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NEW GEMMOLOGICAL MICROSCOPE

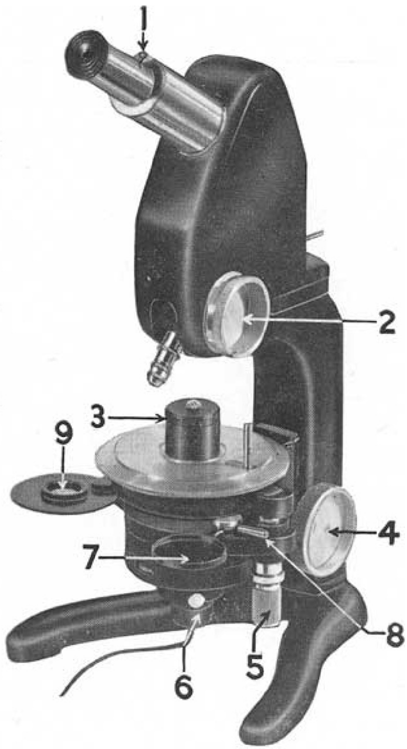
by E. H. RUTLAND, Ph.D., F.G.A.

OF the multitude of instruments now available for gem testing (and what a change there has been in the last ten years) the oldest of all, the microscope, undoubtedly remains the most essential, the most generally useful. It is unnecessary to labour this point to the expert, but to him who regards the microscope as the perquisite of scientists, it may be permissible to point out that it is the simplest, surest and quickest means of distinguishing pastes and synthetics (a growing problem) from natural stones ; indeed, it is the only test readily available for separating synthetic and natural ruby with certainty. To the expert a suitably equipped microscope can tell more about a gem than all the other instruments combined ; a fact which does not detract from their usefulness.

The evolution, for the first time in this country, of a microscope specially designed for the gemmologist and jeweller is therefore an event of some importance. There is already a great variety of microscopes on the market, some of which can be adapted very satisfactorily to gemmological work. The new instrument, however, combines all requisites for gem testing with sturdy construction and with a number of ingenious modern features which greatly simplify its use.

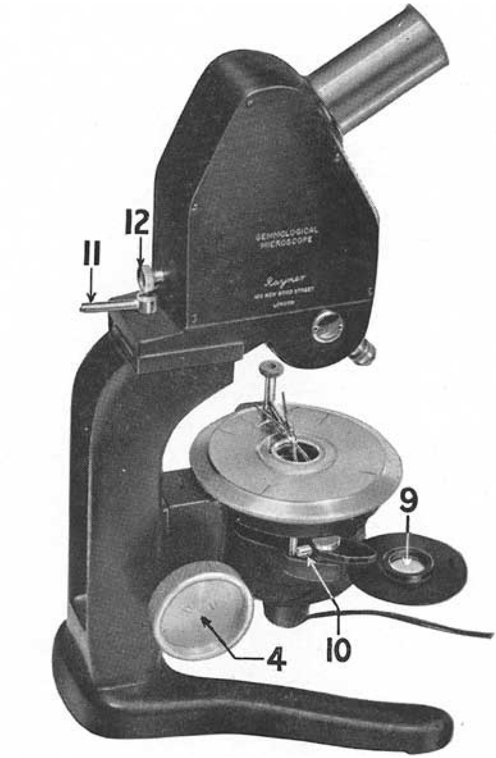
One such feature is the focusing system. There are three built-in objectives giving, with the ocular provided, 10 ×, 25 × and 60 × magnifications and all are completely parfocal. They can be changed by merely turning a large knob[2]. It is, therefore, possible to survey a large area rapidly and then to magnify anything unusual that is seen by a mere turn of the knob, with the assurance that the feature selected will be in focus without further adjustment.

1. Lever controlling spectroscope slit opening.
2. Change of magnification drum.
3. Spectroscope condenser.
4. Focusing knobs (2).
5. Knob for height control of dark-ground illumination.
6. Lamp holder securing screw.
7. Swing-in occluder to give dark-ground effect.
8. Dark-ground lever.
9. Swing-in polarizing filter.



Focusing is further simplified by the low mounting of the focusing wheels on the stand[4]. This enables one to rest the whole arm on the bench while focusing and adds greatly to the smoothness of operation. The focusing wheel in fact moves the stage and not the body tube as in most microscopes. There is no fine adjustment, but in view of the large wheel employed and of the low magnifications used, this is no drawback.

The stage and sub-stage form a unit which contains quite a number of interesting features. Following modern trends, the lighting is built in. Expert microscopists may prefer the greater flexibility provided by independent lighting, but where speed and simplicity matter, it is a great boon to be able merely to switch on in the knowledge that the light will be in perfect adjustment and that this adjustment cannot be upset by a random movement of

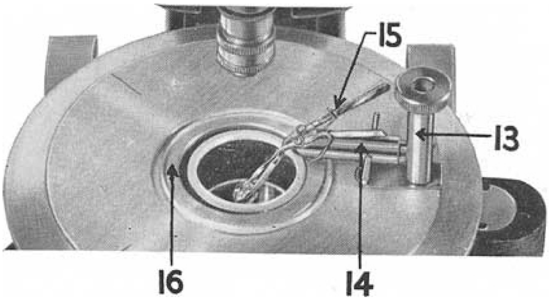


4. Focusing knobs (2).
9. Swing-in polarizing filter.
10. Polarizing filter lever.
11. Body-locking lever.
12. Push-pull analyser knob.

the instrument. The source of light is a 12W, 1A close coil lamp and is ample for most purposes. For normal working it needs to be dimmed by means of the rheostat provided, keeping full power for spectroscopy. A few of the spectroscopically more difficult stones may need stronger light than the instrument can give.

The substage condenser system is distinctly novel in that it employs both a condensing lens in front of the lamp for transmitted light and a mirror behind the lamp for dark-ground illumination.

The mirror is of paraboloid shape and produces a parallel beam of light upwards. This beam is then collected by another paraboloid mirror which deflects it at right angles and condenses it at a point just below the stage. This arrangement provides a most vivid form of dark-ground illumination. A glass cell is supplied that hangs by its rim below the level of the stage[16]. In this cell the specimen can be viewed either dry or in any of the usual immersion liquids. An ingenious stone holder is supplied that enables one to move the stone in any direction and hold it in any position. When dark-ground illumination is required a swivelling black disc[7] cuts off the direct light from the specimen and it now receives light only



13., 14., 15. Stone-holding attachment comprising: Vertical post (13), Horizontal bracket (14), Tweezer (15)
16. Dark-ground immersion cell.

from the top mirror, i.e. from all sides. A separate screw control[5] makes it possible to raise and lower the ring of light reaching the specimen in such a way that it traverses the stone from top to bottom.

Both dark-ground and direct-light illumination have their advocates among gemstone microscopists and each form has advantages for certain types of inclusion. On the new instrument one can switch from one to the other at the touch of a finger[8]—a pleasant experience when one is used to changing condensers.

Instead of the recessed immersion cell, the stage can be fitted with a frosted glass diffuser for normal working. This, too, should save many a small stone from losing itself in the inside of the substage unit. For spectroscopy, the stage aperture can be closed with a condensing lens over which a black " pot " holds the stone in a small aperture at the focal point of all the light from underneath. Here an iris diaphragm would accommodate stones of all sizes but no doubt this would raise the cost. The pot is shown in position[3] in one of the illustrations.

The microscope is equipped with a rotating stage engraved with lines at 90°. The polarizer swivels[9] next to the dark-ground disc and the analyser works on a push-pull button[12] at the back of the instrument. Both are fitted with polaroid. The polarizing equipment provides the usual facilities for observing double refraction, dichroism, the spectra of individual rays, etc.

The inclined eyepiece is also in keeping with modern trends. The tube holding it will take a number of accessories : foremost among these is a new hand spectroscope. This slides right into the eyepiece tube and is shown in position in the illustration. It can of course also be used independently and gives as bright and clear a spectrum as any of the hand instruments on the market. It possesses the advantage that the slit can be adjusted by means of a small lever halfway along the spectroscope[1]. This is much more smooth in operation than the tiny screw with which such instruments are usually equipped. When in the eyepiece tube, the spectroscope is held in position with the red end of the spectrum on the left side.

The Rayner dichroscope can also be fitted to the eyepiece tube and used in conjunction with the microscope. Further fitments are understood to be in preparation, including a camera attachment.

It will have been observed that the optical constituents of this instrument are not of standard size and that the objectives and ocular are not interchangeable with other makes. This is because the instrument was designed as a whole and for use in gem testing primarily. It is a very good specialized tool for this particular purpose, rather than one that provides endless variety for the unspecialized microscopist. Messrs. Rayner, to whom gemmologists owe a great deal already, are to be congratulated on their enterprise, ingenuity and workmanship.

JADE STORY - EUROPEAN

(The second part of the Story of Jade in Europe)

by ELSIE RUFF, F.G.A.

THE *Dark Ages of Jade* might well describe one of the missing links in the story of jade.

If we take Dr. Sydney Ball's dates[1], we find remnants of the neolithic age in Europe around 1500 B.C. Up to this date it would appear that jade was highly valued and commonly used, at least among advanced stone-age peoples. Then we discover a gap. It is a wide gap, for it extends from this early date to the historical use of material undoubtedly referring to our present jade. In other words, we have jadeite and nephrite in what would appear to be constant use in Europe from the beginning of enlightenment to 1500 B.C. From this date we leap forward to the period of the Spaniards introducing the jade of South America, the jade of Sir Walter Raleigh. The jade of the Spaniards and that of Sir Walter Raleigh was principally jadeite. But to establish any type of jade in Europe is to wrestle with etymology.

We may read[2] " there is no word of jade in European literature before the discovery of America by Columbus in 1492." On his fourth and last voyage, during 1503, Columbus was in Jamaica. The Spaniards were in Mexico during 1519, but in 1511 they had contacted the Yucatans, nineteen years after the discovery of the continent by Columbus.

This may or may not mean that the author of the above statement, in 1906, had found mention of jade in Europe before the discovery of jade in South America by the Spaniards. In 1912 Dr. B. Laüfer (*Jade*) was writing : " Our word *jade* is but a recent introduction first brought to England by Sir Walter Raleigh (*c.* 1552-1618) who always uses the Spanish name for the stones in his books ; the word does not appear in our literature before this."

If Sir Walter used the Spanish term and, moreover, brought specimens of jade back with him, it is obvious that he too contacted Spanish culture somewhere in South America. He is alleged to have shown a piece of this jade to one of his friends and to have commented that it was used in America for the treatment of renal diseases.

An official report by Sir Walter Raleigh on " The Discoverie of Guiana " mentions jade. It is referred to as the *spleene-stone*, and sometimes both *spleene-stone* and *kidney stone* are used, as though dealing with two separate stones. " . . . others of better estimate " suggests material more valuable than jade ; perhaps emeralds. Again, of the spleene-stone, he says : " . . . of these I saw divers in Guiana ; and commonly every king and casique hath one, which their wives for the most part weare ; and they esteem them as great Jewels." He wrote too : " A kinde of greene stones, which the Spaniards call *piedras hijadas* and we vse for spleene stones." (Whether he meant that the South Americans did not so use them is a moot point.)

There is little doubt that this jade, so venerated in South America and introduced into Europe under a Spanish name, was similar to the spleene-stone of England. In any case, it was close enough to bear comparison.

Since the Spanish invasion antedates the jade of Raleigh's time and the Spanish term was accepted, it would seem essential to put the enquiry back a few years. Certain it is that the Spaniards brought back enough of these stones to impress their fellow countrymen, in spite of the fact that the jade was often forced upon them by the Aztecs. Not always were these gifts accepted, for the Spaniards preferred gold and emeralds, which had a high monetary value in Europe. But the invaders were frequently treated as honoured guests. And they were guests in a luxury country. Nevertheless, it implied that while jade was less valuable in Spanish eyes, perhaps even of small degree, the newcomers were not unmindful of what was being offered. Whether the jade was accepted as a cure for kidney ailments is something not yet established. If not, then the Spaniards must have received these stones in the belief that they were in circulation as a cure for kidney diseases within their own country. It seems incredible that these (often uncouth) explorers would invent such a theory on the way home, for no particular reason—unless it was to establish that the stones were extremely valuable in the land of the Aztecs. To discover whether the Spaniards were hoodwinking the European world, it is necessary to discover whether such a belief existed anywhere.

The Monardes book, to be quoted later, appeared in the latter part of the 16th century and, quite apart from jade, is interesting in many ways. Not least is a letter written to the physician Monardes by a Spanish soldier in South America. He must have been a soldier of unusual capacities for he wrote the letter as a result of having read an early publication by Monardes. He stressed not only the intelligence of the people of the Indies and the wisdom of so much that they did, but also the indifference of the Spaniards who came to those parts, completely lacking in curiosity regarding the people they set out to subdue. Later in the volume, Monardes himself writes of stones " of a white couler " obtainable from certain large, strong fish common to the " Seas of the Indies," often weighing (the stones) more then " twoo pounds " and " hollowe in some parts, and verie white, thei are somewhat heavie. Of these stones they have in the Indias greate experience : givyng theim made in pouder unto those that dooth suffer the grief of the stone in the Kidneis . . . and to them that can not caste out the stone of the raines, and of the Bladder . . . This is a thyng emongest the Indians very plaine, and knowen ; and likewise emongest the Spaniards which doe dwell in these partes."

This information would suggest that kidney trouble was commonly treated by powdering a stone. And it would not be a long jump to use (perhaps by exalted personages) the most precious stone of all in this way, or to retain the stone and use it externally.

