Gems&Jewellery

June 2008 / Volume 17 / No. 2

Irradiated gems

Birds, beetles and brooches

Rough diamond fakes

The Scottish Conference

The Gemmological Association of Great Britain

Editorial

Gems&Jewellery
June
08

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"What does Gem-A do, exactly?"

The question crops up frequently. They say that everyone should have a succinct explanation of their company's activities at the ready. But in practice different people want to hear different things. For some, Gem-A's provision of gemmological education to help developing countries create sustainable gem industries is music to their ears; for others gemmological education for the UK jewellery industry is most relevant. During 2008, our centenary year, raising money to achieve our ambitions is of paramount importance, so getting the right message to the right people is vital.

So what does Gem-A do? Our core products are our internationally recognized qualifications, the Gemmology Diploma (graduates are eligible for election to Fellowship – FGA) and the Diamond Diploma (graduates are eligible for election to Diamond membership – DGA). International qualifications are as important in Peshawar as in Pontefract for the jewellery industry and for the buying public. We do other things. We sell equipment, publish this magazine and our Journal, and hold numerous events and workshops. But all lead people towards our qualifications, or support them and keep them up-dated once they have graduated.

So our 'one minute' answer could be "Gem-A is the longest established gemmology education body, providing international qualifications of the highest status. In this world of ever new gem sources, treatments and imitations, our qualifications and the knowledge and ethics they promote are essential, whether for global business, developing countries or localized retail customers. Our job is to provide those qualifications and to support and promote those that have attained them."

Of course, not all our members are our graduates. Some will study with us one day, others are gem enthusiasts who simply wish to be kept up-to-date. So we need to add another sentence to our answer: "We also have many subscribing gem enthusiasts around the world who do not hold our qualifications. Some are in the industry, others have gemmology as an enthralling hobby. All are important to us in supporting our work."

Jack Ogden
Chief Executive Officer

Cover Picture

Rough emeralds from Zambia. Photo courtesy of Guy Clutterbuck. (See Gem Discovery Club, Exploring Zambian emeralds and aquamarines, page 23.)

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The Centenary Dinner
of
The Gemmological Association of Great Britain

To be held at

The Worshipful Company of Goldsmiths

Goldsmiths' Hall, Foster Lane, London EC2V 6BN

on

Thursday 3 July 2008 at 7:00 for 7:30 pm

Gem-A is delighted to celebrate the One Hundredth Anniversary of the historic 1908 meeting of the National Association of Goldsmiths of Great Britain and Ireland which established courses and examinations in gem education, and later developed into Gem-A.

To mark the occasion and to celebrate the past, present and future in gem education, we request the company of members, gem trade professionals, and gem and diamond enthusiasts at The Centenary Dinner. The cost of the dinner is £145 per person. To order your tickets go to www.gem-a.com/Centenary Dinner.htm where you may download an application form. Alternatively contact Olga Gonzalez at Gem-A at the address given below.

Proceeds from the evening will be used for our educational initiatives, including the production of our new course notes, member publications and student website redevelopments. For information on how to sponsor a portion of the event or to place an advertisement in the programme, please contact Olga Gonzalez directly at Olga.Gonzalez@gem-a.com

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Rough diamond imitations on the market

Thomas Hainschwang reports on some alarmingly convincing fakes and how to identify them

Until a few years ago, because rough diamonds were generally accessible only to those in the rough diamond trade, they were rarely imitated. However, in the past fifteen years those from countries such as Brazil, Russia and especially from certain African countries including Sierra Leone, Guinea and Congo, have reportedly become increasingly available to people who are not directly involved in the rough diamond trade. This has in turn led to increasing numbers of rough diamond imitations appearing on the market. Although these imitations could be very convincing, experienced buyers were able to identify them relatively easily. However, more recently large quantities of surprisingly natural-looking and superficially convincing crystals imitating rough diamond have appeared.

