Ges., **29,** 1/2, 5-16, 9 figs, bibl., 1980.

Synthetic amethyst is grown hydrothermally from KOH- or NH_4OH-containing solutions. The violet colour is produced by addition of Fe^3 in the form of oxides or hydroxides and subsequent x-radiation. The morphology of synthetic amethyst crystals as dependent on the growth method is discussed. Inhomogeneities in the colour distribution are explained by the irregular positioning of the Fe in the lattice. The synthetic stone is grown from hydrothermal solution as it is in nature and many features are therefore the same—especially, amethyst grown in alkaline solution shows the development of rhombohedron faces; there is also a unique resemblance in the infrared absorption spectra of natural and synthetic amethysts grown in strong alkaline potassium solutions, showing a broad band at $3400cm^{-1}$.

E.S.

BALL (R. A.). *Nephrite jade from Cowell, South Australia.* Aust. Gemmol., **14,** 4, 53-6, 3 figs, 1980.

A report on a 9 km^2 surface area on the eastern margin of the Cleve Uplands which contains about 100 large olive-green to black nephrite pods or lenses, some up to 100 m long and 3 m wide. Black nephrite is sought after. Figures are unnumbered.

R.K.M.

BANK (H.). (a) *Geschliffener grüner 'smaragditischer Grammatit' (= Tremolit-Actinolith) aus Tansania.* (Cut green 'smaragdite-grammatite' (tremolite-actinolite) from Tanzania.) Z.Dt.Gemmol.Ges., **28,** 4, 201-2, 1979; (b) *Smaragdgrüner geschliffener 'Smaragdit' als Diopsid angesehen.* (Emerald-green cut smaragdite thought to be diopside.) Id., 203-4, 1979; (c) *Geschliffene durchsichtige blaue, grüne und blaugrüne Dumortierite aus Brasilien.* (Cut transparent blue, green and blue-green dumortierite from Brazil.) Id., 205-6, bibl., 1979.

(a) Describes transparent cut smaragdite, i.e. emerald-green Cr-containing grammatite, which is a tremolite-actinolite from Tanzania. (b) Relates how an emerald-green cut smaragdite was at first believed to be a diopside. (c) Describes transparent cut, blue, green and blue-green dumortierite from Brazil. Dumortierite is usually translucent (not transparent) and of a violet-blue colour. Rarely is this stone found as a transparent gem; a brown variety from Sri Lanka and a blue one from Brazil have been described. These new blue, green and blue-green examples from Brazil, however, are quite transparent. E.S.

BANK (H.). (a) *Changierender Korund mit hoher Lichtbrechung aus Sri Lanka.* (Colour-change corundum with high refraction from Sri Lanka.) Z.Dt.Gemmol.Ges., **29,** 1/2, 86-7, 1 fig. in colour, 1980; (b) *Grüner schleifwürdiger synthetischer Periklas.* (Green cuttable synthetic periclase.) Id., 88-9, 1 fig. in colour, 1980; (c) *In rohpartien natürlicher Smaragde aus Sambia synthetische Smaragde entdeckt.* (Synthetic emeralds found in parcels of natural emeralds from Zambia.) Id., 90-1, 2 figs in colour, 1980; (d) *Seltene Aquamarinparagenese mit Granat und Einschlüssen von Columbit-Tantalit.*

(Rare paragenesis of aquamarine with garnet and inclusions of columbite-tantalite.) Id., 92-3, 2 figs in colour, 1980; (e) *Über die Paragenese des Schlossmacherit.* (On the paragenesis of schlossmacherite.) Id., 94-5, bibl., 1980; (f) *Sternspinelle aus Sri Lanka.* (Star spinels from Sri Lanka.) Id., 96-7, bibl., 1980; (g) *Lichtbrechung-sindizes von Spinellen aus Sri Lanka.* (Refractive indices of spinels from Sri Lanka.) Id., 98-9, bibl., 1980; (h) *Geschliffenes blaues Glas mit n um 1.575 als Aquamarin betrachtet.* (Cut blue glass with RI 1.575 thought to be aquamarine.) Id., 100, 1980; (i) *Sehr hochlichtbrechender Smaragd aus Sambia.* (Very highly refractive emerald from Zambia.) Id., 101-3, bibl., 1980; (j) *Gefahren der 'zerstörungsfreien' gemmologischen Diagnostik.* (Dangers of 'non-destructive' gemmological methods.) Id., 104-5, 1980.

(a) Dr Bank describes a corundum with colour-change from Sri Lanka. The stone was faceted, weighed 1.52 ct, was greyish blue in daylight and red in artificial light, and had a high RI, 1.764-1.773, with DR 0.009. (b) A green periclase from Israel was found to be synthetic, RI 1.738, SG 3.75. (c) Mentions synthetic emeralds which were found in parcels of natural emeralds from Zambia. (d) A rare aquamarine paragenesis with garnet and a beryl with columbite inclusions are described. (e) Another paragenesis dealt with is Schlossmacherite. (f) Towards the end of 1979 for the first time star spinels were obtained from Sri Lanka. Of the 11 specimens four were blue, and seven of reddish colour, RI between 1.715 and 1.720, SG 3.60. Under microscope needle-like inclusions were recognized as rutile. (g) Refractive indices of spinels from Sri Lanka are discussed. They vary for red spinel from 1.714 to 1.729 and for blue to grey stones from 1.718 to 1.742. The Zn-rich spinels have an RI from 1.725 to 1.753 and the name 'gahnospinel' has been suggested for them. (h) A cut blue glass with RI of 1.575 was at first taken to be an aquamarine. (i) A dark green emerald from Zambia with very high RI values (1.592-1.602, with DR 0.010) was tested for trace elements and found to have the normal chrome content and a very high iron content. (j) Discusses the dangers of so-called 'destruction-free' diagnostic methods, mainly in the field of x-ray applications.

E.S.

BERKA (R.). *Strahlender Edelstein Zirkon.* (Irradiated Zircon.) Mineralien Magazin, **4**, 10, 462-3, 1 fig in colour, 1980.

A colour plate of rough and cut zircon is accompanied by a short description of the mineral. M.O'D.

BROWN (G.). *Gemmology study club report. The radiographic features of keshi pearls.* Aust. Gemmol., **14**, 3, 28-9, 2 figs, 1980.

Radiographic examination of three keshi, or adventitious, pearls accidentally produced by fragments of shell falling into the body of the oyster during the culturing operation. Three 'dumbell' [*sic*] shaped pearls also examined appear in radiographs to consist of a cultured bead pearl joined to an adventitious pearl of the above type. [Author's explanation is quite acceptable.] R.K.M.

BROWN (G.). *Gemmology study club report. An examination of a clam pearl.* Aust. Gemmol., **14**, 3, 38-40, 2 figs, 1980.

A white clam pearl with a smooth mat surface but irregular in shape showed no 'flame-like' sub-surface markings. SG 2.80. R.K.M.