Montezuma said, when handing some of these jades to Cortez : " To this I will add a few *chalchihuis* (jades) of such enormous value that I would not consent to give them to anyone save to such a powerful emperor as yours ; each of these stones is worth two loads of gold." In similar vein, the Maori was to say, a few hundred years later : " Let the gold be worked by the white man. My only treasure is the *pounamu* " (jade). It has been said that when Montezuma played games of chance with Alvarado, one of the Spanish leaders, he was paid in chalchihuitl if he won and in his turn paid gold when he lost.

Before quoting Monardes, a writer who preceded him by a few years should be mentioned. He contributed little to the jade theme, but is undoubtedly of interest to the gemmologist. Conrad Gesner, or Konrad von Gesner (sometimes referred to as the

German Pliny), a professor at Zürich University, published in 1555 or 1565 (the year of his death)—there seems to be a difference of opinion with regard to the year of publication—a work entitled : *Book particularly on Stones and Gems. Their Forms and Similitudes. A Source of Aid and Pleasure, not only for doctors, but for all students of Natural History and Philology. Zürich.*

" *Various ornaments.* It is a habit to attach or wear on some part of the body ornaments for the sake of embellishment. People also attach to themselves ornaments in the hope of physical healing, as by amulets. Superstitious persons have produced all kinds of such for enjoyment or showing off. At this time, Gentiles of our very religion carry some, be it as ear-rings or armlets, be it that they use them in the form of beads for prayers out of piety. But we have not beads only but all kinds of figurings ; round, hollow, angular, rhombic. Amongst others one appears a mere exudation which I mention like Chalcedon, often named, and is found in the belly of a hen and partly consumed : in two of these pieces is a midget embodied as within the amber, in which often insects are embodied. I have been given pieces of Amber by friends in which parts of small insects are preserved. These round balls exist also in different materials, Jaspis, Chalcedon, as it is vulgarly called, Crystals, Amethyst, Silica precipitate, Coral, Amber, Jet, and as Galenus writes of the green stone of which this is the application : they suspend it from the neck that it touches the belly where the stomach lies. He simply says Gems with rings (of which we made mention before) of the round or the rectangular form. Besides stones, also gold and silver ornaments are suspended from the neck and worn in a different way. The Indians like to make from Beryls cylindric ornaments as Pliny states. I omit tambourine-shaped ornaments and ear-rings at this place. Also suspended pictures are worn as ornaments.

Green stone or gem which is utilized by the inhabitants of the India of the West. They fasten it on perforated lips, the thicker end inside the mouth and the rest hanging down in the front. You may therefore call it a mouth-ring, in the same way as with plants we have the expression ' Filipendulum.' One Ferrius from Piedmont has given me a stone for my documentation. He says in his letter to me, I send you a green coloured stone of a round shape, long like the middle finger of a man, fitted on both ends with a ring. This stone the Nobles of Brazil carry when appearing in public, fastening it in their lips, which in their youth are perforated. They carry one or more according to rank and they are valued in accordance of what they show of their hanging ornaments."

The *green stone or gem* of the India of the West and of Brazil was almost certainly jade, though Gesner makes no statement regarding its species. In another place he refers to *belemnites*, certain dart-shaped fossils, used in Spain " against calculi in the kidneys." It was a substance that could be " burnt or indeed powdered and mixed with other things. Or prepared as a drink soaked in it. It also cleans the teeth when reduced to ash . . . "

Despite the interesting statement that Spain had its own curative for kidney diseases, Gesner does not appear to link up the disease in any way with his *green stone.*

This volume contains no less than thirty-four authorities (viz. earlier than 1565) consulted or quoted.

Monardes was the chronicler of the Spanish *piedra de ijada.* As a physician of Seville, he was writing of material interesting to medicine. It seems, in 1569, he was the first to use the term *piedra de ijada* in print. He is here quoted at length because his report is valuable. Apart from jade, both a South American wood and a root were used as cures for the same disease.

Joyfull News out of the Newe Founde Worlde, written in Spanish by Nicholas Monardes, Physician of Seville, and Englished by John Frampton, Merchant . . . London, 1577.

" . . . Of the Blood Stone and the Stone for the deseases of the Kidneis and Raines.

Thei doe bryng from the newe Spain, twoo stones of greate vertue, the one is called the Stone of the Blood, and the other is a Stone for the desease of the Stone in the Kidneis and Raines.

The Blood Stone is a kinde of Jasper of divers coullours redde, of the which stones the Indians doeth make certaine Hartes both greate and small . . .

The other Stone, whiche is for the desease of the stone in the Kidneis or Raines, the finest of them are like unto Plasma of Emeraldes, which is likened to greene with a Milkishe couller, the greatest is the beste ; thei bryng them made in divers forms and fashions, for so the Indians had them in olde tyme, some like to fishes, other like to the heddes of birdes, other like to billes of Popagaies, other like to rounde Beadstones, but all pearsed through, for that the Indians did use to weare theim hangyng for the effecte of the griefe of the stone or stomache ; for in these twoo sickenesse it doeth marveilous effectes. The chief vertue that it hath, is in the paine of the stone in the Kidneis and Raines, and in expellyng of Sande and stone. In so muche that a gentleman whiche had one of them here, the best of them that I have seen, havyng put it to his arme, he dooeth make hym to expell and caste out muche sande, that many tymes he doeth take it awaie, for that he thinketh that it dooeth hurte hym for to put out so muche and in takyng it awaie, he comneth to caste away from hym, when he feeleth the paine of the stone, and puttyng hym to againe, it doeth take it awaie incontinente, with expellyng of muche Sande and smal stones. I have seen it carried to persones that have been grieved with greate griefe, and paines of the saied desease, and puttyng it to them, thei doe forthwith expell the sande and the little stones, and remain cleare thereof. This stone hath a propertie hidden, by the whiche meanes he doeth greate effectes, to preserve that thei fall not in to the paine of the saied desease, and after it is come it taketh it awaie, or diminisheth it. It doeth make the sande to bee expelled in great aboundance, and likewise stones. It taketh awaie the heate from the raines of the backe, it profiteth in griefes of the stomache, put to it : and above all it preserveth from the saied grief.

My Ladie, the Duchesse for that she had in shorte tyme three tymes, exceddyng paines of the stone, she made a bracelet of them, and she used to weare it at her arme, and sithence she put them to her arme, she never had more paines of the Stone, and so it hath happened to many other that had the like benefit, for the whiche thei are muche esteemed, and now thei bee not so sone had, as at the beginnyng : for that these stones onlely the gentlemen, and rich men have them, and with reason, because thei do suche marveilous effectes . . . "

This jade from the South American continent, which Monardes wrote *piedra de ijada*, was the *chalchihuitl* of the Aztecs. The Spanish rendering *piedra* (stone) *ijada* (sometimes spelt *yjada*[1] or *hijada*) flank or loins (kidney trouble producing tenderness or pain in the loins), was alternatively written *piedra de los riñones* or *raines,* stone of the kidneys. (The Oxford Dictionary gives *reins,* archaic, the kidneys ; the loins.) Apart from archaic spellings, we have also to deal with the haphazard writings of earlier times. The Monardes extract, Englished, is an example of this.

Nevertheless, in 1569, we have an authoritative writer giving us *piedra de ijada.* In 1598—nearly thirty years later, yet time for Raleigh to have introduced his jade—an English writer, who was also a language expert in his day, gives us *iada,* using, it seems, the Italian rendering and describing the stone as " a kinde of precious stone like an emeraud." From this there would seem to be few obstacles for the establishment of our word *jade.* In 1777 it was spelt *jadde* by one[2] who wrote : " A piece of green nephritic stone, or jadde." As late as 1811, John Pinkerton (the man who coined the word *gemmology*) in his treatise on rocks (Vol. 1. p. 346) gives us " *Jad*—the *Giada* of the Italians. The Nephritic Stone." Here he remarks : " Werner and his disciples have continued the ancient name of nephrite to jad . . . and they divide it into two sub-species, the Oriental, which is brought from China and the East . . . and what they call Beilstein, or Axe-stone, because it is brought in the form of axes from South America, whence it might be strictly called occidental . . . Recent French writers have called it Felspath compact, Jadien, which, they add, is the Jad of the lapidaries, and the Nephrite of the Germans . . . " The French apparently spelt it *l'ejade* and later (changing its gender) *le jade,* so that had we collected the word direct from this source, as with so many of our words, the result could be the same.

We are told that the original Spanish *ijada* for flank or loins descends from the Latin *ilia* meaning loins. As a curative for colic there is an apparent error. Colic is described as a griping belly pain, and the Oxford Dictionary states that the Latin *ilia* for flanks has been confused with the Greek *eileos* for colic. Yet this connection with the word colic seems to have been common in Europe. It may be that pains in the loins as well as pains in the stomach were loosely described as colic. In certain instances kidney pains were interchangeable with the term colic by the same writer. Some Spanish dictionaries render the word *ijada* as both flank and colic. When one reads such statements, as late as the 18th century, that someone had died of a " dreadful cholic " one is left to imagine all kinds of possibilities. Perhaps the following, written in 1775, is as good an explanation as any : " There is a great likeness of circumstances after colic and cardiac (of the heart) affections, nephritic pains come near and not the least sort which arises in the protruding gland, and the bile duct, or the tenacious back-holding, which originate from the stone in the kidney[1] . . . "

In 1632 a lady in Paris sent a jade bracelet to a friend in Madrid. The friend replied : " If the stone you have sent me does not break mine, it will at least make me bear my suffering patiently ; and it seems to me that I ought not to complain of my colic, since it has procured for me this happiness." If this passage has not suffered through translation, it would appear that the stone referred to was a kidney stone and the affliction described as colic, perhaps loosely meaning pain ; obviously not the belly pain of the dictionary. What appears most likely is that over a period most pains connected with the internal organs were loosely referred to as colic. A contemporary medical man has given some clue to this problem by stating that it is possible to have colic in the kidneys if there is a stone in them.

In 1633, Voiture, the poet, in a letter to Mlle. Paulet, wrote : " Ainsi pour ce coup, l'Ejade a eu pour vous un effet que vous n'attendez pas d'elle." Later, one of his letters appeared in English with the statement : " I perceive there must be found out for me some more substantial remedies than the Ejade."

The spleen stone as a remedy continues, at least, as late as 1725 when Sir Hans Sloane (also a physician and therefore interested in cures) was writing his *Natural History of Jamaica*. In it, (Part II. Book VIII) he makes two entries :

1. " *Jaspis e cinereo viridis*. (*Ash-Green Jasper*).

   This was of a more pale colour than the Spleen Stone, but green as it, having some paler veins in it, and being capable of as good a polish, but such a one as jasper takes, whence it is that I range it here. I found it amongst the pebbles and stones thrown up by the sea.

2. " *Jaspis Viridis*. *Spleen Stone*.

   This stone which is very hard, is frequently found on the shores of this island, amongst the stones or pebbles common there. I have taken them up myself about Port Royal, and have had them cut in England, but they proved to be the same with that stone out of which the Indians make their hatchets, wherewith they served themselves in place of iron or steel tools, before the coming thither of Europeans. Of which hatchets I have found one in this island.

" This stone is opaque of a green colour, with some pale veins running through it very hard, and capable of a very good polish.

" They are cut into thin square pieces, and strings being tied to holes in their corners, they are fastened about the arm[1] and thought very much to help in the Stone and Hypochondriac affections. This opinion I take to be owing to a superstition of the Turks and Mohametans I have seen wearing sentences out of the Alcoran in Arabick, etc. wrote upon cornelians, etc. and loged in these grease stones which are hung about their necks or arms, to keep them from the power of the Devil or Diseases, etc.

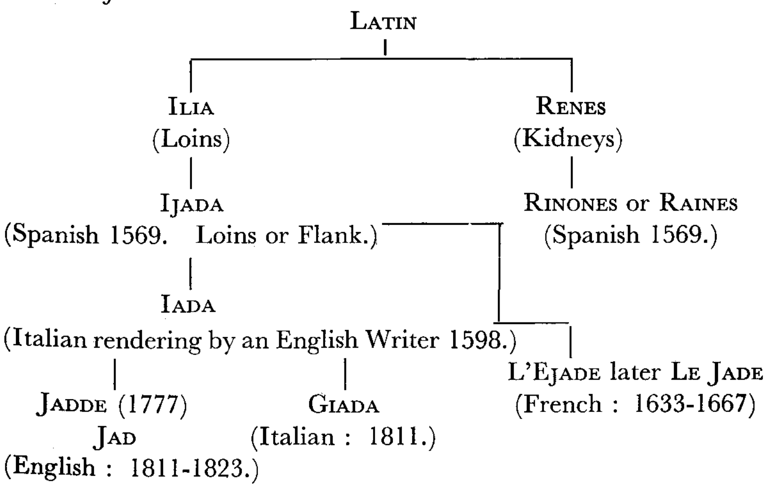
" This is the Piedra de Hijada of the Spaniards, Pierre de Jade of the French authors, who magnify the virtues of it so as to make them incredible, nay M. Labat, a French late author, would make us believe it cures epileptic Fits. Sir Walter Raleigh first brought some of them to England, giving vast encomiums of them."

The spleen stone, referred to by Sir Walter Raleigh and, as we see, more than a hundred years later, by Sir Hans Sloane, whatever its species, was used curatively, as it was before the time of Raleigh's American expeditions. (The spleen, one of the ductless glands, has a connection with the kidneys that needs the explanation of a medical man to do it justice. The word has a connection also with irritability, a state of mind closely associated, one would suppose, with those suffering from kidney ailments.)