Background

Rough diamonds are generally simple to recognize on the basis of their characteristic habits (usually octahedron or rounded dodecahedron, sometimes strongly distorted), their unique lustre, and their growth and dissolution features (**1**). High thermal conductivity unique to diamond can also be used as an aid to identification and is the property on which most commercial diamond testers are based.

Obviously rough diamond imitations have existed for a very long time, probably since diamond was first traded, but in most cases the appearance of these materials has not much in common with diamond. The materials used include quartz, topaz and glass, rudimentarily worked to resemble diamond crystals in order to fool tourists and those inexperienced in gemstone identification.

In the past some short reports on perfectly shaped octahedrons, sometimes engraved with 'dissolution figures' have been reported in trade journals; these were usually made of topaz, cubic zirconia or glass, and probably were part of small-scale scams as such materials, to our knowledge, have not appeared in large quantities in the gem trade for some time.

Today the situation appears to be different, based on information from a diamond dealer in Sierra Leone. The dealer had a handful of imitation diamond octahedrons made of glass in his possession which, though well made, were not very convincing to an expert. According to the dealer, such glass octahedrons are produced in quite significant quantities by Chinese manufacturers in Freetown, the capital of Sierra Leone. ▶

1: Natural rough diamond octahedrons (left and right) and a rounded dodecahedron (centre) with their typical strong lustre.

Gems and Minerals

Rough diamond imitations on the market (contd)

2: Part of the parcel of stones offered as rough diamonds – some perfect octahedrons and rounded dodecahedrons, and some cleverly coloured.

3: The details of some of the crystals shown in 2.

The phenakite/topaz scam

Recently a stone was analysed in the Gemlab laboratory that was sold as diamond in its rough state. After cutting, the sample was offered as a 'diamond-like gem material'. This conclusion was drawn by the owner of the sample, because the stone had been identified as diamond during tests with several thermal probes. Nevertheless, the brilliant-cut stone had a very different appearance to that of diamond, and the cutting showed that the sample was not diamond. Specular reflectance infrared spectroscopy analysis of the stone at the Gemlab proved it to be phenakite, a relatively rare beryllium silicate.

To confirm the claim that the material indicated diamond when tested by the thermal diamond tester, the sample was measured several times with the owner's diamond/moissanite tester and indeed the probe indicated the stone to be diamond in every test.

4: A perfect octahedron with an internal cleavage plane oriented NW-SE, not parallel to any of the octahedral faces, which are the cleavage directions in diamond.

A few weeks later in Portugal the author had the opportunity to analyse a parcel of crystals weighing nearly 2000 ct, that were supposed to be large (above 4 ct, average weight about 9 ct) high-quality rough diamonds. The stones were exceptionally colourless and clean octahedrons and rounded dodecahedrons with distinct growth motifs; there were also some flattened octahedrons in the parcel, which looked like typical diamond macles (**2**).

At first sight, immediate suspicions were raised since the lustre of the crystals was noticeably below the lustre of diamond and none of the samples showed the typical dissolution motifs (such as so-called 'trigons') although there were some apparent growth features (**3**). Some crystals showed some areas with small chips that appeared distinctly conchoidal; this stands in stark contrast to diamond, where chipped surfaces always have microscopic steps due to their perfect cleavage. It was thus evident that the parcel did not consist of diamonds, but of ingeniously designed, polished and engraved imitations.

In the absence of suitable instruments at the location to identify the true nature of the stones, it was necessary to collect as much evidence as possible to get an idea of their identity. In one perfect octahedral crystal an internal cleavage was observed that did not follow any of the octahedral directions (**4**). In diamond this is crystallographically impossible, because the perfect cleavage in diamond always follows the four directions of the eight octahedral faces.

With a loupe many curved planes containing tiny cavities with liquid and two-phase liquid/gas inclusions could be seen, and there were irregular cracks with obvious interference colours. This inclusion scenario is typical for minerals grown under hydrothermal conditions, but has not been seen in diamond. With the loupe a

A parcel of rough diamond imitations

Rui Galopim de Carvalho tells of a parcel of phenakites sold as diamonds in Portugal.