BROWN (G.). *An evaluation of the Gem Instrument Corporation's gem diamond pen.* Aust. Gemmol., **14**, 3, 42-6, 6 figs, 1980.

The Instrument Evaluation Committee of the Australian Gemmological Association found that this instrument was useful in the rapid testing between diamonds with sufficiently large facets and imitant substances, provided that other simple tests were taken into account. R.K.M.

BROWN (G.), SNOW (J.). *Battery powered light sources for hand lenses.* Aust. Gemmol., **14**, 4, 73-5, 6 figs, 1980.

A G.A.A. Instrument Evaluation Committee Report. The Coddington magnifier, by Bausch & Lomb, has a built-in light source but is only partly corrected for spherical and chromatic aberration. It was found awkward to use and in time the magnifying lens parted from the torch handle.

The Gem Penlight, by the Gem Instrument Corporation, is a light source only, but to use it with a stone held in tongs and a × 10 lens really needs a third hand. A useful slip-on attachment is suggested which partly overcomes this problem. R.K.M.

BROWN (G.), SNOW (J.). *An evaluation of the Krüss portable microscope.* Aust. Gemmol., **14**, 4, 69-72, 2 figs, 1980.

A G.A.A. Instrument Evaluation Committee Report on a horizontal portable microscope. Instability of tripod mount and other design faults are pointed out and suggestions made to overcome them. A zoom facility is incorporated, but to focus at any given magnification means moving the specimen, since no normal rack focusing is provided. R.K.M.

BROWN (G.), SNOW (J.), TAYLOR (B.). *An evaluation of the Dipro diamond testing probe.* Aust. Gemmol., **14**, 2, 3-9, 3 figs, 1980.

An apparently rather confused report on a probe operating on a 'slightly different principle' from that of the Ceres diamond probe. It is said to work on the rate of change of voltage in the test surface rather than measuring the maximum voltage decrease.* Test takes up to 30 seconds after an initial 5 minutes warming up period. Imitant materials are not identified, but diamond is. R.K.M.

BUTLER (J. N.). *An attempt to assess the recent popularity of different gems.* Aust. Gemmol., **14**, 4, 77-82, 1980.

Based on the publicity given to each gem mineral by advertisement or press article in a variety of publications over a period of six years (1973-8), this can only be an attempt. R.K.M.

DEICHA (G.), DEICHA (C.). *Effets du désequilibre cristallogénétique sur la croissance du diamant.* (Effects of crystallographic disequilibrium on the growth of diamond.) Revue de Gemmologie, 64, 8-9, 5 figs, 1980.

Variations in crystal growth processes have an effect on the crystallographic architecture of diamond. Some effects are shown with the aid of the electron microscope. M.O'D.

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*Do writers mean temperature rather than voltage?—R.K.M.

GOLDSMID (H. J.), GOLDSMID (S. E.). *Thermal conduction in gemstones. Part II. A simple thermal comparator.* Aust. Gemmol., **14**, 3, 49-51, 2 figs, 1980.

The thermal 'squeak' proving less than totally reliable,* these experimenters constructed two thermocouple probes, the second of which contains a built-in heater. These gave direct e.m.f. readings indicating thermal conductivity of substances when the probes were placed in contact with them and adequately identified diamond, separating it from its imitants.

[Note: the 'squeak' depends on heat being brought rapidly to the contact point by the diamond; the probes depend on diamond conducting heat rapidly away from the point of contact.] R.K.M.

GÜBELIN (E.). *Letter to the Editors.* Aust. Gemmol., **14**, 4, 69, 1980.

Mentioning that in electron microprobe analyses of so-called cacoxenite needles in amethyst by two different institutes phosphorus could never be found and the result reported was goethite, Dr Gübelin asks whether any exact analysis of these inclusions has been made in Australia or is likely. J.R.H.C.

GÜBELIN (E.), SCHMIDT (K.). *Scheinbare Unstimmigkeiten in gemmologischen Textbüchern.* (Apparent disagreements in gemmological textbooks.) Z.Dt. Gemmol.Ges., **29**, 1/2, 20-32, bibl., 1980.

The authors stress the importance of checking data to be published in textbooks. All too often wrong data are taken from old texts and re-used. Authors and gemmologists should take their own measurements. Details of mistakes occurring are given. Between the years 1850 and 1932 the density of lapis lazuli was taken to be 2.38-2.42 instead of 2.7-2.9.† Details of disagreeing data with various sources are given for chalcedony, chrysoberyl, herderite, hypersthene, serpentine, zoisite, jeremejevite, boracite and chrysocolla. E.S.

HAHN (H.), HAHN (E.). *Zuchtperlen und ihre Produktionsstätten.* (Cultured pearls and their places of production.) Z.Dt.Gemmol.Ges., **29**, 1/2, 33-9, 6 figs, 1980.

Description and pictures of freshwater and various salt-water cultured pearls. Most freshwater cultured pearls come from Lake Biwa in Japan, but there are also other farms in Japan, and also China. There are many more sea-water farms, mainly in Japan, but also in the Thursday Isles near Northern Australia, also near the north west coast of Australia. New Guinea, Tahiti, Celebes, Philippines, Burma and China are also producers. The production in the south of Thailand is described in more detail and the mortality rate of the oysters discussed. E.S.

HANNEMAN (W. W.). *Educating the eyeball—the Hodgkinson method.* Lapidary Journal, **34**, 7, 1498-1519, 16 figs (15 in colour), 1980.

Describes the 'visual optics' method of testing gemstones, with illustrations [but see *Letter to the Editor,* J.Gemm., 1980, XVII(1), 66-7]. M.O'D.

JOBBINS (E. A.). *Opal in Piaui State, Brazil.* Z.Dt.Gemmol.Ges., **29**, 1/2, 40-54, 2 maps, 6 photographs, 1980.

Paper read to the 17th International Gemmological Conference in Idar-Oberstein. Opal has been reported and worked in Piaui State, but exact localities

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*See Abstract of Part I on p. 423 below, s.v. Thwaite (R.) *et al.*—Ed.

†Louis Dieulafait (1871) gave the SG of lapis lazuli as 2.95 in his *Diamants et Pierres Précieuses.*—Ed.

and nature of the material were in some doubt. During 1973 P. G. Linzell and E. A. Jobbins investigated the occurrences for the State Government. Precious opal at Pedro II occurs at a sandstone quartz-dolerite contact where it has been mined on a small scale. Alluvial opal is found up to about a 10km radius. The opal at Varzea Grande, Castelo do Piaui and elsewhere occurs mainly in thin veins and pockets along joints in dyke rocks; mostly these are common opal, but some are reddish-orange and have been described as fire opal. Only at Pedro II is the opal of economic value. E.S.

KANIS (J.). *Gemstone news from Southern Africa.* Z.Dt.Gemmol.Ges., **29**, 1/2, 55-7, 1 map, 1980.

Paper read to the 17th International Gemmological Conference in Idar-Oberstein. Short note about the occurrence of emerald in Zambia and Rhodesia, precious coral near Port Elizabeth, and tourmaline in Kenya. E.S.