Sir Hans Sloane appears to have made his division on the strength of a slight difference in polish. There would seem to be no reason to assume that he was dealing with two distinct species. Both are *spleen stones*. Both are *Jaspis Viridis*. Yet, of the second stone at least, he says it is the Spanish *Piedra de Hijada* and the French *jade*. Moreover it is also the ancient material of the Indians. Since the term jade was not then popular, and therefore little understood, this author uses the well-known *spleen stone*. *Jaspis*, a still older word, but obviously understood at that time, must be reserved for a later article.

As an example that the word *spleen*, as well as *colic*, covered a multitude of sins, the following is a quotation from the Appendix of Dr. Schliemann's *Ilios*[1], p. 724, Appendix V, Medical Practice in the Troad in 1879, by Professor Rudolf Virchow. " Tumours of the spleen are common among the people, and the term *spleen* (σπλήν) is generally employed to express the disease. Many apparently similar cases fall under the same term. Thus . . . one day a little boy was brought to me with a large echino-coccus, and my assurances that it was no " spleen " were hardly believed. A man whom I consoled with the assurance that his wife had no " spleen," but that she would present him with a child in a few months, was quite panic-stricken, for they had been married for seven years without having children . . . Another, who believed himself to be sick of the spleen, had a most developed purpura . . . "

The chart below is an attempt to clarify the development of the term *jade*.



(A few years later Jade was spelt in the modern way.)

Although Monardes was writing in his own language as early as 1569 and it was Englished by John Frampton in 1577, most writers still employed the, then, more literary Latin. So that, instead of writing *piedra de ijada* or *piedra de los riñones* it would be written *Lapis Nephriticus*, again *lapis*, stone, *nephriticus*, kidneys. (From the Greek for kidney, *nephros*). It means therefore that while our word *jade* stems from Monardes (or evidence points that way, for the Spaniards in their heyday were asserting their nationalism) this new rendering was attached to material known generally as *lapis nephriticus*. That is, to all intents and purposes, it was one and the same material and accepted as such. We must remember too that the spleen stone was already familiar to Raleigh before the advent of *piedra de ijada*, so it seems likely that this spleen stone was also the established *lapis nephriticus*. *Lapis nephriticus* was the latin literary term that covered two[1] and perhaps many more local terms. When the writer, in 1777, wrote " nephritic stone or jadde " he established the connection clearly. Here therefore these terms part company, from the investigator's point of view. The search now is for *lapis nephriticus*.

REFERENCES

1. See *Journal of Gemmology*, Oct., 1954, page 337.

2. *Investigations and Studies in Jade.* Bishop.

3. i and j for long indicated the same sound. A sound for j seems to be the later one.

4. Georg Forster (1754–1794). *A Voyage Round the World*, 1, 161.

5. Johann Friedrik Cartheuser.

6. It is interesting to note that nearly always the *cure* was effected by the stone's contact with the arm.

7. *Journal of Gemmology*, Oct., 1954, p. 339.

8. The term *jadeite* does not concern us here. It is the word suggested by A. Damour, the well-known mineralogist, after extensive investigation, when he established that two distinct species had been covered by a single term. In a paper by F. W. Rudler, read before the Anthropological Institute of 1891, is the following : " He (Damour) therefore proposed to establish a new species under the name of JADEITE, retaining the old mineralogical term NEPHRITE for the typically Oriental jade."

THE FIRST HALF of the 19th CENTURY

by M. D. S. LEWIS, A.R.C.S., B.Sc., F.G.A., C.G.

IN some respects the years 1800-1850 form the most depressing period in the history of jewellery. Towards the close of the 18th century, design and workmanship had reached their apogee, yet in the short space of fifty years they were almost at their nadir. Nevertheless, the period is of considerable importance since the designation " antique " usually depends on some date associated with this era. In England an article tends to be regarded as such if over one hundred years old, whilst Americans mainly specify 1830 as the qualifying date. Within the half century originated many of those unlovely pieces, on the acquisition of which so many jewellers have expended so much time and treasure.

As far as Western European jewellery is concerned French and English influences predominated. The Italian school of Castellani, Novissimo and Giuliano, which attained such proficiency in filigree and enamel work flourished mainly after 1850. Towards mid-century Viennese jewellery had established a great reputation for fine workmanship and elegance of style, without, however, influencing the trend of fashion.

From the 17th century onwards, there have always been two main classes of jewellery. The "grand" jewellery worn principally in Court circles by the richest aristocracy and on the other hand the " popular " less expensive type of the " bourgeoisie." The former tends to be international showing no great variation from country to country and one must often look to the latter to discern national characteristics.

Three main currents compose the stream of jewellery from 1800-1850, merging, separating, crossing and re-crossing. First, a persistent recurrent return to Gothic and Mediaeval designs. Secondly, a striving after " naturalism "—the exact reproduction in jewellery of insects, boughs, sprays, etc. Often petty and banal in its effect, the full flowering of this tendency falls rather outside the period under review—not until the 1860's, when Massin, possibly the greatest of French jewellery designers, was producing his superb sprays, prototypes of so many elegant patterns which have followed. Thirdly and probably most interesting to us, the typical gold and silver semi-precious* jewellery set with aquamarine, amethyst, topaz, and similar stones, which will always be associated with Victorian England.

The 18th century—age of elegance—came to an end, not in 1799, but with the French Revolution in 1793, when the guillotine claimed the heads which had borne the crowns, the aigrettes and the diadems with such charm and distinction. Every article of jewellery denoting wealth or aristocracy vanished from view, much of it for ever, and the only ornaments dared to be worn were emblems of Republicanism and Equality, such as medallions fashioned from stones of the Bastille and miniature guillotines.

An even worse blow to the art of jewellery, one from which it took nearly a century to recover, was the abolition in 1791 of the title " Master " of the Corporation of Parisian Jewellers. This privilege had imposed on the aspirant an obligation to produce entirely by himself an outstanding article of jewellery in the grand manner. The rigid but beneficial discipline of the 18th century Trade Guild gave way to supervision by the State with the result that apprentices had no longer to learn every aspect of their craft.

The beauty of 18th century jewellery was due, in part, to the fact that it was conceived as an artistic entity, executed throughout by one pair of hands. When later in the 19th century the Guilds were revived in a modified form, the age of specialization had been reached and jewellery manufacture was split into the two main (and often subconsciously opposed) processes of mounting and setting. The mounter produced the metal structure and having done so his interest in the article ceased. The setter received a mount in the design of which he had played no part ; his duty was merely to set securely the stones provided.

With a gradual subsidence of the Terror, the jewellery workshops began to re-open and in the absence of any special impetus, they resumed in the style which had been fashionable before the Revolution. This was the " style Pompadour," the antique classical fashion which had its origin in mid-eighteenth century, when the discovery of the ruins of Herculaneum and Pompeii had evoked an

* (The author prefers to use this term because he considers it suitable for describing these gems. Although much used in Victorian England, it is less used to-day.—Editor.)

intense interest in the culture of ancient Greece and Rome. Enthusiastically endorsed by Madame de Pompadour, beautiful and cultured mistress of Louis XV, it highlights a consistent feature of French jewellery—the influence of the Royal favourite. Diane de Poitiers, who fostered the 17th century vogue for black and white enamel, " La belle Ferronière " who originated the fashion of forehead ornaments, Madame de Sévigné, who gave her name to the series of bow brooches so popular in the 18th century, Madame de Pompadour, Madame du Barry, Marie-Antoinette, the Empress Josephine and lastly the Empress Eugénie—they all crowd into the long line of elegant queens, mistresses or friends, who in capturing the heart of the King, left also an indelible mark on the history of jewellery.

In England there is but one similar instance—Queen Elizabeth I. Her cameo portrait, the centre piece of so many 16th century jewels, is the outstanding feature of Elizabethan iconography, but this was a tribute to her imperial qualities, not to her beauty or leadership in the world of fashion.

In Paris at the turn of the century, the painter David, at the height of his fame and influence and dominating early 19th century French art, was the arch-exponent of the pseudo-classical style. What seemed right and proper, however, against the background of 18th century taste and discernment appears ludicrous in its excess amidst the ruins of the post-revolutionary era.

Women would dress as nymphs and Greek Goddesses wearing three bracelets on each arm, a large breast ornament, big round ear-rings and a multitude of rings in the Roman fashion. A celebrated Parisienne, Madame Tallien, clad in flesh-colour Greek tunic paraded in the Champs Elysées. A doctor wrote satirically, " Nothing is more agreeable than your modern costumes, your Greek tunics, which leave chest and arms uncovered ; nothing is more seductive to your admirers and above all more lucrative for us doctors." From the Journal de la Mésangère came the dolorous announcement that, " Madame X, young, pretty, amiable and rich, died on the 13th of this month for having wanted—contrary to the representations of her husband—to dress herself in the current fashion . . . Mme X is the victim of that deplorable mania for uncovering throat and arms like your Grecians. What is pleasing in Athens is fatal in Paris ; that is what the ladies forget."

Against such a background it was inevitable that the cameo—most classical of ornaments—should become the popular jewel. It was frequently mounted within a border of gold, ornamented by Greek-key motifs which conformed with the current style. Coral, too, now began its fifty years of popularity, perhaps because it was cheap and its employment in jewellery entailed little skill in mounting.

Around 1800 the growing stature of Napoleon began to dominate the Parisian scene. He loved spectacle and entertainment, whilst his Empress Josephine became one of the most extravagant purchasers of jewellery even in the opulent history of the French Court. In six years she was reputed thus to have spent over twenty-five million francs.

Marengo, Austerlitz, Jena, Wagram—a succession of brilliant victories made him the idol of Paris, initiator of a growing era of Court luxury in which he assumed the role of a new Caesar. In the Louvre, the colossal picture by David of his coronation in 1804 must rank as an outstanding historical record of contemporary jewellery. It shows, above all, the veritable passion for cameos which pervaded Paris at this time.

The Empress Josephine, as she kneels to receive her crown from the hands of Napoleon, wears a cameo bracelet over her gloved hand, in contrast to her other most magnificent jewellery. The Queen of Holland wore a belt ornamented by cameos and the two Duchesses in waiting wear diadems set with cameos. The crown of the Emperor was decorated by engraved hard stones and antique cameos.

Except for those pieces surviving from the 18th century, much Napoleonic Court jewellery was opulent and vulgar, mainly flat, lacking in artistry and with coarse heavy settings tending to magnify the size of the stones. Eagles, laurel leaves, imperial devices incorporating the initial " N " were frequent motifs. Bracelets were very popular and worn in pairs, one on each arm. The wearing of a single bracelet is a comparatively recent custom. Tiaras worn unbecomingly low on the forehead were almost *de rigueur*. The original " Laurel-Leaf " Tiara, copied so frequently, made its first appearance from the workshops of Nitot, Napoleon's own jeweller, an allusion, no doubt, to his client's military triumphs.

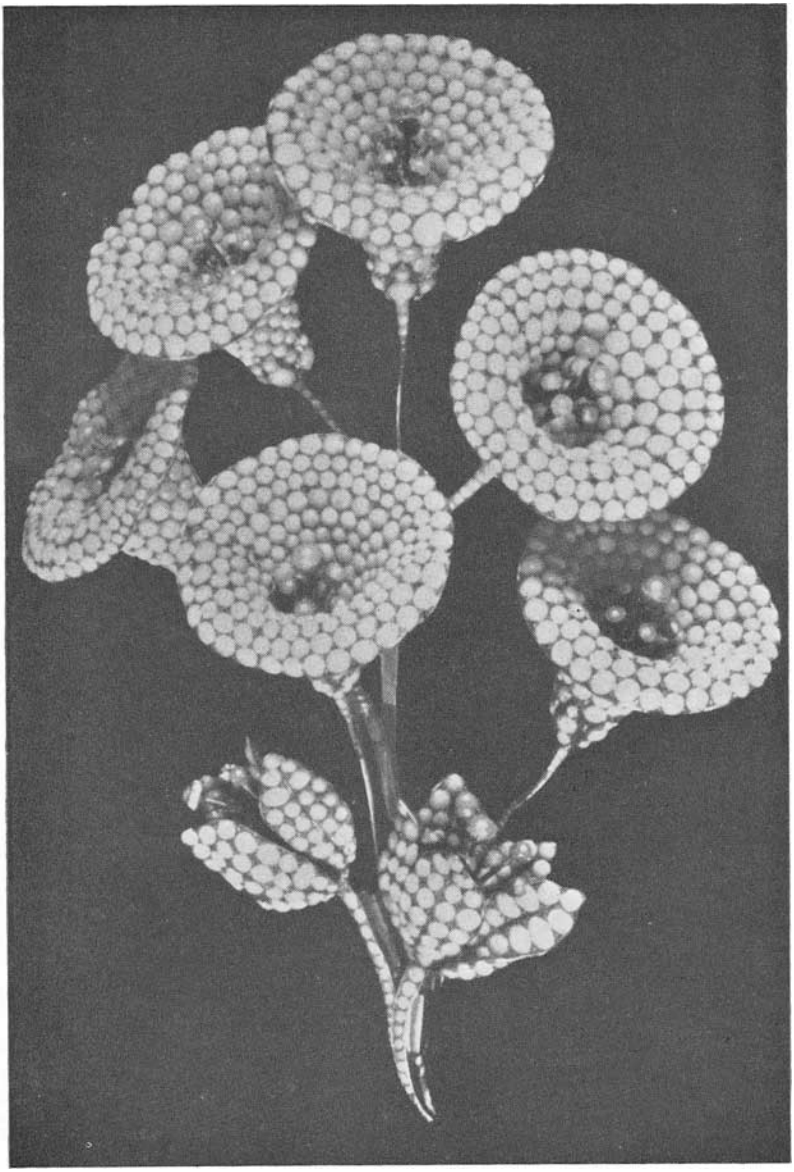
Outside Court circles it was a different story. The bourgeoisie wore little jewellery and that very modest and discreet. Portraits by well known artists, indicating their patrons were wealthy, show little ornament. But in any event the era of Napoleonic luxury was short lived and with Waterloo rising menacingly above the horizon, we must now turn attention across the Channel.