Due to its long-standing position in the diamond trade, during the sixteenth and eighteenth centuries with the stones coming from Goa and Brazil respectively, and more recently in the early twentieth century when they came from Angola (then a Portuguese colony), Lisbon has seen a many parcels of rough diamonds offered for sale.Although that trade is not now so busy, people still do not think it strange to be offered rough diamonds.

It appears that in the first trimester of 2008 a couple of dealers, reportedly from Angola, were allegedly touring Lisbon's downtown jewellery offices offering for sale a significant parcel of uncut stones in natural-looking shapes, and presenting them as diamonds. An experienced diamond dealer who was offered the stones declined any interest in buying the parcel. He had immediately identified them as diamond simulants using a 10x lens but did not tell the sellers that he had identified the stones as imitations, just claiming that he was not interested in buying the material at that time (a common practice to avoid any possible unpleasant discussion about bogus products). The dealer immediately warned some local traders about the situation, but the alert did not reach all of them.

The parcel was subsequently offered to a retail jeweller who saw the large volume of 2 to 4 ct, virtually colourless and flawless stones as a great business opportunity. He was not as cautious or as observant as the diamond dealer, so the 'bip' from a thermal diamond tester was sufficient proof for him that the stones were actually diamonds. After bargaining, he reportedly paid a large sum (several tens of thousands of euros) to purchase the stones. Once again, the 'too good to be true' deal hit the under-educated businessman.

This proves that product knowledge is vital in the gem trade. On the one hand, we see the experienced diamond dealer who, knowing how to look at and what to look for in a gemstone, immediately notices non-diamond external and internal features; on the other, we witness the blind reliance on an instrument that needs to be used with care and background knowledge to be reliable as an aid to identification.

This reminds me of the old story about the apprentice who asks his master how he may become wise:

The master answered: "Good decisions."

Apprentice: "And how do I make good decisions?"

Master: "Experience."

Apprentice: "And how do I get experience?"

Master: "From a lot of bad decisions."

I would rather this last response to be "From gemmological education"! So, dear fortune-seekers, this material is out there and apparently everywhere, therefore do consider investing in basic gemmological knowledge from a reputable educational institution, learn how to skilfully use a hand lens and, as a wise industry leader once said, do humbly recognize that "true knowledge is recognizing what you don't know and true skill is recognizing what you can't do".

slight double refraction was visible, and this was confirmed by the reaction of the crystals under crossed polarizing filters. The collected data are consistent with these stones being the same as that identified in the lab – phenakite or topaz. Since the discovery of large phenakite crystals in Madagascar, this mineral has been available in appreciable amounts and for rather low prices. This also explains the appearance and misidentification of such material a few weeks before the large parcel was encountered. The other possibility for at least part of the material would be topaz, since it also shows cleavage and since topaz is also sometimes known to fool the thermal testers.

Concluding remarks

These rough diamond imitations are so perfectly and ingeniously made that some buyers will mistake them for the real thing. The fact that the material is falsely indicated as diamond by certain diamond testers will certainly increase the success of this scam.

Why certain diamond and diamond/moissanite testers indicate that this material is diamond is most likely due to their low sensitivity. Different thermal probes may use methods of maintaining their supply of heat and measuring how fast it is dissipated in the gemstone, which vary in detail, and the responses of different gems will vary accordingly.

It is not currently clear who exactly is responsible for this large scale diamond scam. The author has been informed by a source in South Africa that the stones are being produced in Namibia and that they are being distributed through Botswana. As crystals have now appeared in Basel, New York and South Africa, in addition to Liechtenstein and Portugal, it would appear that there is a network of people involved in the distribution of these tricky and convincing diamond imitations.

Ed.: When these imitation diamonds were being discussed on Gem-A's MailTalk, there was much discussion about the seemingly 'positive' readings they sometimes gave with a thermal diamond tester. This will be followed up in the next isue of *Gems & Jewellery*.

Photos courtesy of Thomas Hainschwang.

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Duped again!