KOSKI (K.), KOSKI (D.). *Spectrolite, Finland's gem labradorite.* Lapidary Journal, **34**, 7, 1476-84, 17 figs (in colour), 1980.

The location for spectrolite is 250km east of Helsinki. Details for fashioning are given. M.O'D.

KNISCHKA (P. O.). *Isometrischer Habitus von gezüchteten Korundkristallen mit grosser Flächenzahl.* (Isometric habit of grown corundum crystals with a large number of faces.) Aufschluss, **31**, 469-77, 16 figs (1 in colour), 1980.

Corundum crystals with an isometric habit have been grown by the flux-melt method. M.O'D.

LANDAIS (E.). *Un réfractomètre selon l'angle de Brewster pour la mesure des hauts indices de réfraction.* (A refractometer using Brewster's angle to measure high refractive indices.) Revue de Gemmologie, **64**, 6-7, 4 figs, 1980.

A prototype refractometer using the principle of Brewster's angle to measure materials with high refractive indices has been developed. The relationship between Brewster's angle and RI is explained. M.O'D.

LENZEN (G.). *Sicheres Erkennen von Diamantimitationen: Die Wärmeleitfänigkeit als gemmologisch nutzbare Eigenschaft.* (Certain recognition of diamond simulants: heat conductivity as a useful gemmological property.) Z.Dt.Gemmol.Ges., **28**, 4, 197-200, 1 fig, 1979.

As it becomes increasingly difficult to determine definitely what is diamond and what is diamond imitation, the development of qualitative measuring of the heat conductivity is a great aid. In the States the 'Ceres Diamond Probe' has been developed specifically for this purpose. The author found this instrument very reliable, independent of the size of stone to be tested and usable for loose and set stones. The instrument is described in some detail. The dial is adjusted in such a way that the zero level is in the middle, diamond readings to the right, imitations to the left. A table gives heat conductivity figures taken at room temperature in watt per second per centimetre per kelvin, from diamond Type I, IIa and IIb to djevalite, cubic zirconia, YAG. Between these two extremes readings are given for silver, copper, gold, aluminium, corundum and topaz. The figures for spinel, quartz, rutile, zircon and beryl are similar to those of djevalite. E.S.

MALLALIEU (Huon). *Polar Star diamond ring sold for £1,960,784.* The Times newspaper, 60783, p.14, 22nd November, 1980.

An account of recent sales at Christie's and at Sotheby's, including the sale by Christie's in Geneva on 20th November, 1980, for 8m Swiss francs (£1 960 784) to Razin Saliah, a dealer based in Sri Lanka, of the 'Polar Star', a diamond of 41.285 ct, mounted in a ring: it came from Golconda, was owned by King Joseph Bonaparte, the Youssoupoff family, and Lady Lydia Deterding. The pavilion is applied with a two-fold eight-pointed star and the symmetry is so perfect that it can be balanced on its culet. J.R.H.C.

MUMME (I.). *Modern methods of gemstone colouration.* Aust. Gemmol., **14,** 2, 10-11, 1980.

A reiteration of the various established methods, some far from modern. R.K.M.

NOGUÉS-CARULLA (J. M.), VENDRELL-SAZ (M.), ARBUNIES-ANDREU (M.). *Structure microscopique des couches de la perle.* (Microscopic structure of pearl coatings.) Revue de Gemmologie, **64,** 10-12, 10 figs, 1980.

SEM techniques are used to examine the surfaces of pearls. It is noted that aragonite crystals are tabular and are made up of lamellae in a matrix of organic matter. Coating thickness is estimated at 1-2μm. M.O'D.

PERHAM (J.). *Maine tourmaline—a study in lapidary.* Lapidary Journal, **34,** 6, 1400-2, 6 figs, 1980.

Increased supplies of tourmaline from the Dunton mine, Newry, Maine, have resulted in a variety of objects being manufactured in addition to cabochon-cut and faceted stones. M.O'D.

POIROT (J.). *A propos du traitement thermique des Gemmes.* (About the heat treatment of gemstones.) Z.Dt.Gemmol.Ges., **29,** 1/2, 58-61, 1980.

Paper read to the 17th International Gemmological Conference in Idar-Oberstein. The author discusses heat treatment of gemstones seen as a historical technique and the nomenclature which has been derived from these methods. E.S.

POUGH (F. H.). *New gemmological instruments—part 1.* Lapidary Journal, **34,** 6, 1396-9, 3 figs, 1980.

This introductory article deals chiefly with apparatus designed to detect diamond and its simulants. M.O'D.

RAMSEY (J. L.). *Faceted treated stones—an overview.* Lapidary Journal, **34,** 7, 1534-7, 1980.

Lists stones which are commonly treated by heat or irradiation before being sold. M.O'D.

REYMER (H.). *Ammonite fossils from Alberta, Canada.* Z.Dt.Gemmol.Ges., **29,** 1/2, 62/3, 1980.

Paper read to the 17th International Gemmological Conference at Idar-

Oberstein. The fossil ammonite consists mainly of aragonite and method of working it is described. It can be used for jewellery purposes and has been sold commercially under such names as 'Korite' and 'Calcentine'. E.S.

SASAKI (E.). *Thailand's merchant's domination toward gem marketing.* Z.Dt.Gemmol.Ges., **29**, 1/2, 64-5, 1980.

Paper read to the 17th International Gemmological Conference in Idar-Oberstein. The author discusses occurrences of gems in Thailand and also the marketing position. The country has a well deserved reputation as a gem centre, but there are many pitfalls in Bangkok's 800 to 1000 jewellery shops. E.S.

SASAKI (E.). *Treatment of sapphires.* Z.Dt.Gemmol.Ges., **29**, 1/2, 66, 1980.

Paper read to the 17th International Gemmological Conference at Idar-Oberstein. Description of colour-alteration in sapphire by heating. Most sapphires on the market appear to have been treated. E.S.

SAUL (J. M.). *Some rarer African gem minerals.* Z.Dt.Gemmol.Ges., **29**, 1/2, 67, 1980.

Paper read to the 17th International Gemmological Conference at Idar-Oberstein. A few rare gemstones, such as bright green tanzanite and bright green sphalerite amongst others, were shown. Most of these gems came from Kenya and Tanzania. E.S.

SAVKEVITCH (S. S.). *Méthodes physiques de la détermination des sources géologiques de l'ambre et autres résines fossiles.* (Physical methods for determining the geological sources of amber and other fossil resins.) Revue de Gemmologie, 64, 17-19, 2 figs, 1980.

A review of possible methods of identifying the geological sources of amber is given. Infrared and mass spectrometry are discussed. M.O'D.

SCHMETZER (K.), BANK (H.). *Zur Unterscheidung natürlicher und synthetischer Amethyste.* (Differentiation between natural and synthetic amethysts.) Z.Dt.Gemmol.Ges., **29**, 1/2, 17-19, 1 fig, bibl., 1980.