From the Middle Ages to the end of the 18th century, English tastes had followed closely on those of France. In matters of jewellery, England had usually been content to seek guidance from Paris. There were minor exceptions of course, e.g. the manufacture of buckles, in which English makers were pre-eminent, but generally speaking the English fashion was somewhat of a tardy watered-down version of the French. The first half of the 19th century is unique, in that for the first time " le style anglais " was often preferred in France. The ravages of revolution and invasion, from which England remained happily free, could not fail to leave their mark on French art and industry. Throughout the Napoleonic wars England's mastery of the sea enabled her to import great quantities of semi-precious stones—amethysts, topazes, aquamarines—from South America and her early industrialization led her to devise inexpensive methods of manufacture. By the time France had recovered, England had (in certain directions) established a considerable lead, not lost until mid-century.

There is some evidence that the 19th century vogue for gold and semi-precious stone jewellery originated in England. In 1815 the Parisian jeweller, Odiot, sent his son to London to study the new industrial techniques in jewellery manufacture. Dr. Joan Evans attributes English origin to the fashion for " cannetille " in mounting amethysts, topazes, aquamarines and other gems. " Cannetille " is the name applied to those coiled wire pyramidal ornaments which together with matted and filigree wire work formed the standard motifs in so much semi-precious 19th century jewellery.

At first these ornaments were well and attractively made, often in three-colour gold and hand-fashioned mounts, but as the century progressed a growing army of Birmingham tool makers produced a vast number of cheap stampings in the form of standardized ornaments, galleries and collets which facilitated the mass production of the typical " Victorian " jewellery. On the Continent it never attained the popularity enjoyed in England, possibly on account of greater mechanical efficiency here or perhaps because of a higher standard of taste there.

To return to Paris of the Restoration (1815 to 1830), where a totally new order prevailed. Louis XVIII, old and fat, preferring



Convolvulus spray brooch closely set with turquoises French-Circa 1840.

(From the Victoria and Albert Museum, London Crown Copyright)

tranquillity to feasts, now ruled over a restored but impoverished aristocracy and the pendulum had swung to the other extreme. The classical style was dead, David had been banished and prudery pervaded womens attire. Every part of the female form was heavily veiled and a mediaeval Gothic fashion was now adopted. Receiving its initial impetus through the discovery of a new picture of Joan of Arc it was enthusiastically adopted by a Mademoiselle Mars, popular actress, and by la Duchesse de Berry, unchallenged leader of Parisian society. For formal occasions huge jewelled *ceintures* in the mediaeval manner were worn and in the lesser jewellery can now be detected the three principal 19th century characteristics to which earlier reference has been made—bias towards mediaeval and Gothic designs, naturalism and the combination of gold with semi-precious stones.

About 1820 the " Ear of Corn " began to enter jewellery design to remain steadily in favour for many years. In diamonds especially and often in turquoise and gold it seems to predominate in tiaras and sprays of the period. Butterflies were also much in evidence but one of the most characteristic features of early 19th century jewellery was the extraordinary popularity of the serpent. This reptile writhed its way into every article of jewellery—necklaces, belts, bracelets, rings, brooches and ear-rings. It coiled itself around stems of gold and silver fashioned to look like wood and very frequently was depicted, held at bay by a bird defending its nest. If no other role could be assigned, it justified its existence by suspending a heart from its mouth. Occasionally most immense technical skill would be lavished on these ornaments and some perfectly magnificent gold necklaces were made in snake form, in Paris around 1825, fully articulated and superbly enamelled in black and many other colours.

Cameos retained their popularity and were even copied in chocolate with white icing. Coral remained in favour, malachite is characteristic of the years 1820-1840, as were also *sautoirs* and suites of moss-agate. Chains were worn in large numbers to meet the new short-waisted style. The 18th century English fashion of faceted cut steel jewellery was much in evidence. Originally hand cut and polished it was at first surprisingly expensive. A bill rendered to the Empress Marie-Louise specifies 1724 francs for a suite of cut steel comb, chains, bracelets, etc. Even Napoleon's Empress had not disdained such non-precious jewellery. In 1819 a Frenchman—Frichot—discovered a mechanical method of manufacture, causing the price to drop sharply. It is interesting to note that by 1828 a French jeweller—Bernauda—was already using Platinum.

The perennial vogue for mourning jewellery remained strong. The woven hair jewellery, later wrought with such infinite skill by Victorian ladies, had originated much earlier but reached its apogee around 1840. In Paris black jewellery became almost a necessity when, in 1820, the Duc de Berry was assassinated and the city plunged into mourning. This was the heyday of " Berlin Iron-work " jewellery—long necklaces, bracelets and brooches of black cast iron links and medallions in not unattractive patterns. Originally made around 1804 in Germany where in the Napoleonic wars patriots surrendered their gold for the benefit of the Fatherland, the vogue spread to France and much so-called Berlin iron-work jewellery was actually made in Paris to meet the demand. Later, of course, Whitby entered the field and supplied jet jewellery to all parts of the world for half a century. In this it was helped by the long years of mourning observed in Queen Victoria's Court. The beginnings of the Whitby jet industry lie about 1809. By 1850 it was at its zenith and almost extinct by 1870.

The Restoration years had ushered in social changes of great significance in France—impoverishment of the nobility and rise of the commercial class. As in England, this was the seed from which grew the passion for cheap show of gold so characteristic of most of the Victorian era. Gold was the outward symbol of wealth ; the more the better. Wafer thin stampings, leaves springing from nowhere, scrolls and shells designed to give a pseudo-rocaille effect, flat strips of gold contorted into clumsy convolutions, the minimum of work, the maximum of show—these were the hall-mark of mid-19th century " popular " jewellery.

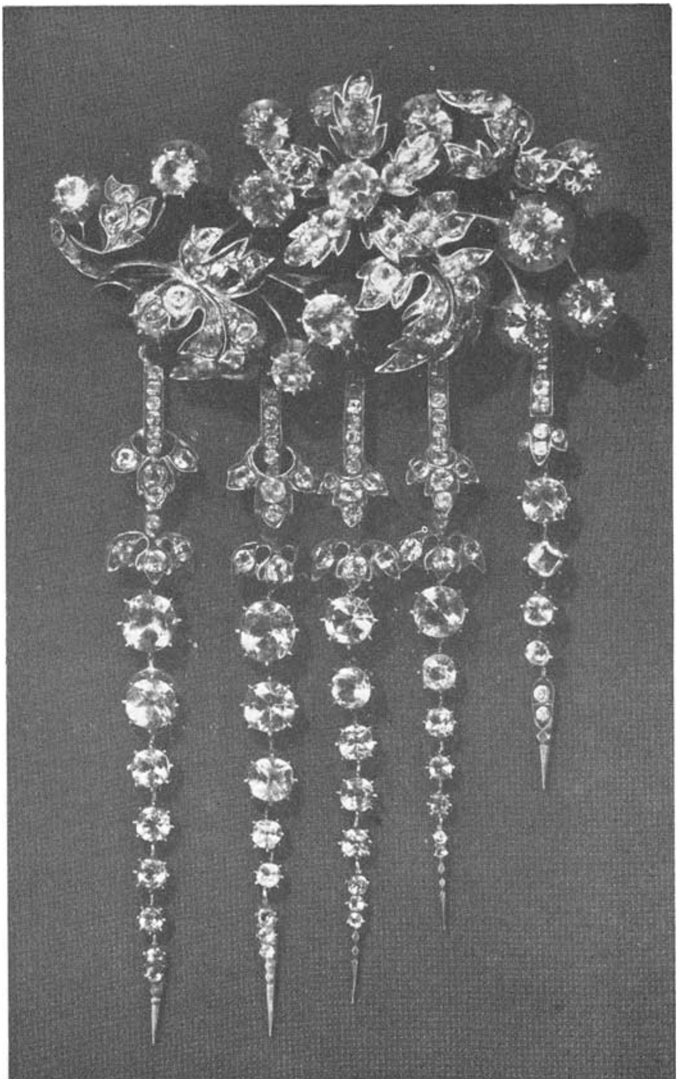
In 1830 with the accession of Louis-Philipe, a new tendency appeared in European art ; it was the beginning of the Romantic age with the pseudo-Gothic as its principal feature. In this, English influence was strong ; the spell of Byron and Scott had spread far beyond these shores into Europe. The fashion for Scotch jewellery, which flourished from 1830 onwards, was eagerly embraced in Paris. Queen Victoria's liking for everything Scottish was not without effect.

The few remaining vestiges of 18th century influence, e.g. very finely pavé-set small pearl and turquoise work on watch cases, now disappeared and generally speaking the period 1830-1848 is one of the least distinguished in jewellery history. There are few records of anything fine produced in the " Louis-Philipe" era; the word " ordinary " is probably the most flattering description which can be applied to the jewellery of this period.

Seed pearl work was very popular, reaching its zenith about 1837. Italian Mosaics and lava cameos depicting scenes of Italian archaeology made their appearance in gold mountings. The English were fast developing their zest for foreign travel and voyagers liked to bring home a souvenir of their continental holidays. This may also account for the continued popularity of coral, the liking for which remained strong until about 1845. Single bracelets replaced the pair always worn hitherto. Enormous buckles at the waist, charms and three similar brooches worn one above the other were very popular.

That most unbecoming of all ornaments—the Ferronière—remained consistently in vogue. This was a jewelled ornament worn on the forehead, in the manner adopted by the subject of Leonardo da Vinci's portrait, " La Belle Ferronière," in the Louvre. At one time this was mistakenly held to be the beautiful blacksmith's wife who became the mistress of King François I of France in his declining years. In a picture of one of Victoria's early courts, the Queen and many of the ladies are seen wearing ferronières.

Chrysoprase and ruby parures were popular about 1830. The typical Victorian pavé-set turquoise work in which small stones were set in rows of geometrical precision may be said to date from about 1835 though manufacture continued through the greater part of the century. Although the design of such pieces is often negligible, the quality of the setting cannot fail to arouse admiration and they constitute one of the minor triumphs of 19th century technique. The strange desire to imitate wood in silver and gold with faithful detail had originated quite early in the century but was now at its strongest. Victorian brooches fashioned like branches of a tree are very characteristic of the period. A more pleasing note is struck by the " Pampille " style of about 1840—cascades of diamond collets, etc. hanging gracefully from a floral ornament. Often such pieces had translucent green enamelled leaves.



Ornament in the " pampille " style, very typical of French jewellery - cira 1840.

(Courtesy Frederick D Meller, London)

Meanwhile a new school of French jewellers was maturing. Led at first by Fauconnier who inaugurated a campaign against

" the English style " its most outstanding product was François Froment-Meurice who dominated European jewellery for some years. He revelled in the pseudo-Renaissance style of sculptured figures, knights in armour, mythical beings, lords and ladies in mediaeval costume. He was the arch-exponent of the Romantic and, as an obituary tribute reveals, also of the Naturalistic style. He did not make much jewellery himself but was a good organizer and businessman and although he probably produced a few " grand " pieces his principal achievement lay in the " pseudo-Gothic " style. He loved the human figure and his chef-d'oeuvre is the Gothic Bracelet depicting scenes from the life of St. Louis, which was particularly acclaimed at the Great Exhibition of 1851. He died suddenly in 1855 at the early age of 53 amidst a chorus of regrets. With typical Gallic fervour Théophile Gautier wrote—" It would be a lengthy task to recount the numerous works which have earned for Froment-Meurice the reputation which he leaves . . . He knew how infinitely to vary the fantastic creations of the world of ornament, where the female springs from the calyx of a flower, where the chimera ends in foliage, where the salamander writhes in a fire of rubies, where the enamelled lizard glides under emerald foliage . . . He would place waves of pearl, coral and mother of pearl under mermaids of silver with hair of green gold ; under the feet of terrestrial nymphs he would put a ground of diamonds, topazes and precious stones. He would combine grape-gatherers of ivory with vine branches of metal and set them in his snuff-boxes . . . He made his " boutique " a glittering Aladdin's cave, the treasure of the Calif Haroun al Raschid, the Wells of Aboulcasem or the Green Vaults of Dresden."

In spite of such enthusiasm the dust of time has settled heavily on Froment-Meurice and his work. Little seems to have survived and if it had, it is very doubtful whether, in spite of greater " antiquity," his jewels would attain the popularity of those by his successors, e.g. Giuliano or Fabergé. Deeply steeped in " Gothicism " the majority of his pieces would lack feminine appeal. The splendid original jewels of Gothic and Renaissance times are one thing ; the pale imitations of 1850 France are quite a different matter. In any case mediaeval and Renaissance jewellery was worn as much, if not more, by men, than by women and as Mr. Clifford Smith remarks, " Ladies have seldom a taste for archaeology." Froment-Meurice was a product of his age—the mediocre era of Louis-Philipe—at whose simple and inelegant court the Queen Amelia never even wore the Crown jewels.

Other prominent jewellers of the period were Christofle, specializing in filigree work, and Dafrique who received technical advice from Gay-Lussac, one of the fathers of modern chemistry. Dafrique was expert in enamel work and revived the quite attractive idea of ornamenting cameos with miniature jewels, e.g. a tiny necklace around the throat of a negress, carved in two colour agate.

The Revolution of 1848 dealt another blow to French jewellery and several jewellers—Marchand, Morel, and others left Paris to work in London. It was not long, however, before the characteristic French resilience re-asserted itself and at the Great Exhibition of 1851 French jewellery exhibits secured sixty per cent of the awards.