Maggie Campbell Pedersen follows up on some of the items bought this year at the Tucson Gem Fair

At the Tucson gem fairs two years ago I purchased a sphere of what I was told was 'Russian jet'. It was very black and had a good polish – not as good as that of Whitby jet (from Yorkshire, UK), but what one might expect of a younger material. It did seem a little heavy, but gave no other indications of being anything other than jet. Subsequent testing gave the result that it was a rubber based material, in other words a jet simulant, possibly vulcanite.

When I came across a lot of 'Russian jet' and some 'Mongolian jet' at the Tucson fairs this year, I was naturally somewhat sceptical and wary. I asked many questions, but in every case I was given absolute assurance that the material was correctly described.

I purchased a number of samples, including small carvings of frogs. The carvings were bought from a reputable dealer from whom I have bought carved antler and amber items in the past, but the 'jet' frogs lacked the lustre and feel of polished jet, so I was still sceptical. In order to reassure me, the dealer introduced me to his Russian importer, from whom I bought further samples of rough and polished material.

All these purchases are still being tested – and re-tested – but the preliminary results show that many of them are rubber based, in other words: fakes. This includes the small frog carvings.

We know that jet is found in, amongst other places, Siberia and China, but that it is much younger than Whitby jet (possibly about 30 million years old, as opposed to 180 million years), and not of the same quality as it lacks the lustre of the English material. However it occurs in much larger pieces, enabling it to be carved into bigger items. Also, Whitby jet is only available in very limited quantities, while the others seem to be plentiful.

Jet is at present enjoying a renaissance, with some exciting jewellery of modern design that is far removed from the old Victorian mourning jewellery with which the material is usually associated. There is, without doubt, a market for more jet. It is therefore a shame that it is being imitated and these fakes sold as the real thing. The result will be that it loses its good reputation in the same way as has happened with Baltic amber.

A full report with further results and more details of the tests will appear in Organic Gems online at www.maggiecp.com.

Photo © Maggie Campbell Pedersen.

Rays in concern

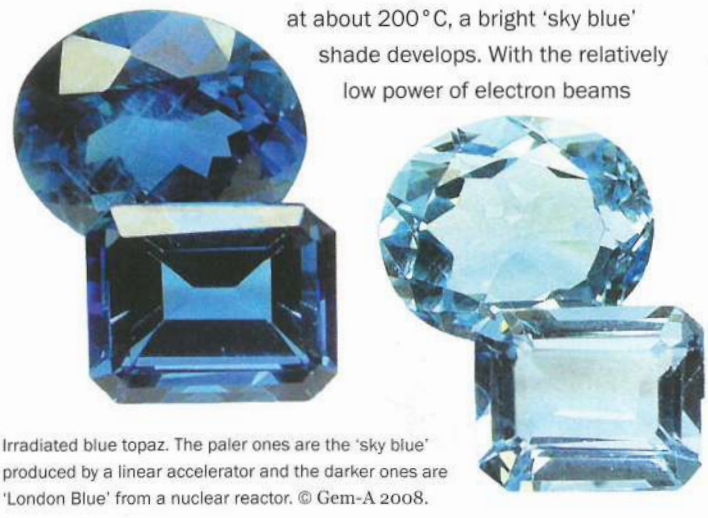
Just how concerned should we be about the dangers of irradiated gems? **Jack Ogden** looks at the facts.

A century ago came the discovery that exposure to radium salts turned a diamond green. The treatment seemed permanent, but there was a side-effect, the stone was left radioactive. The irradiation treatment of gemstones has developed enormously since those early days, but there is still confusion about safety.