The authors refer to amethyst grown hydrothermally with the addition of iron oxides and hydroxides and subsequent x-ray treatment. These synthetics cannot be distinguished from the natural variety by their structural, chemical or physical characteristics. In the case of the rough stone the seed can usually be detected, but this is not the case with cut stones. The authors advise the use of infrared spectroscopy. While natural amethyst shows absorption bands at 3200, 3410, 3685 and 3615, the synthetic amethysts examined had additional bands at 3300, 3380 and 3540. Infrared spectra of synthetic Russian amethyst and natural amethyst from Zambia are shown. E.S.

STEVENS (E. L.). *Inclusions in N.S.W. gemstones.* Aust. Gemmol., **14**, 3, 23-6, 2 figs, 1980.

A wide variety of gems are found and almost all 'containing inclusions of all types'. Author is satisfied that beryl localities can be identified by inclusions and physical constants. Deals only with beryl, quartz and, briefly, with topaz. R.K.M.

SUPERCHI (M.), ROLANDI (V.). *A proposal for delimiting ruby (from rose and violet corundum) and emerald (from light green to dark green beryl).* Z.Dt.Gemmol.Ges., **29**, 1/2, 68-70, 2 figs, 1980.

Paper read to the 17th International Gemmological Conference in Idar-Oberstein. Gem varieties are characterized with the help of DIN colour tables and differentiation between emerald and green beryl and ruby and pink and violet corundum is discussed. E.S.

THOMPSON (W. H.). *The determination of the maximum and minimum refractive indices of a gemstone.* Aust. Gemmol., **14**, 2, 13-15, 2 figs, 1980.

A report to confound unnamed gemmologists 'of considerable standing' who apparently dispute the well-established fact that the highest and lowest readings for any birefringent stone can be obtained from any convenient facet of that stone. Tables of readings for three surfaces of quartz, and five of peridot, at 30° intervals of rotation, are given from 0° to 180°, very slight variations for different facets being well within limits of experimental error and probably due to the adherence to this strict interval of arc.

[Author proves his point beyond argument, but should not need to do so with experienced gemmologists.] R.K.M.

THWAITE (R.), JAMES (J.), GOLDSMID (S.). *Thermal conduction in gemstones. Part I, Oscillations induced by dry ice.* Aust. Gemmol., **14**, 3, 47-8, 2 tables, 1980.

Mechanical oscillations occur when certain substances are pressed against dry ice (solid CO_2). They are due to heat from the foreign body vaporizing the CO_2. The gas formed cuts off the heat until it has escaped, allowing further contact, which sequence repeats rhythmically. The greater the conductivity of the foreign substance (gem) the more rapid the oscillation. Diamond, conducting heat rapidly to the interface, produces a recognizable squeak. So do some other substances. R.K.M.

TIFFANY (E. B.). *Some very important but little known historic diamonds.* Z.Dt.Gemmol.Ges., **29**, 1/2, 71-8, 16 photographs, 1980.

Paper read to the 17th International Gemmological Conference in Idar-Oberstein. Little known but important diamonds are to be found in the crown jewels of Iran, the Soviet treasury and in private hands of Indian Princes. E.S.

TOMBS (G.). *Further thoughts and questions on Australian sapphires, their composition and treatment.* Z.Dt.Gemmol.Ges., **29**, 1/2, 79-81, 1980.

Paper read to the 17th International Gemmological Conference in Idar-Oberstein. The author describes possibilities of alteration of colour in Ceylon and Australian sapphires by heat treatment, and also the underlying causes of such alterations. A table shows proportions of trace elements in sapphires from both localities. E.S.

TOMBS (G.). *Further thoughts and questions on Australian sapphires, their composition and heat treatment.* Aust. Gemmol., **14**, 4, 64-5/68, 1980.

Paper* read to the 17th International Gemmological Conference at Idar-

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*This is the same paper as that published in Z.Dt.Gemmol.Ges., **29**, 1/2, 79-81 (abstracted above) with a few minor verbal changes and omitting the table.—Ed.

Oberstein, compares treatment of Australian sapphires and that of Ceylon (Sri Lankan) stones. Low titanium content in Australian material suggests silk, when present, may be alpha corundum and not rutile as usually assumed. Leaves many questions to be answered. Some Sri Lankan heat-treated sapphires are said to have reverted in colour. Australian stones, similarly treated, are colour stable. R.K.M

TOMBS (G.). *Natural and man induced irradiation of diamond. Possible identification between irradiation types.* Aust. Gemmol., **14,** 3, 30-2, 1980.

A paper presented at the Federal Conference, 1979, deals with known facts on naturally irradiated diamonds and those artificially irradiated. ['All natural green diamonds do not owe their colour to x-radiation' would be better stated 'Not all natural green diamonds owe their colour—etc.'. Author apparently confuses G.A. of G.B. with the London Chamber of Commerce Gem Testing Laboratory. He also suggests that advanced training in this subject is available here. To abstracter's knowledge it is not, being still very much in the experimental stage.] R.K.M.

TOMBS (G. A.). *Some highlights from papers presented at the International Gemmological Conference.* Aust. Gemmol., **14,** 3, 32-5, 1980.

A report on the XVIIth International Gemmological Conference held at Idar-Oberstein in September 1979. J.R.H.C.

VARGAS (G.), VARGAS (M.). *A new quartz gem material.* Lapidary Journal, **34,** 7, 1504-6, 10 figs (in colour), 1980.

Quartz combining the colours of amethyst and citrine has been found in the North of Uruguay; some theories as to its origin are advanced. M.O'D.

WIJESEKERA (M.). *Gemstones of Sri Lanka.* Lapidary Journal, **34,** 7, 1616-18, 6 figs, 1980.

A short description of the varieties of gemstone found in Sri Lanka, with notes on their occurrence. M.O'D.

WILSON (A. F.). *Metamorphic processes in gemstone formation.* Aust. Gemmol., **14,** 4, 57-63, 6 figs, 1980.

Discusses formation of gem minerals in existing rock by pressure and/or heat and indicates where in the petrological picture a given mineral might be expected. Some terminology is delightfully unfamiliar (e.g. poikiloblastic garnets) but the paper is full of well-informed theory and facts of natural mineral occurrence and growth. Metasomatic gems, in which additional elements are added to the original rock composition by percolating fluids, are also discussed. R.K.M.

ZWAAN (P. C.), ARPS (C. E. S.). *Properties of gemscapolites from different localities.* Z.Dt.Gemmol.Ges., **29,** 1/2, 82-5, 2 graphs, bibl., 1980.

Paper read to the 17th International Gemmological Conference in Idar-Oberstein. The physical properties of scapolites in gem quality in the collection of the National Museum of Geology and Mineralogy in Leiden, Netherlands, are given. The authors discuss the position of the gem scapolites within the mixed crystal series marialite-meionite. E.S.

BOOK REVIEWS

CHESTERMAN (C. W.). *The Audubon Society field guide to North American rocks and minerals.* Knopf, New York, 1980. pp.850. Illus. in colour. £6.95.