This brings us almost to the end of the period under review, but a brief glance of what lay beyond may perhaps be permitted. A period of great brilliance and prosperity lay ahead for French jewellery in the second half of the 19th century. The new Emperor, Louis Napoleon, was determined to give Paris unchallenged leadership in fashion and elegance. In this, he was ably assisted by his beautiful wife Eugénie, who, from the moment she emerged as Empress on the steps of Notre Dame after their wedding, " fairer and more dazzling than the sun," exerted a profound influence on all aspects of fashion. She was a great lover of jewellery—particularly emeralds. She knew when to wear it and when not. Winterhalter's superbly graceful picture of 1855 shows her seated among the ladies of her court, they, all bedecked with jewellery whilst she, the centre-piece, wears no ornament whatever ; beauty unadorned sufficing. The Parisian stage was to be filled by a host of accomplished designers and craftsmen—Lemonnier, Mellerio, Falize, Massin, Viennot, Fontenay, and others. All this, however, belongs to another chapter and a later period. The truest evaluation of the years 1800-1850 is probably to be found in Mr. Clifford Smith's words, " The whole period (19th century) was an eclectic one and the majority of its productions, the result of nothing less than aimless hesitation and fruitless endeavour to revive the forms of the past, display at least doubtful taste."

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Gemmological Abstracts

BURBAGE (E. J.). *Dichroscope exhibited at Haslemere educational museum in England.* Gems & Gemology, Vol. VIII, No. 3, pp. 89-91. Fall 1954.

Describes an ingenious piece of apparatus constructed for exhibitional purposes to illustrate the effect of dichroism to the lay mind. The apparatus consists of a circular opaque disc having a thin radial or diametrical slit containing a strip of polaroid. A dichroic mineral placed behind the disc will show, for slow rotation of the disc, the two dichroic colours separately seen at positions every 90°. On speeding up the disc persistence of vision will ensure that a coloured figure will be produced in the form of a Greek cross. In the actual piece of apparatus the disc was rotated at speed, by a circumferential drive from a small A.C. mains driven motor, for it was rightly considered that more interest would be aroused by a demonstration involving movement. The dichroic plate used, in order to get a uniform field, was not a mineral, but a synthetic red dichroic filter, which showed red and colourless, to which an Ilford medium green filter was bound up, so as to complete the Greek cross. The assemblage was completed by a lamp, a ground glass screen and a low power lens, the whole being cased in a wooden cabinet which embodied the necessary electrical switches and connections.

5 illus. R.W.

SINKANKAS (J.). *The gem and ornamental stone market in Hong Kong to-day.* Gems & Gemology, Vol. VIII, No. 3, pp. 84-87 and 92. Fall 1954. (*Journ. Gemmology Abs.*, Vol. IV, No. 8, 1954, p. 353.)

The second and concluding instalment of this article.

Nephrite is the jade used from the earliest days of Chinese carving. Whitish shades commonly used which necessitate dependence upon excellence of form and deeply incised patterns. As outsides of boulders usually have weathered brownish-red skin this is commonly used to produce colour effects. An intense yellowish-green nephrite is most prized. A dark green nephrite with a blackish cast and somewhat fibrous is used for the largest carvings. It is called "Jasper jade." The Chinese take the view that inferior jade-like minerals are jades in infant stages. "Soochow jade" (a serpentine) is called "New jade" as are other finely granular minerals. "Jasper jade" the name given to dark green varieties of nephrite are considered mere adolescents compared to the final product—*old* jade—the fine grained lighter hued nephrite. Jadeite carvings often lack artistic merit. White jadeite is often seen as eggshell carvings. Coloured variations more common, but jadeite is less reverenced than is nephrite. The wooden bases used to support carvings are accorded the same care and treatment as is the carved piece itself, and the packaging is always in silk covered wooden boxes in which the piece is placed upon recessed cushions. This differs from the Japanese method of packing in which the boxes are without lining. As the result of the Communist domination of the Chinese mainland much wealth has filtered into Hong Kong in the form of all kinds of Chinese art. Some carving is still going on in Communist China. There are no import or export taxes upon gemstones and carvings by the Government of the Crown Colony, yet prices are high and wages are steadily rising. Quoted cost of production compare closely with Japanese and Idar-Oberstein productions. Hong Kong is still a buyers' market but is rapidly reaching a point where its products will no longer be competitive. R.W.

COPELAND (F. O.). *An interesting discussion of an ancient art.* Gems & Gemology, Vol. VIII, No. 3, pp. 93-95. Fall 1954.

Tells the story of one of the few remaining gem engravers in North America, and possibly the only one in Canada. Apprenticed in London (England) the engraver tells the story of the dying industry—dying because no fresh apprentices are coming along to train for the exacting work. Notes on black onyx, the tools used and how the work is done are mentioned in this article written in popular style. R.W.

ANDERSON (B. W.). *A new substitute for lapis lazuli.* Gems & Gemology, Vol. VIII, No. 3, pp. 88-89. Fall 1954.

A further report on the new lapis-coloured sintered synthetic spinel, which was reported in the *Journal of Gemmology* for July (Vol. IV, No. 7, 1954, p. 281). New information is that some specimens of the material are now supplied with specks of " pyrites " which are in fact real gold. Also that the pieces so far seen are cut as seal stones in cut-corner rectangles or as ovals. R.W.

SCHLOSSMACHER (K.). *trans. by* EHRMANN (M. L.). *The origin of gemstones.* Gems & Gemology, Vol. VIII, No. 3, pp. 81-83 and 92. Fall 1954.

A general survey of the origin of gem minerals. Largely a repetition of an article which has appeared in Zeitschr.d.Deutsch.-Gesell.f.Edelsteinkunde. (*Journ. Gemmology Abs.*, Vol.IV, No. 7, p. 315.) R.W.

SHAUB (B. M.). *Notes on the fracturing around zircon and other gemstone inclusions.* Gems & Gemology, Vol. VIII, No. 3, pp. 78-80. Fall 1954.

The author discusses the cause of the so-called " zircon, pleochroic or radio-haloes." The appearance of the haloes is first discussed, and followed by the author's theories. This theory is that the inclusions are usually unstable and revert to an isotropic and amorphous structure (metamict ?), with decrease in density and increase of volume which induces a pressure on the host mineral which cause the cracks (haloes) ; the colour of the cracks being due to alteration products, probably iron, working in along them. The risk of breakage of gems containing zircon haloes is suggested. R.W.

BARBER (R. J.). *The nature of jade (Part II).* Gems & Gemology, Vol. VIII, No. 3, pp. 67-77. Fall 1954. (*Journ. Gemmology Abs.*, Vol. IV, No. 8, 1954, p. 355.)

The second and final instalment of a monograph on jade. This second instalment discusses extensively the geology and mineralogy of the jadeite deposits of Upper Burma. During the rainy season mining is done along the high-bench conglomerate resulting from extensive surface erosion during Tertiary times. This conglomerate contains jadeite boulders. Flood waters of the watershed cut through these beds further sorting the jadeite boulders along the river beds. When rains cease the bedrock outcrops are mined. The succession of rocks, from the surface downwards, at the Tawmaw Dwingyi mines are tabled, and the names given by the Burmese traders to the different types of jadeite are given. Nearly all Burmese jadeite eventually reaches China, either legitimately or otherwise. Of scientific interest is the finding of a small body of jadeite in Nagata province, Japan. The "Oceanic jade," the worked pieces found in many islands of the Pacific, is said to be serpentine and not nephrite. The nephrite found in the South Island of New Zealand is well discussed. The Maori names for the different types are given, as also the geology and mineralogy of the area where the nephrite is found. There is a small find of nephrite reported from the island of Celebes. The sources of jade in the Americas are given, with the historical accounts of the finding of nephrite in Alaska, in British Columbia, Wyoming and California entertainingly written. The problem of the source of the jadeite used for the artifacts found in Central America is discussed. Analyses of these jadeite pieces, which spread from Mexico to as far south as the Amazon, show that they differ from the Burmese jadeite, and that these archeological jades form three distinct groups—the Mexican, the Guatemalan and the Costa Rican. The writer considers that the material used was locally found and gives his reason for so doing. The article ends with a short summary.

8 illus. R.W.

ANON. *Diamonds*. Imperial Institute Commodity Leaflet (*New series*), No. 19.

A four page brochure giving bare facts about diamonds, diamond recovery, marketing and uses. The world yearly output of diamonds is about 18 million carats and the Commonwealth produces about one third of this. The value of the diamonds produced in the Commonwealth for 1952 is tabled. Foreign sources are given. The cause of the South African pipes, and the method of mining for the diamonds which they contain, are told by prose and picture. In the section on alluvial deposits mention is made of the Orangemouth deposits where the diamonds have been washed back from the sea on to the beaches and covered by sand to a depth of some seventy feet. After their long immersion the diamonds had become salt-coated so that they have lost their affinity for grease and require to be reconditioned by treating with fish-oil and caustic soda, or the smaller particle concentrate is treated by electro-magnetic separation. The methods and the styles used in fashioning are given. The last page tells the story of the use of diamonds in industry. The price is 4d. per copy.

11 illus. R.W.

MARCHER (G. H.). *Detection faceted glass gemstones.* Mineralogist (Oregon), Vol. XXII, No. 11, pp. 421-424, November '54.

An article, intended for the amateur, giving those characteristics of glass gems which may be observed by the use of a lens, a pocket knife or a hardness point of apatite. Points to notice are itemized and reasons are given for the causes of such characteristics.

The glass melt, " metal " as it is termed, is stirred with long poles which causes air to be entrapped. Because the air always tends to expand during the heating of the " metal," the bubbles shape themselves into spherical forms. Only synthetic stones show bubbles with spherical forms. Cavities in natural stones are always irregular. Imperfect mixing of the " metal " causes layers of different optical density and show up as irregularly curved lines termed " striae." In the synthetic stones such " striae " would be regularly curved and concentric ; and in genuine stones similar lines would be straight.

Glass gems are made by pressing the molten glass in brass or steel moulds. On cooling the facet edges harden first and the centre of the facets later, these then tend to shrink producing a depressed centre or shrivelling of the centre surface. Cheap grades are left like this, or they may have the table polished on a tin lap, or in better qualities the other crown facets may also be " tin cut." Most frequently the back facets are left just as they come from the mould and definitely indicate the once molten condition. Natural and synthetic stones must always have ground and polished facets, and cannot have shrivelled facets. The girdles of glass imitations will often show where the glass has been squeezed out between the two halves of the mould. In cheap stones this is merely chipped off leaving a glassy edge, or if a better grade may be " fire polished " after being ground off vertically. This effect is not seen in genuine stones.

The body colour of glass imitation stones is always " too good." Idealized colours should always arouse suspicion. Most gemstones, except diamond, zircon, sphene and demantoid, show little prismatic " fire," while the paste gems often show a good degree of dispersion. Hardness testing, using a penknife or a piece of apatite on an inconspicuous corner of the stone is recommended. A note is given on some special glasses, particularly the harder ($6\frac{1}{2}$ Mohs) " hard mass." These stones have little dispersion and are limited to imitations of sapphire and emeralds, but the blue colour is, since the advent of the synthetic sapphire, not often seen, but " hard mass " emeralds are still sold. Such stones are finished all over. It is suggested that a collection of gemstones should be accompanied by an assortment of glass gemstones for comparison.

R.W.

SWITZER (G.). *29th annual report on the Diamond Industry,* 1953. Jewelers' Circular-Keystone, 10 pp.

The report mentions briefly the technological work of J. F. H. Custers and work of the Diamond Research Laboratory of Johannesburg. Artificial coloration of diamonds, improved means of recovering small diamonds and abrasion hardness of diamonds were some of the problems investigated.

Sales of gem and industrial diamonds during 1953 totalled £63,000,000 (£72,000,000 in 1952). World production was approximately 12,100,000 carats, the highest in history. The Belgian Congo continues to be the world's largest producer of diamonds in terms of quantity, although second to South Africa in value. Most of the Belgian Congo output is of industrial use only. S.P.

DAKE (H. C.). *White jade mined.* Mineralogist (Oregon), Vol. XXII, 10 October, 1954, p. 338.

A report of an occurrence of white jadeite at Clear Spring Mine, in the jadeite area of San Benito County, California. S.P.

ALTMAN (J. D.) *Spotlight on Australian Opals.* Lapidary Journal, Vol. 8, 4 October, 1954, pp. 304-312. (*Journ. Gemmology Abs.,* Vol. IV, No. 8, 1954.)

The second part of a short review of Australian opal fields, the problems of mining and future prospects for the industry. After sixty years of opal production no advance in mining technique has been made, and tools similar to those used in the early days are still the main implements. The scarcity of rough opal has caused many to leave the opal fields for more lucrative work, even though there is a great demand for good quality stones. The author suggests that the economic prosperity of Australia has greatly influenced opal production, and that a big immigration programme might help in attracting new adventurers in the opal fields.

S.P.

———— *Australian Opal production.* Mineralogist (Oregon), Vol. XXII (10), October, 1954, p. 346.

A very condensed account of information that has been stated by the author elsewhere. S.P.

Brose (H. W.). *A short history of faceting.* Lapidary Journal, Vol. 8 (4), October, 1954, pp. 314-322; Vol. 8 (5), pp. 446-452.

Greater use of the many works which the author has undoubtedly consulted would have made this brief history of even more value. The faceting of gems is traced to a much earlier period than the often accepted fifteenth century, and the story of Louis de Berquen of Bruges placed in its proper order of events. The author suggests the early 1300's as the probable time of the introduction of facet cutting in Europe, and gives 1870 as the time of its introduction into America, and there it did not become general until the amateur lapidary took it up. S.P.