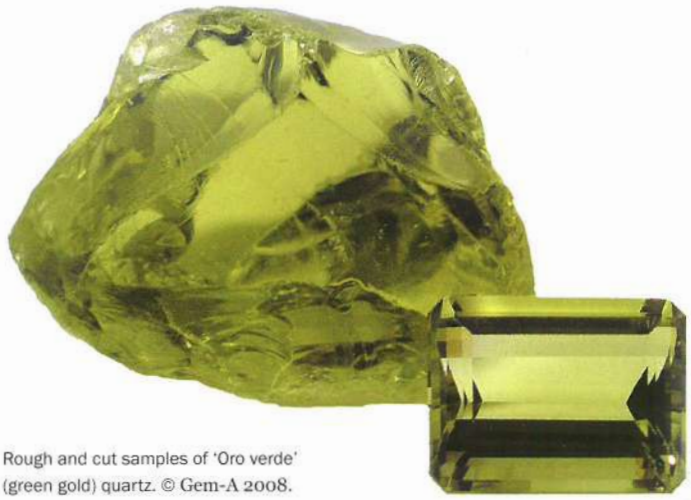
In modern gem treatments there are three types of irradiation. The most familiar to most of us is a nuclear reactor with uranium fuel rods where nuclear fission generates high-energy neutron rays. A second type is a linear particle accelerator (linac) which generates a stream of electrons. In the third type, gamma rays are spontaneously produced by a radioisotope, typically cobalt-60.

Topaz is the commonest and most familiar of irradiated gems. Gamma irradiation turns colourless topaz an unstable brown; if then heated it turns a permanent pale blue. Gamma irradiation doesn't make the gems radioactive, but this process is becoming far less common today because alternative irradiation treatments produce deeper colours. Gamma irradiation is also used to treat such gems as quartz, yellow sapphire, red tourmaline, kunzite and cultured pearls. For example, the currently popular oro verde ('green gold') quartz, much in evidence at Tucson this year and subject to recent discussion on Gem-A's MailTalk, is treated with Cobalt-60.

When colourless topaz is bombarded by electrons from a linear accelerator a brown colour is also produced. When heated at about 200°C, a bright 'sky blue' shade develops. With the relatively low power of electron beams typically used by gem treaters, there is no significant residual radioactivity, but when higher powers are used, which speed up the treatment process, the topaz can remain radioactive for up to a few weeks. Other gems that are treated with a linear accelerator include beryl, tourmaline, kunzite and diamond.



Irradiated blue topaz. The paler ones are the 'sky blue' produced by a linear accelerator and the darker ones are 'London Blue' from a nuclear reactor. © Gem-A 2008.



Rough and cut samples of 'Oro verde' (green gold) quartz. © Gem-A 2008.

Neutron radiation using a nuclear reactor, turns topaz a greyish blue — so-called 'London blue'. Subsequent heat treatment is not essential, but is often used to brighten the colour. The treated gems are radioactive and must be set aside for up to two years to allow this to decay before they are put on the market. The more vivid blues, including the so-called 'Swiss blue', result from a half dose of neutron irradiation followed by electron irradiation from a linear accelerator and finally heat.

As long as the necessary 'cooling off' periods to allow the radioactivity to decay are observed, there is no evidence that electron or neutron irradiated gems are dangerous to wearers. However, there is an obvious and serious health risk if the gems are not allowed to 'cool off' before entering the market, or when irradiated rough is cut too soon after treatment. So, despite the occasional horror story, there is no suggestion of a general health risk. Indeed, in 2007 the United States Nuclear Regulatory Commission (NRC) issued a report that stated: "The NRC believes irradiated gemstones currently on the

market are safe." But the trade needed clear guidance. The result was *The Essential Guide to the US Trade in Irradiated Gemstones* jointly published in January 2008 by the Jewelers Vigilance Committee of New York, the American Gem Trade Association of Dallas and the NRC. The salient points can be found on the NRC website http://tinyurl.com/2u7z8z. US producers or importers of gemstones irradiated using a linear accelerator or nuclear reactor require a licence.

Recent reports by the UK National Radiological Protection Board included assessments of radiation doses from irradiated gemstones and highlighted the widely varying relevant legislation across the EU.