In this attractive book minerals are arranged by colour for the illustrated section and chemically for the descriptive section. The quality of the colour reproduction is high. Descriptions include quite a lot of locations, and modes of occurrence are given. There is a very short bibliography and an index. For its size this is a respectable book. M.O'D.

FRIESS (G.). *Edelsteine im Mittelalter.* (Gemstones in the Middle Ages.) Gerstenberg Verlag, Hildesheim, 1980. pp.206. DM48.

The major portion of the book, arranged by stone, gives references by author, some of these being classical in date. Introductory chapters discuss mystic and medicinal properties of gemstsones with notes on selected authors. M.O'D.

KIVIENKO (E. I. A.). (Prospecting and evaluation of deposits of precious and economic stones.) Nelra, Moscow, 1980. pp.165. Illus. in black-and-white. 55k. (In Russian.)

A useful book on deposits of economically important minerals and gems. M.O'D.

LEEDER (O.). *Fluorit.* (Fluorite.) Verlag Deutscher Verlag für Grundstoff-industrie, Leipzig, 1979. pp.266. Illus. in black-and-white. 40M.

This useful volume forms part of the series Monographienreihe Nutzbare Gesteine und Industrieminerale; a good deal of attention is paid to the crystal structure of the mineral and also to its synthesis. Maps show the world's main locations and the remainder of the book discusses the industrial applications of fluorite. There is a very full bibliography and an index. M.O'D.

SEMENOV (V. B.). *Jasper.* Middle-Urals Publishing House, Sverdlovsk, 1979. pp.352. Illus. in colour. 14r.

This is the most attractive book on any earth science topic that I have yet seen from the USSR. After an introductory chapter (in Russian, with an English summary) the rest of the book consists of photographs of Soviet jasper locations and artefacts, each detailed in a list at the end of the book. The wealth of material is considerable as the excellent pictures show. M.O'D.

(Precious and coloured stones.) Isdateltsvo Nauka, Akademia Nauk SSSR. Moscow, 1980. pp.290. Illus. in black-and-white. 1r.30k. (In Russian.)

One could wish for such a book in English or at least in a Western European language, since it deals with the occurrence of gem material with particular reference to mineral associations. M.O'D.

ASSOCIATION NOTICES

OBITUARY

PROFESSOR DR KARL SCHLOSSMACHER, F.G.A.

An Obituary Note by B. W. Anderson

In the death of Professor Karl Schlossmacher last November at the age of 93 we have seen the passing of the third 'Grand Old Man' of gemmology to die during the past decade. The first, and oldest of them all, was Dean Kraus of Michigan, who died in 1973 at the remarkable age of 97, and who will be remembered as senior co-author of that excellent textbook 'Gems and Gem Materials'. The second was Robert M. Shipley, founder and first President of the Gemological Institute of America, who was 91 at his death in 1978.

Of the three, Prof. Schlossmacher was the most academically learned as a mineralogist and skilled as a practical gemmologist. His influence on the growth of gemmology in Germany was indeed tremendous. In his student days at the University of Marburg he underwent a thorough mineralogical training, and his propensity for gemmology was ensured from the beginning by his being a pupil of Prof. Max Bauer, author of the justly famous work 'Edelsteinkunde', first published in 1896. This was for many years the finest and most complete textbook on the subject and was translated by L. J. Spencer and his wife for the English edition, which was published as 'Precious Stones' in 1904 and reprinted fairly recently in paper-back form. Much later, Schlossmacher was himself destined to prepare a greatly altered version of 'Edelsteinkunde', which appeared in serial parts during the period 1928-1932.

The present writer as a keen young gemmologist was much inspired by this Schlossmacher version—partly because there were many references therein to original sources in the literature which opened up a world of science beyond the hackneyed 'textbook' material, too often copied or rehashed from one book to another.

Before that time Dr Schlossmacher held posts at Heidelberg and later at Berlin University, where he organized the first official German course in gemmology. In 1926 he was appointed Professor of Mineralogy and Petrography in the University of Königsberg, with all the resources of a fine new Institute at his disposal. Here for a time his chief interest lay in the colour absorption of gemstones as revealed by a

Prof. Dr Karl Schlossmacher *(Photo: Z.Dt.Ges. für Edelsteinkunde, 1967)*

spectrophotometer. In 1938 Schlossmacher was elected an Honorary F.G.A.—a distinction awarded only to a very few.

Towards the end of the Second World War he was appointed Professor of Mineralogy at Freiberg before settling into his last professional niche as Director of the Precious Stone Research Institute in Idar-Oberstein, the very heart of the gem-cutting and precious stone trade in Germany. There, enveloped in an aura of immense prestige, he taught and carried out routine gem-testing and research for many years.

Amongst the more important of the specialized instruments which he designed during this period was a horizontally disposed polarizing microscope which simplified the thorough examination of a gemstone in any desired orientation while immersed in a cell of liquid. He also wrote two useful books for students, 'Leitfaden für die exakte Edelsteinbestimmung' ('A Guide to the Accurate Determination of Gemstones'), and 'Edelsteine und Perlen', which went through several editions.

During his long years of retirement Prof. Schlossmacher received many honours. A small street in Idar-Oberstein was labelled with his full name and title as 'Professor Dr Karl Schlossmacherstrasse', and quite recently (1980) a newly-discovered mineral (a calcium aluminium sulphate and arsenate) was christened *Schlossmacherite* by its discoverers, Schmetzer and Bank.

The death even of so aged a veteran must cause sorrow to those who were close to him, while the many gemmologists who knew him chiefly by reputation can feel thankful that Karl Schlossmacher's long life was so valuably spent in the service of his chosen science.

* * *

Mr Leslie Frank Austin, F.G.A. (D.1952 with Distinction), Evesham, Worcester, died on 26th May, 1980.

Mr Donald A. Light, F.G.A. (D.1952), Sutton Coldfield, died in October, 1980.

Mr Albert Shindler, F.G.A., (D.1972), Kenton, died on 20th January, 1981.

Mr Hubert E. Smith, F.G.A. (D.1936), Hove, Sussex, died on 14th November, 1980.

Mr Edward E. Webb, F.G.A. (D.1949), Wimborne, Dorset, died on 26th December, 1980.

GIFTS TO THE ASSOCIATION

The Council of the Association is indebted to the following for their gifts:

Mrs David Merson (formerly Mrs Rutland) for manuscripts of 'An introduction to the world's gemstones', by the late Dr E. H. Rutland, F.G.A. (Country Life, London, 1975).

Mr E. A. Thomson, London, for an oval cabochon-cut calcatricite weighing 4.06 ct.

NEWS OF FELLOWS

On 8th October, 1980, Mr M. J. O'Donoghue, M.A., F.G.S., F.G.A., gave a talk on man-made gemstones to the Medway Lapidary and Mineral Society. Mr O'Donoghue also recently visited the Academy of Mining and Metallurgy and the Skawina Aluminium plant near Cracow; the latter produces corundum, which is cut at the plant.