Webster (R.). *Stichtite—a mineral new to gemmology.* Gemmologist, Vol. XXIII, No. 280, pp. 211-212, November 1954.

The article is actually a report of the Geologist's Association annual meeting and exhibition, held at Chelsea Polytechnic. Among the exhibits were specimens of stichtite both rough and cut as cabochons. Stichtite is an alteration product of serpentine and was first found at Dundas, Tasmania. Other sources are Algeria, the Black Lake district of Quebec and from Rhodesia or Transvaal. The material shown was said to have come from Rhodesia. The material made attractive lilac-coloured cabochons somewhat like lepidolite but without the micaceous spangles of the lithia mica. The data (taken from literature) are given as hardness 1·7, density 2·16 and refractive indices 1·542 for the ordinary ray and 1·516 for the extraordinary ray. The negative birefringence is 0·026. The rough material appears to be somewhat fibrous and of hexagonal symmetry of crystallization. Some luminescent properties are given. The article describes other exhibits, particularly some new gemstones in the collection of the Geological Survey Museum which were on show at the meeting. P.B.

Webster (R.). *Imitation turquoise from the U.S.A.* Gemmologist, Vol. XXIII, No. 279, pp. 190-192, October 1954.

Reports the result of an investigation into the characters of an imitation turquoise presumably made in the United States of

America. Some other data on other imitations of turquoise is given. The U.S.A. specimen was found to have a hardness of $2\frac{3}{4}$, a density of 1·85 and a refractive index of 1·56. The specimen is a good turquoise colour and " veined " convincingly. Chemical tests showed the presence of copper, phosphate and possibly some aluminium. Calcium was not present. No decisive absorption was observed. Luminescent characters are given. Other turquoise imitations mentioned are a " reconstructed turquoise " made from finely powdered ivory stained with copper stain and bonded with cement. " Viennese turquoise " is said to have a density of 2·4 rising to 2·7 after thorough soaking in water ; and an R.I. of 1·45. Other imitations mentioned are stained chalcedony and coloured plastics.

1 illus. P.B.

Meldinger fra Norges Gemmologiske) Selskap. (Journal of the Norwegian Gemmological Association. Vol. 1, No. 1, 1954.

The first issue of a small periodical for members of the Norwegian Association. The main items are abstracts from other gemmological journals. No doubt this new publication will increase in size and make a useful contribution to gemmological literature. S.P.

WESTGAARD (H. R.). *A pocket dichroscope.* Gemmologist, Vol. XXIII, No. 278, p. 169, September 1954.

Describes a method of making a pocket dichroscope using a piece of polaroid so divided as to produce two half circles, each with its vibration directions at 90° to each other. These two half circles are bonded between glass circles and mounted in a pocket lens type holder, which may also incorporate a Chelsea colour filter, and also if desired a 10× lens. *The use of pieces of polaroid suitably oriented had been suggested by Thibault as early as* 1939.

2 illus. P.B.

LEE (H.). *Tests on the bonding of artificial turquoise.* Gemmologist, Vol. XXIII, No. 280, pp. 199-200, November 1954.

The writer has made a more critical examination of the bonding material of the American imitation turquoise reported on by R. Webster. Lee's findings are that the bonding material is a styrenated alkyd. Notes are given on a quick chemical test for such material. The role of the phosphoric acid radicle is discussed.

It may be present as an inorganic phosphate in the general make up or could be used as a catalyst to accelerate polymerization of the bonding material. P.B.

FELDHAUS (F. M.). *Imitation emerald problems in the 16th century.* Gemmologist, Vol. XXIII, No. 278, pp. 174-176, September 1954.

From 1475 the main trades of the medieval town of Nuremburg were controlled by the so-called Ragsamt, which could be likened to the English City Guilds. Some notes made by the clerks of the Ragsamt, and still available, form the basis of the article. The bureau's function was to investigate complaints which, if substantiated, were passed to the police for action. The notes show to what extent control was enforced during these times on gemstones and jewellery. Many of the notes refer to the use of false emeralds and the penalties exacted for using them. Real emeralds were called " smarallen." An idea of the police methods of the time, which closely resemble present day methods, is illustrated by a note of 1581. A thief stole precious stones and jewellery from Steyr Castle. A messenger brought the information to the Magistrate at Nuremburg who had a search made for the stolen goods in the town and he circulated a description of the stolen goods among the artisans (jewellers?) and issued a detailed description of the thief. R.W.

ANON. *Suggestions for a new brilliant cut.* Gemmologist, Vol. XXIII, No. 279, pp. 177-179, October 1954.

Prof. R. L. Parker has critically reviewed the various brilliant cuts and has calculated a new brilliant cut, differing only in the angles and size ratios from other brilliant cuts, and not in a different distribution and number of the facets, as in the King and Magna cuts. The Parker cut has a lower crown in relation to the depth of the pavilion. In percentages of the girdle diameter the height of the upper part is 10·5 ; the height of the lower part is 43·4 ; the total height 53·9 and the table diameter is 55·9. The angle between the plane of the girdle and the crown facets is 25·5°, and between the girdle plane and the pavilion facets 40·9°. A table is given comparing the Parker cut with the Ideal cut of W. F. Eppler, the Tolkowsky cut and the Practical cut of Eppler.

1 table, 1 illus. R.W.

fully considered. Recently a ruby-red synthetic spinel and a schillerized spinel imitating moonstone have been produced. Synthetic sintered spinel coloured by cobalt imitates lapis-lazuli. Data on synthetic spinels are given. Centres of production are named and the series concludes with consideration of synthetic spinel, but no note is mentioned of synthetic strontium titanate.
13 illus. P.B.

HOPKINS (I.). *Gemmologist in Paris.* Gemmologist, Vol. XXVII, No. 328, pp. 211–213, November, 1958.

Discusses a visit to the Paris Mineral Gallery of the Jardin des Plantes and the Mineral Gallery of the Natural History Museum. Many of the beautiful specimens and objects of art seen in these galleries are mentioned.
2 illus. R.W.

POUGH (F. H.). *Hydrothermal ruby crystals.* Gemmologist, Vol. XXVII, No. 327, pp. 179–184. October, 1958.

The article gives a report on the growing by hydrothermal means of crystals of synthetic ruby by workers at the Bell Telephone Laboratories. The method of growth is similar to that used in the synthetical production of quartz crystals by using an autoclave. In the case of the ruby synthesis modifications were made in the autoclave in order to compensate for the higher temperatures and increased pressures (in excess of 30,000 pounds per square inch), and the more corrosive solutions used. The factors needed to give good results are mentioned. The nutrient is a hydrated alumina compound. The seed plates are round discs of Verneuil synthetic ruby cut so that their flat surfaces lie at right angles to the " c " axis, or with the " c " axis at such an angle that the growing crystal would have a rhombohedral face vertical as the crystal grows in the bomb. Pure nutrient produces in an iron autoclave greenish-coloured corundum crystals from iron contamination. The use of a silver lining to the autoclave allows colourless crystals to grow and by the addition of 1/10th of a gramme of sodium chromate to a litre of circulating solution ruby is formed. It is said that these crystals are grown for academic reasons and not for commercial exploitation.
3 illus. R.W.

stone and the spectroscope to cut off the ordinary ray so that the extraordinary ray can be seen alone. The strength of the absorption spectrum depends upon the amount of chromic oxide present, and is strong in the chrome-rich synthetic emerald. Green beryls do not show the chromium lines and therefore the presence of such lines entitle a stone to be called an emerald. The strength of the absorption spectrum will also give a clue to the depth of colour of emeralds " improved " by backing with green-coloured foil.

Other green stones which owe their colour (in part) to chromium and show a chromium spectrum are green fluorspar and certain heat-treated indicolites (tourmalines) and jadeite. Soudé emeralds (quartz and spinel) do not show a chromium spectrum but some green glass imitations do show a "woolly" spectrum, but too indistinct to cause confusion. Some notes on the residual colour seen through the Chelsea colour filter are given.

In alexandrite the three optical directions give different absorption spectra, but only the fast ray (lowest index ; red or purple coloured ray), and the slow ray (green colour with highest R.I.) need concern the worker. The intermediate " beta " refractive index (orange) has too weak an absorption effect to influence the spectrum. The spectrum of the green (slow) ray shows the 6805A doublet and the 6785A line to be most prominent, and other lines at 6650A, 6550A, 6490A, and 6450A are also seen in the red. The broad central absorption approximates from 6400A to 5550A and appears to have two narrower concentrations of absorption within it. There is a complete absorption of the blue and violet as far as 4700A. In the red (fast) ray the doublet is weaker and the 6875A line is now the stronger member, and only two of the lines—at 6550A and 6450A—are seen in the red. The broad absorption band has shifted to 6050A-5400A, accounting for the change of colour, and there is a clear-cut line in the blue at 4720A sometimes accompanied by a weaker line at 4680A. The general absorption of the blue and violet has receded a little to 4600A. The absorption spectrum is stronger for the stones from the Urals than for those emanating from Ceylon. A warning is given that a chromium rich alexandrite can show a spectrum reminiscent of that of a good Siam ruby, and a mistake can be made if the stone has not been first seen in daylight. The fluorescence effects of alexandrite as seen by the " crossed filter " method are also mentioned.

8 illus. R.W.

ANON. *The colourful career of John Mawe.* Gemmologist, Vol. XXIII, No. 278, pp. 157-158, September 1954.

John Mawe, a Derbyshire man, was a mineral and gemstone dealer and collector, who, in 1823, had a shop at 149 Strand. He travelled extensively and suffered many privations, especially in South America where he caught yellow fever and was also thrown into jail. He was a member of the Mineralogical Societies of London and Jena and was a prolific writer. His books include : *The Mineralogy of Derbyshire*, published when he was 38, *Travels in the interior of Brazil* ; *Familiar Lessons in Mineralogy and Geology* ; *Instructions for the management of the blow-pipe, chemical tests, etc.* ; *A descriptive catalogue of minerals* ; *A treatise on diamonds and precious stones* ; *A description of the lapidary's portable apparatus for cutting, setting and polishing crystal, jasper, agate, chalcedony and precious stones*, and also two books on conchology. R.W.

MITCHELL (R. K.). *Some further notes on hypersthene-enstatite.* Gemmologist, Vol. XXIII, No. 280, pp. 195-6, November 1954.

The similarity between the hypersthene-enstatite and brown kornerupine is discussed, with particular attention to the absorption spectra shown by the two stones. It is suggested that the 5060A line seen in the enstatite is not seen in kornerupine. The question of the twinning, previously mentioned by L. C. Trumper, is also discussed. R.W.

GEOBELER (H.). *Eine kleine Betrachtung zur Atomphysik anlasslich unserer Besichtigung des Max-Planck-Instituts in Mainz. Notes on atomic physics on the occasion of a visit to the Max-Planck Institute at Mainz.* Zeitschr.d.Deutsch.Gesell.f.Edelsteinkunde, No. 9, 1954, pp. 5-7.

A brief restatement of events leading to our present knowledge of atomic physics. At the end of the article there is mention of the potential impact of nuclear physics on gemmology. The cyclotron allows acceleration of alpha particles, protons and deuterons, with a present maximum energy of 400 million electron-volts. Diamonds bombarded in this way turn green after 5-8 minutes and are strongly radio-active for about one hour. Further bombardment causes a deep brown colour. E.S.

BAMBAUER (H. U.) : SCHMITT (K. H.). *Lapis-Lazuli-farbiger synthetischer Spinell. Lapis-lazuli coloured synthetic spinel.* Zeitschr.d.Deutsch.Gesell.f.Edelsteinkunde, No. 9, 1954, pp. 7-11.

This article is essentially the same as in Gold und Silber, No. 7-8, 1954, pp. 13-14, and abstracted in the *Journ. Gemmology*, Vol. IV, No. 8, pp. 349-350. E.S.

SCHÜTT (E.). *Die Theorie der Perlenuntersuchung mit Rontgenstrahlen. The theory behind the determination of pearls with X-rays.* Zeitschr.-d.Deutsch.Gesell.f.Edelsteinkunde, No. 9, 1954, pp. 11-16.

Cultured and genuine pearls consist mainly of crystallized calcium carbonate ($CaCO_3$), in the modification known as Aragonite. This is a rhombic crystal with a strong inclination for twinning, which at times can simulate hexagonal symmetry. Small crystals too which are not twinned, can show approximately a sixfold symmetry. Mother-of-pearl, as well as pearl itself, consists of innumerable minute scaly crystals which are orientated in a uniform fashion and cemented together by the organic conchiolin. In pearls, the tables of the crystals are all at right angles to the radii of the spherical pearl. A genuine pearl is thus built up of concentric shells. The author points out the differences between natural and cultured pearls and describes X-ray equipment used at the Idar-Oberstein Gemmological Institute and also the three methods employed.

(1) The fluorescence method is based on the fact that the beads in cultured pearls are mostly made of fresh-water mother-of-pearl, which has a greenish or bluish fluorescence (owing to its manganese content) when excited with X-rays. This fluorescence can be observed through a thin skin of a cultured pearl or through the hole of a drilled pearl. The human element in observation plays a large part in this method.

(2) X-ray radiography produces shadowgraphs which are in principle familiar from the medical application. During exposure the pearls are three-quarters immersed in carbon tetrachloride. The interpretation of the radiographs is sometimes difficult.