Uniformity was clearly needed, and so in 2007 the European Commission published *Guidelines for the Regulatory Control of Consumer Products Containing Radioactive Substances in the European Union*. This noted that "It is normal practice in the industry for the gemstones to be stored for a pre-determined length of time, to eliminate the activation products before the stones are released onto the market. This means that under normal circumstances, by the time they reach the point of sale they do not contain radioactive substances." Thus the European Commission has decided that irradiated gems do not require any specific legislation, and could be freely manufactured, imported and sold, unless residual radioactivity was significant enough to bring them within general radiation safety legislation.

Disclosure

CIBJO guidelines allow the general term 'treated' for irradiated gemstones, but with increasing consumer awareness about treatments it is probably better to be more open. In which case, you need information from suppliers and the knowledge at hand to assure customers that irradiated stones are not radioactive.

Recent Events

From Nano Crystals to Haggis Rock

The 2008 Gem-A Scottish Branch Conference

The conference was held at the Queen's Hotel, Perth, from 2 to 5 May. After registration, the conference was launched by Stephen Whittaker, managing director of Fellows & Sons, the well known Birmingham auctioneers, who entertained delegates with a humorous and insightful look at the auction business in his talk 'An auctioneer's lot is not a happy one'. He described a variety of lots that Fellows had sold, some greatly exceeding expectations in the amounts realized. The sheer quantity and variety of general jewellery that passed through Fellows amazed many in the audience, and the need to handle and identify this quickly and accurately needed very well trained staff — Fellows is a great promoter of Gem-A's Gemmology and Diamond Diplomas and employ many staff with FGAs and DGAs. More valuable jewellery is also regularly handled by Fellows and Stephen passed several objects around, including a 5.59 ct Asscher cut diamond (see below).

The programme on Saturday morning started with the keynote speaker, Professor George Rossman (of the Division of Geological and Planetary Science, California Institute of Technology, Pasadena) presenting a 'Tour of the frontiers of science: ever smaller and smaller'. His subject was the causes of optical phenomena in gemstones, as revealed with advanced technology.

He took rose quartz first, asking where the colour and asterism actually came from. Neither silica not oxygen, the constituents of silica, would on their own impart colour. Dissolving crushed samples of rose quartz in an acid left an insoluble residue, weighing about 0.05% by weight of the original rose quartz and having the colour of rose quartz. Examination at very high magnifications with a scanning electron microscope revealed that this residue consisted of fibres which in turn proved to be ropes of fibres each just a few hundred nanometres in diameter. Highly sensitive analysis using X-ray

An auctioneer's lot ...

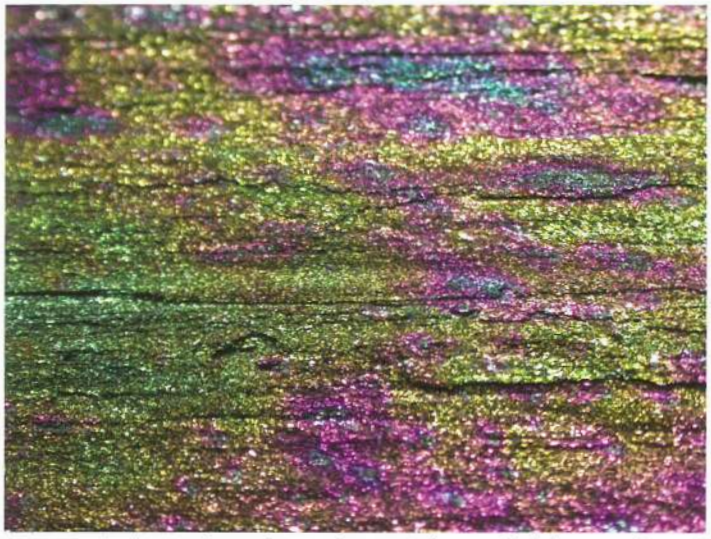
Those attending Stephen Whittaker's talk during the Conference were delighted to have an early 'preview' of two important items which are to be included in Fellows & Sons' Antique and Modern Jewellery sale to be held in Birmingham on 3 July.