Mr John G. Rae, F.G.A., Shetland, was made a M.B.E. in the last New Year's Honours.

On 26th February, 1981, Mr Alan Hodgkinson, F.G.A., was the guest speaker at a practical seminar and reunion of old gemmology-students at Openshaw Technical College.

MEMBERS MEETINGS

Midlands Branch

On 30th January, 1981, at the Society of Friends, Dr Johnson's House, Colmore Circus, Birmingham, Mr Hugh Ransom gave an illustrated talk on valuations.

On 26th February, 1981, at the Society of Friends, Mr D. R. G. Walker, Deputy Keeper of the Natural History Department, City of Birmingham Museum, gave an illustrated talk on the gem and mineral collections of the Museum.

North-West Branch

On 29th January, 1981, at Church House, Hanover Street, Liverpool, Messrs Walter and Don Hartshorne, of Isis Minerals, gave a short lecture and displayed crystal specimens.

South Yorkshire and District Branch

On 27th January, 1981, at Sheffield City Polytechnic, Mr Peter Harrison, of Treak Cliff Cavern, gave an illustrated talk on Blue John, covering the properties of the mineral, the particular difficulties found working it, and the history of the industry at Castleton.

ANNUAL REUNION OF MEMBERS AND PRESENTATION OF AWARDS

The Annual Reunion of Members was held at Goldsmiths' Hall during the evening of Monday, 17th November, 1980, when a large number of members attended.

The Reunion was followed by the Presentation of Awards, when the Vice-Chairman, Mr Noel Deeks, welcomed over 300 members and recipients of awards with their relations and friends. He mentioned that people from eleven countries apart from the U.K. had come to receive their awards in person, some coming from places far afield. He presented the apologies of the Chairman, Mr David Callaghan, who unfortunately was ill and could not be there but who sent his best wishes to everyone. Also he apologized for the fact that Sir Edward Ford, who was to have presented the awards, was not able to come because of a bereavement, and thanked Mr C. T. Smith, Prime Warden of the Worshipful Company of Goldsmiths, who had very kindly, at short notice, come along that evening.

In his opening remarks Mr Deeks said that 46 persons had sat for the Gem Diamond, 425 for the Diploma and 746 for the Preliminary examinations. Although the numbers were slightly less than last year, there was a better percentage of passes. The Tully Medal was not awarded, but Christine Woodward had received the congratulations of the Examiners for her excellent work. The Rayner Prize in the Preliminary examination had been awarded to Graeme Hogarth. He then thanked the Examiners, the Association's staff and everyone else who assisted in any way with the examinations, without whose co-operation the whole exercise would be impossible.

Mr C. T. Smith, Prime Warden of the Worshipful Company of Goldsmiths, was then introduced and presented the awards. After the presentation the Prime Warden delivered the short address which is recorded in full below.

Dr Allnutt expressed the thanks of the Association to Mr Smith for presenting the awards, and Mr Noel Deeks in closing reminded members that 1981 marked the 50th Anniversary of the Association and special events were being held in London between 4th and 7th October. Some of the world's leading gemmologists, Basil Anderson, Robert Crowningshield, Edward Gübelin and Richard Liddicoat, would be coming to give addresses to members. There would also be an exhibition at Goldsmiths' Hall showing the progress of gemmology and new gems that had been discovered during the Association's fifty years, and including among the exhibits some outstanding and rare gems.

ADDRESS BY MR C. J. SMITH, PRIME WARDEN OF THE WORSHIPFUL COMPANY OF GOLDSMITHS

I am so sorry that I have to stand in for Sir Edward Ford. He is my immediate predecessor as Prime Warden, and, as he is still the chairman of the Goldsmiths' Company's Craft Committee, he would have very much enjoyed this occasion. He takes a great deal of interest in our industry. Sir Edward at one time was a private secretary to the Queen, and you can well imagine that on a State occasion at Buckingham Palace he would have seen more magnificent gemstones, of many carats, than most of us would see in a lifetime. As I am here in his place this evening, to misquote an old saying, I trust that you will accept half a carat rather than no carats at all.

My interest in gemstones was first aroused at an exhibition of diamonds at Christies many years ago. There I saw diamonds of every colour, blue, brown, green, yellow and pink, all rare colours and not one smaller than 2 carats. It was the beautiful yellow one that I liked the most. Since then I have taken an amateur's interest in gemstones and gem materials. But, being a poor silversmith, there it has remained!

It has given me great pleasure to present the diplomas and prizes this evening. I expect that you feel that you have achieved something, and you certainly have. It is a wonderful feeling to look back after many months of study to find that you have 'made it'. You have satisfied the examiners in both theory and practical work, in all the aspects of gemmology—crystallography, mineralogy, refractive indices and a dozen other subjects, including the study of synthetics, which today is becoming increasingly important as the techniques improve. The Technical Advisory Committee of the Goldsmiths' Company thought this subject of such importance that they commissioned a survey by Mr M. J. O'Donoghue to compile a reference to all the available material on synthetics. Strangely, for a book written in English, the greatest sales have been in Europe and the Far East.

I think it is important, for many of you, to remember that this is only the beginning of your career and only a great deal of practical experience can take you to the top. But you will find that you will be regarded as experts, because you are qualified gemmologists. Similarly on my side of the industry we are regarded as experts. Nothing could be further from the truth. We have not learnt it all. Nevertheless we are asked questions and very often asked to give an opinion on a piece of silver. Generally it is something with which you are quite familiar, and there is no problem.

It is sad, but very often when I have been shown pieces of silver which have been highly regarded by their owners, they have been of very little value. You, in time, will have many similar experiences. May I suggest that you do not instantly destroy a cherished belief, probably associated with someone near and dear to the person seeking your opinion. Acquaint your customer, friend or whoever it may be, that it is possible that it is not what they believed it to be. Treat them kindly and gently. In this way they will retain their dignity, you will retain their respect and they will value your advice. You will, of course, get the blusterer who will tell you that you don't know what you are talking about; usually they are only after a free valuation. Do not be perturbed; just suggest that they get a second opinion.

I am most interested to learn that Messrs Rayner & Keeler are presenting one of the awards. Before the war—that seems a long time ago—I was with Ross Ltd, the manufacturers of binoculars and telescopes, and I had the greatest respect for them, and here this evening I find that they are so splendidly supporting the gemmologists.

May I wish all the diploma holders and prize winners every success in the future and that the Gemmological Association will continue to prosper as they enter their 50th anniversary next year. Thank you very much for having me, and may the Goldsmiths and Gemmologists continue in harmony.

PRESENTATION OF AWARDS IN JAPAN

Once again the Gemmological Association of All Japan arranged a ceremony at the Imperial Hotel, Tokyo, on 26th November, 1980, for the presentation of awards to those persons in Japan who had qualified in the 1980 Diploma Examination. Mr R. P. Martin, the Cultural Counsellor and British Council Representative in Japan, presented the Diplomas.