(3) X-ray diffraction allows definite determination. Genuine pearls always cause a " hexagonal " diffraction pattern

owing to the orientation of the aragonite scales. Cultured pearls may cause a similar pattern, when the layers of the mother-of-pearl are appropriately orientated in relation to the X-ray beam. When, however, the cultured pearl is then rotated through 90 deg., a four-fold symmetry will be revealed in the diffraction pattern. Thus a " hexagonal " pattern in the first instance calls always for a second exposure. The exposure time of 1 to 1½ hours for diffraction patterns has been reduced to 5 to 15 minutes by placing behind the film a foil (" Safirfolie," used in medical radiography) which emits blue and ultra-violet light when excited by X-rays. The additional light blackens the film from the back in those places which are already exposed to X-rays from the front. E.S.

BOOK REVIEWS

SELWYN (A.). *Retail Silversmith's Handbook.* 240 pp., 89 illus. (Heywood & Co. Ltd., 1954). 25s. net.

This companion volume to the late Arnold Selwyn's " Retail Jeweller's Handbook " should be welcomed by all engaged in the retail jewellery and silverware trades. It deals with silverware of all kinds, for the table, for personal use and presentation. It commences with chapters on these items and then deals with the metals used and the processes of manufacture.

It would have been helpful if the chapter order had been reversed, for the beginner is confronted with terms in the earlier sections, which are not explained until later in the book. This criticism apart, the book caters admirably for all interested in the craft of silversmithing, and the final chapters on the retailer's shop and his customers add emphasis to the title. S.P.

WALTON (J.). *A pocket chart of ornamental and gemstones.* Sir Isaac Pitman & Sons Ltd., 73 pp., December 1954, 12s. 6d.

Although this publication is referred to on the jacket cover as likely to be an assistance to jewellers, lapidaries, antiquarians and gemmologists, it is probably the latter, especially the gemmological student, who will find it of help in the course of studies or for subsequent work when more knowledge has been acquired.

The main basis of the chart is the grouping of the various gem species under their different colours, for as the author rightly contends, many engaged in the jewellery trade often rely on identification by colour in the first instance. The stones in each group are then listed according to their refractive indices. Characteristics observed with a lens or microscope are amongst those recorded and have had to be made extremely brief. This is a pity, for the records, though helpful, are in some cases tantalizingly inadequate. One could have wished for the shapes of some of the " small crystals " and " crystal inclusions " to have been indicated. The filter used should have been indicated.

Absorption Spectra are recorded by lines or shadings and for the student gemmologist this method is generally to be preferred to the use of numerals.

The chart is really suitable for the pocket, a virtue which other books with similar claim have not possessed, and the data which the author has painstakingly collected should prove of help to the gemmologist who prefers his facts in condensed form. S.P.

MARYON (H.). *Metalwork and Enamelling.* 331 pp., 33 line drawings and other illustrations, 29 plates. Chapman and Hall Ltd., London, 1954. Price 36s.

This is the third (revised) edition of a valuable work which was first published in 1912. It is understandable that this standard work should have been reprinted. The scholarship and care in writing that characterized the first edition has been maintained and, in bringing it up to date, the author has been careful to emphasize that the methods described are those that have been used by himself and thoughtful enough to repeat the invitation of the first edition to those with other knowledge to communicate with him.

There is very little to criticize—the materials and tools used in soldering (there are comprehensive chapters), raising, chasing, spinning and casting of metals, polishing and enamelling, and the care and maintenance of tools are adequately considered. At the end there are various and very useful tables and standards. [In one of these the standard mark used by the London Assay Office for Britannia quality silver has incorrectly been given as " à lion's head erased and figure of Britannia," whereas London used the lion's head as its town mark for this quality.] The bibliography could have been added to, for there are several useful works unrecorded. These, however, are very minor points and this new publication should appeal to the craftsman, student, and all interested in goldsmiths' and silversmiths' work.

S.P.

INTRODUCTORY BIBLIOGRAPHY on OPAL

Mr. Frank Leechman, who was recently awarded a research diploma for his work in connexion with the cause of colour in opal, has prepared the following introductory bibliography on opal as an aid to others who may be interested in the literature on the subject.

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KREJIE & OTT ...	Phosphorescence of opal. *Zeit. Krist.* 88 : 260	1934

NEW METHOD of DETERMINING SPECIFIC GRAVITY

by J. HAMMES, F.G.A.

IN the gemmological literature, at least of the last seven years, I have found the following methods for the determination of the specific gravity of gemstones :

(*a*) direct measurement of weight and volume.

(*b*) measurement of the *volume* of displaced fluid.

(*c*) measurement of the *weight* of displaced fluid (hydrostatic weighing).

(*d*) the use of heavy liquids.

I am really convinced that we do not need more methods than the now existing ones and the intention of this article is by no means an attempt to fill a scientific hiatus. This new method came into my mind and I considered it useful to bring this method to the attention of gemmologists. This method has principally much resemblance to the well-known method of mixing two fluids till the gemstone remains just suspended in the liquid and determining the specific gravity of this liquid by means of the Westphal balance. But my method does not require the use of the expensive Westphal balance because I need only a pipette and a burette, two cheap articles.

The reader will know that the chemist determines the acidity of a solution usually in a volumetric way by titrating the solution with an alkaline solution of definite strength. He then always uses an indicator—for instance lacmoid, methyl orange or phenolphthalein—which indicator shows a change of colour at the right neutralization point. This first suggested the idea to me, that it must be possible to determine the specific gravity of a gemstone in a titrimetric way, using the gemstone itself as an indicator.

This titrimetric determination can be done for gemstones which have a specific gravity of 3·33 or lower in the following way.

Pipette (or, more accurately, measure off by means of a burette) 20 ml methylene iodide into a 50 ml Erlenmeyer conical flask and add the gemstone to be tested. A burette is filled with toluene with a specific gravity of 0·8687. Now we add with the aid of this burette toluene drop by drop with constant shaking, until the gemstone passes from the floating to the suspended state. This end point of the titration can be determined with the exactness of one drop (that is 1/20 ml). After reading off the number of ml of toluene used we can look up in the diagram directly the specific gravity of the gemstone, exact to the second place of decimals.

Properly speaking I determine titrimetrically the volume-ratio of methylene iodide to toluene in the mixture, wherein the gemstone to be tested remains suspended and I read off the specific gravity of this mixture in the diagram. For I have calculated the line *a* in the diagram as the relation between the specific gravity of the gemstone and the number of ml to toluene used, so that after the titration I can read off directly the specific gravity of the gemstone on line *a*.

I have calculated line *a*, assuming a temperature of 15°C., and titrating with a quantity of 20 ml methylene iodide. Thus I used the formula :

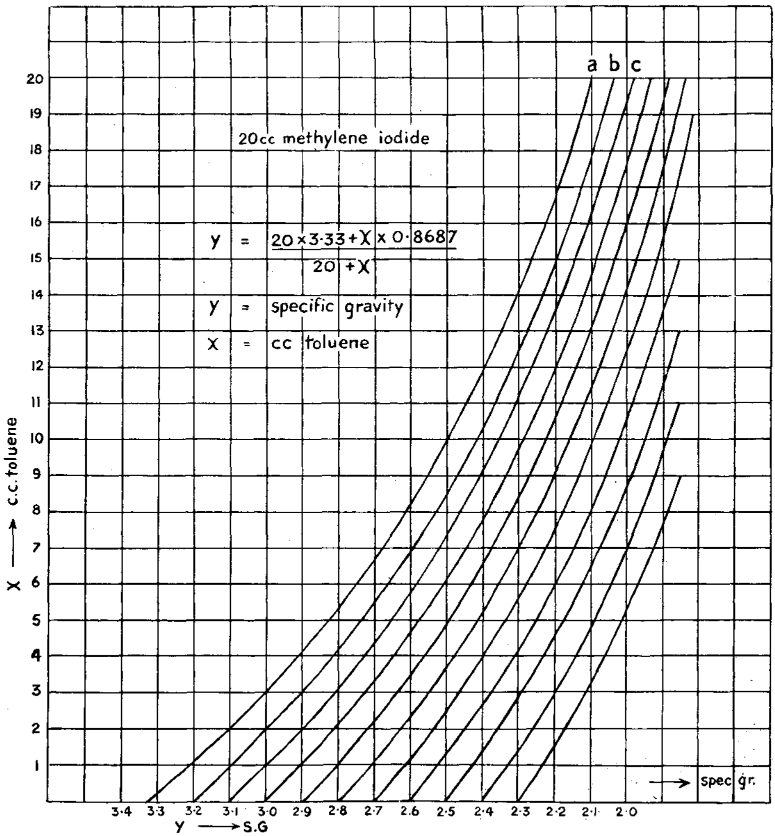
$$Y = \frac{20 \times 3{\cdot}33 + X \times 0{\cdot}8687}{20 + X}$$

where :

Y = specific gravity of the gemstone.
X = number of ml toluene necessary to bring the stone to suspended position.
3·33 = spec. gravity of methylene iodide at 15°C.
0·8687 = spec. gravity of toluene at 15°C.

In order to avoid being able to use the 20 ml methylene iodide, which we need for the determination, only once, I have calculated and placed in the diagram other lines, starting from mixtures of methylene iodide and toluene with specific gravities of 3·1, 3·0, 2·9, etc. This I have done with the following purpose.

Say, we have done a titration and needed therefor 2 ml toluene. Then we read off on line *a* a specific gravity of the gemstone of 3·10. This figure is then also the specific gravity of the mixture after the titration. We can now use this mixture again as starting fluid for the determination of the specific gravity of a



gemstone, which is 3·1 or lower. Only in this case we have to take our reading after the titration on line *c* of the diagram.

For the rest it is always easily possible to bring the used mixture to a higher strength by evaporation " au bain marie " or by fractional distillation, because of the great difference in boiling temperature of methylene iodide (180°C.) and toluene (111°C.).

As I already mentioned before, the line *a* is only right at a temperature of 15°C. Now Herbert Smith indicates in his handbook[1], mentioning the Westphal balance on page 114, that " the density of all liquids is somewhat seriously affected by changes in the

1 *Gemstones.* G. F. Herbert Smith, Methuen, 1952.

temperature." Therefore I have checked the influence of the temperature on the determination of the specific gravity with my method. Assuming that the temperature at which the determination will be done maximally will lie between 10° and 20°C., this problem is confined to the question what is the influence of 5°C. upwards or downwards.

Therefore I needed tables of specific gravity of methylene iodide and toluene at temperatures between 10° and 20°C. I found the table for toluene in Webster's *Gemmologists' Compendium*, page 223 :

Temp. C.	*Density of toluene*
10	0·8737
11	0·8727
12	0·8717
13	0·8707
14	0·8697
15	0·8687
16	0·8677
17	0·8667
18	0·8657
19	0·8647
20	0·8637

This table shows that the density of toluene regularly diminishes by 0·001 per degree Centigrade.

I quote the table for methylene iodide from Timmermans, *Physical chemical constants of pure organic compounds :*

Temp. C.	*Density of methylene iodide*
10	3·3478
11	3·3451
12	3·3425
13	3·3398
14	3·3372
15	3·3345
16	3·3328
17	3·3293
18	3·3265
19	3·3239
20	3·3212

Here also is a regular diminishing of the specific gravity of 0·0026 to 0·0027 per degree Centigrade. There is however in this table an irregularity at the temperatures 16° and 17°C. I suppose that at these temperatures a false determination has been done or there are some misprints in the table. In any case I must assume that the specific gravities in this table at 16° and 17°C. are wrong.

The right table must therefore be as follows :

Temp. C.	*Density of methylene iodide*
10	3·3478
11	3·3451
12	3·3425
13	3·3398
14	3·3372
15	3·3345
16	3·3319
17	3·3292
18	3·3266
19	3·3239
20	3·3212

so that the specific gravity regularly diminishes by 0·0026 to 0·0027 per degree Centigrade, as this regularity is normal for fluids.

With the help of these tables I have calculated at different temperatures the specific gravities of the liquid-mixtures, which are produced by mixing 20 ml methylene iodide with different quantities of toluene. The result is as follows :

ml toluene	*density of mixture*					
	10°C	11°C	12°C	13°C	14°C	15°C
1	3·2300	3·2274	3·2248	3·2222	3·2197	3·2171
2	3·1229	3·1203	3·1179	3·1153	3·1129	3·1103
3	3·0251	3·0226	3·0202	3·0177	3·0153	3·0129
4	2·9354	2·9330	2·9307	2·9283	2·9259	2·9235
5	2·8530	2·8506	2·8483	2·8460	2·8437	2·8413
6	2·7769	2·7745	2·7723	2·7700	2·7678	2·7655
7	2·7063	2·7041	2·7019	2·6997	2·6975	2·6952
8	2·6409	2·6387	2·6365	2·6343	2·6322	2·6300
9	2·5800	2·5778	2·5757	2·5735	2·5714	2·5693

10	2·5231	2·5210	2·5189	2·5168	2·5147	2·5126
11	2·4699	2·4678	2·4658	2·4637	2·4616	2·4595
12	2·4200	2·4179	2·4159	2·4139	2·4119	2·4098
13	2·3731	2·3711	2·3692	2·3671	2·3652	2·3631
14	2·3290	2·3271	2·3251	2·3231	2·3212	2·3192
15	2·2875	2·2855	2·2836	2·2816	2·2797	2·2777
16	2·2482	2·2463	2·2444	2·2424	2·2405	2·2386
17	2·2111	2·2091	2·2072	2·2053	2·2035	2·2016
18	2·1759	2·1739	2·1721	2·1702	2·1684	2·1665
19	2·1425	2·1406	2·1388	2·1369	2·1351	2·1332
20	2·1108	2·1089	2·1071	2·1052	2·1034	2·1016

ml toluene	*density of mixture*					
	15°C	16°C	17°C	18°C	19°C	20°C
1	3·2171	3·2146	3·2120	3·2093	3·2068	3·2042
2	3·1103	3·1079	3·1054	3·1026	3·1003	3·0978
3	3·0129	3·0105	3·0081	3·0055	3·0031	3·0007
4	2·9235	2·9212	2·9189	2·9164	2·9140	2·9116
5	2·8413	2·8391	2·8368	2·8343	2·8321	2·8297
6	2·7655	2·7632	2·7610	2·7586	2·7564	2·7541
7	2·6952	2·6930	2·6908	2·6885	2·6863	2·6841
8	2·6300	2·6278	2·6257	2·6234	2·6213	2·6191
9	2·5693	2·5671	2·5650	2·5628	2·5607	2·5585
10	2·5126	2·5105	2·5084	2·5062	2·5042	2·5020
11	2·4595	2·4575	2·4555	2·4533	2·4513	2·4492
12	2·4098	2·4078	2·4058	2·4037	2·4017	2·3996
13	2·3631	2·3612	2·3592	2·3571	2·3551	2·3531
14	2·3192	2·3172	2·3153	2·3132	2·3113	2·3093
15	2·2777	2·2758	2·2739	2·2719	2·2700	2·2680
16	2·2386	2·2367	2·2348	2·2328	2·2309	2·2290
17	2·2016	2·1997	2·1978	2·1959	2·1940	2·1921
18	2·1665	2·1647	2·1628	2·1609	2·1590	2·1571
19	2·1332	2·1314	2·1296	2·1276	2·1258	2·1240
20	2·1016	2·0998	2·0980	2·0961	2·0943	2·0924

This table proves that the influence of the temperature on the determination of specific gravity with the titrimetric method is much smaller than the remark of Herbert Smith would make us think. For this influence is at a difference of temperature of even 5°C. not more than 0·01 on the result.