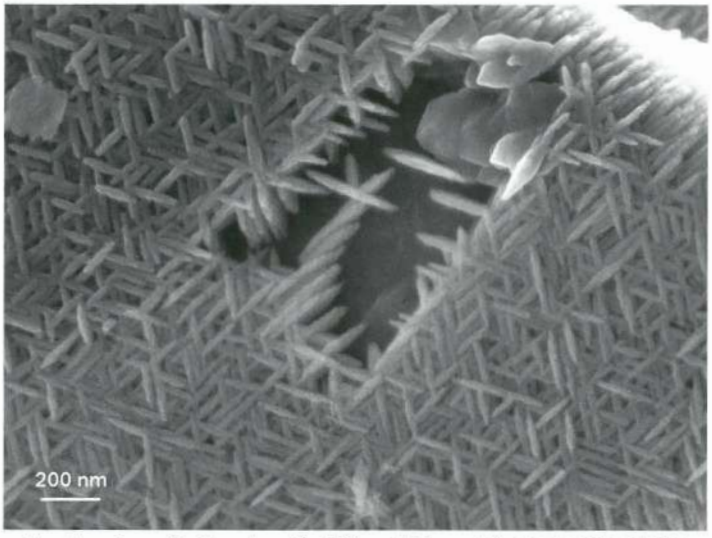
The first was a modified Asscher cut diamond weighing 5.59 ct, of VVS2 clarity and F colour, estimated at £95,000–£120,000. The Asscher cut was developed by the Amsterdam master cutter Isaac Joseph Asscher and first patented on 2 December 1902. The earliest form of the modified square cut originally had a three stepped crown and a seven-stepped base or pavilion, with broad cut corners and a total of 74 facets including the table and culet. This cut was modified during the 1920s to only two or three crown steps and three or four pavilion steps, resulting in more fire and brilliance than the original stones when cut to good proportions and unrivalled amongst square cut stones.

The second item was a diamond and emerald Art Deco bracelet. The piece, possibly from America, has been estimated at £15,000–£20,000. Richard Slater, senior valuer at Fellows & Sons, who was circulating the jewellery during the talk, commented: "The attention to detail, the bright green emeralds and lively diamonds, and the superbly made mount are clear indicators of the quality of the bracelet."

Photos courtesy of Fellows & Sons.

Recent Events





Images used to illustrate George Rossman's presentation on optical phenomena in gemstones. A hand specimen of rainbow hematite (left) and high-resolution image of the crystals that constitute the coating on rainbow hematite (right). *Courtesy of George* Rossman (photograph) and Chi Ma (SEM image), California Institute of Technology (Caltech).

diffraction, infrared spectroscopy, Raman spectroscopy and electron diffraction proved that this material was not rutile as commonly stated, but a new mineral closely related to dumortierite.

George next turned his attention to star almandine from Idaho. Again, the fibres that give rise to the asterism are usually stated to be rutile, but while there is some rutile present, the majority of the 'fibres' are actually minute tubular voids. With corundum, the question concerned the nature of the stars and the 'clouds'. Study showed the presence of rutile in Sri Lankan materials but diaspore in the Tanzanian. When Sri Lankan Geuda sapphires are heated, the clouds disappear thus 'clarifying' the stone, but Tanzanian corundum is not clarified by heating. Clouds in Sri Lankan Geuda sapphires were found to consist of minute linear arrays of small voids, around 100 nanometres in diameter. Heating anneals out these voids.

Next two types of obsidian with optical phenomena were considered. First was iridescent 'fire obsidian'. Scanning electron microscope study showed that the cause of the effect was light reflection off thin layers of obsidian containing minute octahedra of magnetite (under 100 nanometres in diameter) that had a different refractive index to the host obsidian. In contrast, in rainbow obsidian from Jalisco, Mexico, the effect was due to the interference effects caused by minute fibrous rods of a pyroxene (hedenbergite), less than one micrometre in diameter. Scanning electron microscope studies, plus sensitive analysis, also revealed the minute octahedra of magnetite that caused the light scattering in layers on iridescent basalt, and the titanium-rich dendritic magnetite crystals that caused the bright blue coloration of blue basalt.