ISTITUTO GEMMOLOGICO ITALIANO

Mr H. J. Wheeler, F.G.A., Secretary of the Association, was invited to give a talk to members of the Istituto Gemmologico Italiano at their 4th National General Meeting held at the National Museum of Science and Technology in Milan, on Sunday, 30th November, 1980. About 300 persons were present and the talk, at their request, was on the subject of the ways we teach gemmology in the U.K. The talk, which was restricted to thirty minutes, dealt first with the history from 1908 to the present day and how interest has grown. It was pointed out that the G.A. of G.B. only conducts teaching by correspondence which is available to anyone in the world, but evening classes are held at schools and colleges in the U.K. The Association does organize examinations which can be taken by anyone taking its correspondence course or who may study at evening classes, or undertake their own studies. In addition to gemmology we have also laid down a syllabus and arrange an examination related to gem diamond studies.

Representatives from Belgium, Italy, Spain and Switzerland also presented papers. In the afternoon talks were given by a number of their Italian members covering subjects such as coral, its treatment and imitations; unusual specimens; modern gemmology assisting the archaeologist; non-destructive methods to distinguish natural turquoise from imitations by x-ray diffraction; and why trust and honesty are essential in the jewellery trade.

At the end of the talk the Association was presented with a copy of *Il Diamante—Manuale Pratico,* by Gianmaria Buccellati (President of the Italian Gemmological Association), which had just been published.

ANNUAL GENERAL MEETING

The Association's Annual General Meeting will be held at Saint Dunstan's House, Carey Lane, London EC2V 8AB, on Wednesday, 20th May, 1981, at 6.30 p.m.

GOLDEN JUBILEE CELEBRATIONS

1931—1981

Over a period of four days, from 4th to 7th October, 1981, the Gemmological Association will celebrate its first fifty years as an independant institution as follows:

Sunday, 4th October:

6.30 - 8.30 p.m. Reception at the Institute of Geological Sciences.

Monday, 5th October:

11 a.m. Lecture by Mr B. W. Anderson, B.Sc., F.G.A., F.K.C. (Vice-President).

6 p.m. Grand Opening of Exhibition at Goldsmiths' Hall (which will remain open to the public from Tuesday 6th to Friday 16th October from 10.30 a.m. to 5 p.m. daily, except on Sunday, 10th October).

Tuesday, 6th October:

11 a.m. Lecture by Prof. Dr E. Gübelin, F.G.A., C.G. (Research Diploma, 1957).

6 - 11 p.m. Cruise down the River Thames on M.V. *Naticia.*

Wednesday, 7th October:

10.30 a.m. Lecture by Mr R. T. Liddicoat, Jr, (President of the Gemological Institute of America) and Mr G. R. Crowningshield, C.G., F.G.A.

7 p.m. Celebration Dinner in the Captain's Room at Lloyds.

Full particulars and booking forms may be obtained from the Secretary and have already been posted to all Members.

THE SOCIETY OF JEWELLERY HISTORIANS

The 2nd International Symposium on the History of Jewellery Materials and Techniques will be held at the Society of Antiquaries, Burlington House, Piccadilly, London, W.1., on 28th-29th May, 1981. Further details may be obtained from the Symposium Secretary, Mr Jack Ogden, 42 Duke Street, St James's, London SW1Y 6DJ.

On 21st September, 1981, at 6 p.m., Mr Ogden will lecture on 'Profitable Trickery: Imitation Gemstones in the Ancient World', also at the Society of Antiquaries, in Burlington House.

RESIDENTIAL COURSE AT CHICHESTER

A closed week-end residential course for second-year G.A. Correspondence Course students, covering the use of gem-testing instruments, will be tutored by Mr Peter G. Read, C.Eng., F.G.A., at West Dean College on 29th-31st May, 1981. Further details may be obtained from the Course Supervisor, Miss S. Overman, West Dean College, West Dean, Chichester, Sussex. PO18 0QZ.

MICROFILMED JOURNAL

The *Journal of Gemmology* is produced in microfilm by University Microfilms International. Anyone interested in microfilmed copies of the *Journal* should apply to University Microfilms International at 30-32 Mortimer Street, Dept. P.R., London W1N 7RA, or at 300 North Zeeb Road, Dept P.R., Ann Arbor, Mich. 48106, U.S.A.

GEM CRYSTAL TRANSPARENCIES

A third, and enlarged, edition of this useful instructional set of colour slides, by R. Keith Mitchell, is now available from the Gemmological Association, price £10.35 inclusive of V.A.T.

The completely revised booklet accompanying the transparencies gives necessary information and descriptions of most of the 280 or so specimens depicted. These include normal habits, twin forms, some comparatively rare crystal habits and examples of parallel growth. Where relevant, cabochon cut stones have been included to underline special effects. Kodak copies having proved to be less sharp in definition, each of these slides is a direct photograph, using high quality equipment, and crystals are, for the most part, lined up with the appropriate crystal drawings for the mineral species. The twelve principal gem minerals are dealt with; corundum being represented by 37 specimens; zircon by 38, including a rare twin form; spinel

28; diamond 25 and so on down to topaz with a mere 14 specimens shown.

Finally a new section, 'Looking at Crystals', gives the student basic hints on how to start tackling the problem of sight identification of gem minerals.

SRI LANKAN GEMMOLOGISTS

The State Gem Corporation of Sri Lanka is compiling a directory of Sri Lankan gemmologists. Any F.G.A. who wishes to be listed in the directory should communicate direct with the Deputy General Manager, Research & Development Division, State Gem Corporation, 112/1 D.S. Senanayake Mawatha, Colombo 8, Sri Lanka.

LETTER TO THE EDITOR

From Mr Ian McGlashan

Dear Sir,

The Sancy Diamond

The Scots have a proverb 'Mony a mickle maks a muckle', so may I add my scraps to the two articles you published in the *Journal* in 1977 (E. A. Jobbins, *J. Gemm.,* XV(5), 240-2) and 1978 (H. Tillander, *J. Gemm.,* XVI(4), 221-8)?

1. According to 'Uncensored Recollections', by 'Anon' (the British Museum Catalogue calls the author 'Mr Field'), 1924, p.62, *Paul* Demidoff, nephew of *Anatole,* used to carry the Sancy around in his pocket. Until Mr Tillander stated that Nicholas Demidoff bought the Sancy in 1828, I had assumed it was Anatole who owned it and could not understand why a boy of fourteen should buy such a diamond and also why no obituary of Anatole mentioned his owning the Sancy—journalists as a rule do not miss out on such things!

2. *The Illustrated London News* (11th March, 1865) carried a diagram of the Sancy, which, according to the accompanying script, 'has been purchased for £20,000 by Messrs R. and S. Garrard and Co., of the Haymarket, for Sir Jamsetjee Jejeebhoy.... This diamond is of peculiar form, being neither of a brilliant nor a perfect rose cut. It is what is called a briolette—that is, a solid drop; but it differs from a briolette in having flattened tables back and front, a perfect briolette being cut to a point. The facets are very regular and well cut, which leads to the belief that, although the stone retains its original form, the work has been gone over and improved at no very distant date. We are the more inclined to this idea from the fact that the stone was said to weigh originally 55 carats, but its weight is now only 53¼ carats.'