From this we can conclude that we can determine the specific gravity of a gemstone with the titrimetric method easily exact to the second place of decimals.

I agree with Prof. Schlossmacher when he writes in his books, *Leitfaden für die exakte Edelsteinbestimmung*, on page 15, that in practice the determination of the first place of decimals will do for the discrimination of a gemstone, because firstly the specific gravity of a mineral is not fully constant but changes with the composition and inclusions, and secondly because to a certain specific gravity only a very limited number of gemstones can belong.

From this we can conclude that the only slight deviation that can be caused with this method by a little difference in temperature cannot be a reason to reject my method.

From the diagram it can be seen that the line is steeper the more ml toluene are added. Thus every next droplet gives a smaller diminution of the specific gravity. Here we have a difference with the titration of an acid with an alkaline solution. In that case we may start the titration by turning the tap of the burette on full and only just before the end of the titration we add droplets until the exact point of colour-change of the indicator. But with the titrimetric method of determining the specific gravity of gemstones we must just start with droplets of toluene, whereas on the contrary at the end of the titration one or two droplets more or less have not so great an influence on the result.

In the above-mentioned considerations I assumed that no contraction takes place by mixing methylene iodide and toluene. And that indeed will not be the case.

After writing this article I came upon a book, which is the latest publication about specific gravity determinations of minerals, namely E. M. Bonstedt-Kupletskaja, *Die Bestimmung des specifischen Gewichtes von Mineralien*, 1954. In this book many methods for the determination of the specific gravity of minerals are described, but the titrimetric method is not mentioned, so that I can assume that my method is a new one.

It is self-evident that checking the specific gravity of the fluids used is advisable. This can be done by pycnometer-method or by means of the Westphal balance. By titrimetric determination of a stone of known specific gravity (viz. quartz) the specific gravity of the fluids used can also be checked.

There is further a possibility of determining the specific gravity of stones with a specific gravity higher than 3·3 by this method. In this case we must combine the stone with a piece of plastic of known volume and weight[2]. We can for instance fasten the stone in a clamp of plastic and then determine the specific gravity of the combination. A short calculation is then necessary :

When :

V_c = volume of plastic clamp.
W_c = weight of plastic clamp.
V_s = volume of gemstone.
W_s = weight of gemstone.
S_s = specific gravity of gemstone.
S_t = specific gravity of fluid-mixture in which the combination remains suspended.

then we have the following formula :

$$S_t = \frac{W_c + W_s}{V_c + V_s}$$

hence

$$V_s = \frac{W_c + W_s - S_t . V_c}{S_t}$$

or

$$S_s = \frac{W_s}{V_s} = \frac{W_s . S_t}{W_c + W_s - S_t . V_c}$$

I do not pretend the titrimetric method for the determination of the specific gravity of gemstones is an improvement of one of the existing methods. It is only another and new method.

2. In 1889 Retgers applied hooks of glass to determine, with the method of heavy liquids, the specific gravity of minerals with s.q. higher than the fluid, but glass hooks are breakable and not elastic and plastic was not yet invented. (Bonstedt–Kupletskaja, p. 53).

ASSOCIATION NOTICES

PRESENTATION OF AWARDS

The recently elected President of the Association, Sir Lawrence Bragg, F.R.S. was welcomed by the Chairman and Vice-Chairman to the reunion of members, which preceded the presentation of awards, at Goldsmiths' Hall, Foster Lane, London, E.C.2, on 20th October. The reunion was attended by nearly a hundred members and subsequently, when they were joined by diploma winners and their friends, a large number assembled in the Livery Hall for the presentations.

Mr. F. H. Knowles-Brown, the Chairman, welcomed the members, especially those who were to receive diplomas. He hoped they had a sense of pride and achievement because the passing of the examination and winning a diploma was something of merit and note.

For over 40 years the Council had aimed to maintain the standard of examination and keep it at a high level. That was not always easy, but it was a policy which had been justified. Wherever one went it would be found that the diploma of the Association was held in very high regard. Mr. Knowles-Brown said he hoped also that they would regard their success as a milestone and not as an end. They would then derive a good deal of pleasure from what they learned by experience and further study.

He also welcomed Sir Lawrence Bragg who was a man of great international fame as a scientist, and a specialist in crystallography. They were honoured by his Presidency, which was almost a family affair, for his father, Sir William Bragg, was previously their President.

Sir Lawrence then presented the diplomas and prizes. He went on to thank the Association for asking him to be President. He appreciated the honour because his father had been President for five years—until his death in 1942—and another of his friends, under whom he learnt much, Sir Henry Miers, had also been President. He hoped that the winners of the awards would have a successful career in which they would use the knowledge they had obtained. Examinations might be loathsome things, even for the examiners, but there must be some form of assessing, some hurdle, some mark of distinction which measured attainment.

The President went on to speak of the advances that had been made in the study of crystals since the time when his father was President, and even earlier. This study had been begun by his father and himself about forty years ago. Then they studied the crystals of minerals which had been made in nature's workshop. The object then was to find out how the atoms were arranged and they worked from simple specimens. It was strange that only nature could make crystals of simple substances, which a chemist could not do. He could only give complicated structures. The simple ones seem the hardest of all to make. Later we looked for more complicated crystals and found them in the silicates. As so often happened in research, looking for one thing another was found. They were trying to find the pattern of atoms by X-ray and discovered instead the key to the way in which the silicates—and that meant the greatest part of the earth's crust—were built up.

They had running through them a common plan. The mineralogist had divided them into certain families. They were all built into a geometrical plan and could be explained simply by geometry. How pleased the Greek philosophers would have been at this substantiation of their theories, commented Sir Lawrence. In this way they got towards the outline of a blueprint of structure, as it were. Once the key silicate structure had been worked out, one could see that the fact of the world cooling down had to produce rocksalt, mica, and so on.

The reason why they tried to analyse the structure was to gain an insight into why nature had built them up in this particular way to do the job they did.

In simple chemistry one did not have to worry about geometry, but in molecules with sixty atoms one way and forty the other, geometry was everything. With such knowledge one could also begin to understand the action of vitamins or poisons and how they were introduced into and altered the structure. Now, he thought, the secret had been gained of how to apply x-ray analysis to these large molecules. Their mere size gave certain advantages. Tricks could be played with them. They could, as it were, attach marker atoms that could move in and out of the crystals. Having once learned the trick of using mercury atoms as markers he thought that there would be a lot of other marker atoms that could be used, such as chlorine and iodine, that would reveal a lot.

Sir James Walton, the Vice-Chairman, thanked Sir Lawrence for his very interesting talk, and added his congratulations to the winners of awards.

HERBERT SMITH MEMORIAL LECTURE

To commemorate the introduction 50 years ago of a portable refractometer for the testing of faceted gemstones devised by the late Dr. G. F. Herbert Smith, the Association has arranged for a lecture to be given by Mr. B. W. Anderson, B.Sc., F.G.A. entitled " The refractometer and other methods of measuring the refractive indices of gemstones."

The lecture will be given at the Hall of the Medical Society of London, Chandos Place, London, W.1. on Wednesday, 30th March, 1955, at 7 p.m.

COUNCIL MEETINGS

At a meeting of the Council held at 19-25, Gutter Lane, London, E.C.2. on 12th October, 1954, the following elections to membership took place :—

Fellowship

Judith Banister, London ... D.1954
Werner Bolli, Lucerne ... D.1954
Frederick A. Bowden, Plymouth D.1954
Leslie T. Boxall, Richmond D.1954
Alan C. Jackson, Greenford D.1954
Jeffery P. Solomon, Plymouth D.1954
Godehard A. H. Lenzen, Hamburg D.1954
Wilfred Marsh, London ... D.1954
Sigurd G. Olsen, Bergen ... D.1954
Jack Shearman, Barnehurst D.1954
Arthur H. Walker, Bournemouth D.1954
Malcolm H. Webb, Maidstone D.1954
Pieter C. Zwaan, Leiden ... D.1954

FELLOWSHIP, TRANSFERRED FROM ORDINARY AND PROBATIONARY MEMBERSHIP

Neville Deane, Wednesbury D.1954
Claus Bender, Koln ... D.1954
Gwendoline V. Furness, Reading D.1954
Malcolm E. Wilson, Croydon D.1954
Elizabeth D. Wines, London D.1954
Dorothy Burnett-Ham, London D.1954
Richard D. Buttermore, Parkersburg D.1954
John E. Campion, Plympton D.1954
John S. Harper, Birmingham D.1954
Ronald G. Kell, London ... D.1954
Bapusaheb S. Mahajan, Bombay D.1954
Arthur St. G. Showers, Hong Kong D.1954
Noel J. Sutton, London ... D.1954
Sidney F. Watts, Birmingham D.1954

ORDINARY

Frank S. Azzopardi, Malta
Walter R. Burley, London
Jean W. Dubois, Hong Kong
Ronald E. Muir, Wilmslow
Frederick H. R. Parkes, Brierley Hill
Winifred M. Rankine, Farnham
William H. M. Phillips, Ross-on-Wye
John A. Clark, Forfar

PROBATIONARY

John S. Brown, Seaham
William J. Pearce, London
Anthony J. Sibley, West Wickham

The Council continued its discussions on matters arising from the examination results. The examiners emphasized that their aim was to endeavour to ascertain whether students had a real understanding of the subject and stressed that it was desirable to maintain the examinations at their present high level. The Chairman, in summing up the discussions, felt that the problems that had arisen were fundamentally concerned with teaching, a matter over which the Council did not have jurisdiction, apart from its own correspondence courses.

MEMBERS' MEETINGS

Midlands : The 3rd annual general meeting of the Midlands Branch of the Association was held in Birmingham on 30th September, 1954. The retiring Officers and committee were re-elected to serve for a further year. A gemmological exhibition in the autumn is to be the main feature of the Branch's programme this year, and it will be held under the auspices of the City of Birmingham Museum and Art Gallery Committee and the City Council.

East of Scotland : A meeting of the Branch was held on Thursday, 28th October, 1954, when a demonstration of the making of silverware was given in the workshops of Messrs. Hamilton & Inches, Jewellers & Silversmiths of Edinburgh.

London : A colour film " Diamond is forever," which deals with the mining and production of diamonds in South Africa, was shown to members in the London area on November 11th, 1954. The programme also included films on the precious metal, palladium, and horology.

GIFT TO ASSOCIATION

The Council of the Association is greatly indebted to the Gemological Institute of America for providing back number's of the Institute's quarterly publication "Gems & Gemology." The gift will enable the Association to maintain bound volumes of all issues.

OVERSEAS VISITORS

During November 1954, the Association were glad to see Hans van Starrex, of Ceylon, a Fellow who qualified in 1933. M. J. Porter, of India (Diploma 1947) on a visit to the U.K., has also called.

TALKS BY MEMBERS

BLYTHE, G. : *Gemstones*, Young Wives Guild, Leigh on Sea, 2nd November, 1954.
LEAK, F. : *Diamonds*, Knowle West Men's Contact Club, Bristol, 12th October, 1954. *The Science of Jewellery*, Toc H Women's Association, Fishponds, Bristol, 2nd November, 1954. *Ibid*, Knowle Literary & Debating Society, Bristol, 8th November, 1954. *Pearls*, Bristol West of England Jewellers Association, 8th November, 1954. *The Science of Jewellery*, H.M. Prison, Falfield, 8th December, 1954.

ASSOCIATION REQUIREMENTS

The Association wishes to acquire the following books for its library :—

Eppler, W. F. Die Schmuck und Edelsteine. 1912.
Liesgang, R. E. Die Achate. 1915.
Cattelle, W. R. The Pearl. 1907.
Kunz, G. F. Rings for the fingers. 1917.
Cormack, M. B. First book of stones. New York.
Hershey, J. W. Book of diamonds. New York.
Krauss, F. Synthetische Edelsteine. 1929.
Wild, G. O. Praktekum der Edelsteinkunde. 1936.
Williams, G. F. Diamond mines of South Africa. 1906.