3. This weight business recalls the Levrat case referred to by E. W. Streeter ('The Great Diamonds of the World', 1882, pp.266-7). Levrat, he says, got the price reduced from 600 000 francs to 145 800 francs because it had been greatly reduced in weight by being recut. Some reduction!

4. In 1867 a diamond called the Sancy was exhibited in Paris, yet also went to India, having been bought by the Maharajah of Patiala (Streeter, pp.267-8). Surely this must have been the Patiala stone which is stated to weigh 60 carats. It could not have been the Sancy as we know it, for Lord Astor said to members of the British Museum that he bought it in 1892 and Jejeebhoy was the previous owner.

5. The story of the stone as given in 'Dix Siècles de Joaillerie Françaises' (Ministère d'État, Affaires Culturelles, Paris, 1962), the catalogue of an exhibition at the Louvre in which the Sancy was item no. 20, says that it was 'mis en vente par l'Indian Art Gallery à Londres en 1887'. The India Office Library could not find any reference to the Indian Art Gallery, when I asked them, and suggested it might be the Indian Section of the Colonial and Indian Exhibition held in London in 1886: unfortunately there is no mention of a diamond in the catalogue of that exhibition.

There are still a number of gaps which I hope somebody sometime will be able to fill.

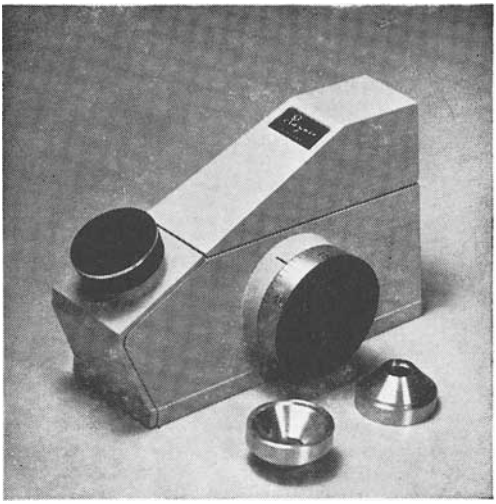
Yours etc.,
IAN MCGLASHAN.

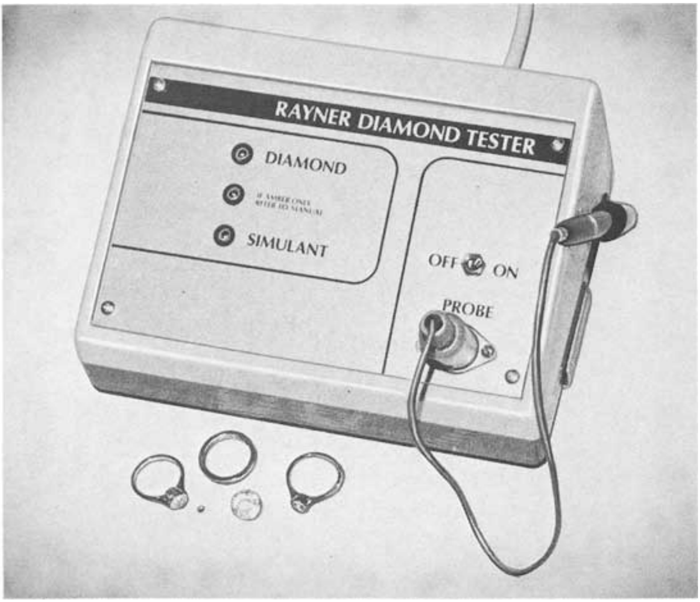
16th January, 1981.
Montagues, Alphamstone, Bures, Suffolk.

[NOTE. *It appears that the story as told by Tillander (1978)—provided his sources are trustworthy and subject to establishing the relationship of the various members of the Demidoff family—is reasonably satisfactory down to 1854, when the widow Karamsin settled in Helsinki after the death of her husband. Then there is a gap until 1865 (when the Sancy was sold to Sir Jamsetjee Jejeebhoy) which could perhaps be filled if we knew the name of the vendor to Sir J. J. (the widow Karamsin?—Streeter says 'the Demidoff family'): and we do not really know what happened to the Sancy between 1865 and its acquisition by Lord Astor—whether in 1892 (McGlashan) or 1906 (Tillander)—but a stone called the Sancy was (according to Streeter) shown at the Paris Universal Exhibition of 1869 and sold to the Maharajah of Patiala, who wore it at the Grand Durbar for the Prince of Wales on his tour of India (1875) and died shortly thereafter. If the Patiala stone was indeed 'our' Sancy—which at best seems doubtful—and if Lord Astor acquired the Sancy* from Jejeebhoy *(whether in 1892 or later), it might mean simply that Jejeebhoy having sold the stone to Patiala bought it back after the latter's death.—Ed.*]

CORRIGENDA

On p.287 above, line 20, for 'course' read 'coarse'.
On p.339 above, line 5 from bottom, for 'aparatus' read 'apparatus'.
On p.340 above, line 24, for *'crysoberyl'* read *'chrysoberyl'*.
On p.343 above, line 6, for 'ant' read 'and'.
On p.358 above, line 7, for 'Huges' read 'Hughes'.
On p.365 above, line 1 of footnote, for 'aproved' read 'approved'.
On p.366 above, second column (following 'Tinted White' in first column), for 'J' read 'L'.

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Historical Note

The Gemmological Association of Great Britain was originally founded in 1908 as the Education Committee of the National Association of Goldsmiths and reconstituted in 1931 as the Gemmological Association. Its name was extended to Gemmological Association of Great Britain in 1938, and finally in 1944 it was incorporated in that name under the Companies Acts as a company limited by guarantee (registered in England, no. 433063).

Affiliated Associations are the Gemmological Association of Australia, the Canadian Gemmological Association and the Rhodesian Gem and Mineral Society.

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Notes for Contributors

The Editor is glad to consider original articles shedding new light on subjects of gemmological interest for publication in the *Journal.* Articles are not normally accepted which have already been published elsewhere in English, and an article is accepted only on the understanding that (1) full information as to any previous publication (whether in English or another language) has been given, (2) it is not under consideration for publication elsewhere and (3) it will not be published elsewhere without the consent of the Editor.

Articles published are paid for, and any number of prints of individual articles may be supplied to authors provided application is made on or before approval of proofs. Current rates of payment for articles and terms for supply of prints may be obtained on application to the Secretary of the Association.

Although not a mandatory requirement, it is most helpful if articles are typed (together with a carbon copy) in double spacing on one side of the paper, with good margins at sides, top and foot of each page. Articles may be of any length, but it should be borne in mind that long articles are more difficult to fit in than short ones: in practice, an article of much more than 10 000 words (unless capable of division into parts or of exceptional importance) is unlikely to be acceptable, while a short note of 400 or 500 words may achieve early publication.

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