Layering caused by exsolution during growth was observed in moonstone and labradorite. In moonstone, the layers were under 100 nanometres in thickness and were alternately calcium enriched and calcium depleted. An exsolution mechanism was also shown to be the cause of the iridescence in andradite garnet (such as that from Mexico) where there are variations between layers of pure andradite garnet and layers where some of the iron is replaced by aluminium.

George Rossman's second presentation, given on Sunday morning, was simply entitled 'Gems and Technology' but was an intriguing look at how highly advanced scientific method can answer some of the questions we have about the causes of colour in gemstones. It was a potentially complex subject, but it was addressed in a clear and often humorous way that made it accessible and understandable to all.

George began with beryl, explaining that the colour in both blue and yellow beryl was due to iron. Much yellow beryl when heated turns blue — Fe^{3+} changing to Fe^{2+}. Beryllium itself neither has colour nor causes colour. So why does beryllium diffusion change the colour of ruby and sapphire? The mechanism by which this occurs had been unclear in the past. However, studies by electron paramagnetic resonance revealed that when beryllium diffuses into corundum it replaces some of the aluminium (Be^{2+} replaces some Al^{3+}) and the electrons released in the associated change in oxygen valency (O^{2-} to O^{1-}) gives rise to colour centres. Free electrons are also the cause of the colour in blue zircons, but here they are generated by the radiation from the minute traces of uranium in the stone. Heating the zircon allows the electrons to free themselves from the defects where they are trapped and the stone loses its colours. George mentioned a woman who lay too long on a sunbed wearing a pair of blue zircon earrings. The one nearest to the ultraviolet source changed to a yellow-brown colour. With amethyst, ultraviolet light can free the electrons from the defects where they form colour centres. This explains why the colour of amethyst is unstable in sunlight.

Similarly, in tourmaline the colour is not due to the basic constituents — pure elbaite is colourless — but is the result of natural radiation on a minor component, manganese. Artificial radiation is also used to produce red tourmaline, and a proportion of the red tourmaline on the market has been deliberately treated by radiation.

George touched on a variety of other instances where advanced analytical methods could help gemmologists. He noted that the ▶

Recent Events

From Nano Crystals to Haggis Rock (contd)

ratio of the oxygen isotopes O^{16} and O^{18} varied from place to place, and thus their relative proportions in gems materials was becoming a useful determinant of source.

George Rossman was followed on the Saturday by Alan Hodgkinson, Gem-A's Scottish Branch President, who provided a detailed and well-illustrated talk about the advantages of 'Top-lighting the Refractometer'. Top lighting is a technique whereby the light is passed vertically down through the stone placed on the refractometer glass. Alan began by talking about various models of refractometer, including early ones. He then moved on to discuss the benefits of top lighting. For example, in certain circumstances, such as with very small stones, it can make it far easier to obtain a reading. For gems with RIs that come close to, or straddle, the RI of the liquid, top lighting can also often resolve one or more of the shadow edges. Top lighting also helped remove the ambiguous or spurious shadows sometimes encountered with conventional refractometer lighting.

In her paper on 'The Origins of the Emeralds in the Mogul Objects in the Hermitage Museum', Elisabeth Strack explained that there had been mixed ideas in the past about the origin of the emeralds set in Mogul period jewellery and objects. A range of magnificent jewelled objects in the Hermitage Museum provided the perfect resource for a study since these contained several thousand cabochon emeralds. These objects included gold, enamel, ruby and emerald pitchers and a similarly ornate plate, and were recorded as having been brought to Russia from India in the early seventeenth century. The size of the objects and the necessity to examine them with limited equipment and within the Hermitage museum meant that advanced technology could not be used. However, microscopic and fluorescence studies confirmed that the green stones were indeed emeralds, that the jagged, three-phase inclusions indicated a hydrothermal origin, and that a substance in fissures that fluoresced yellow under ultraviolet light might well be an indication of original oiling. A hydrothermal origin pointed to Colombia or Afghanistan as the most likely sources. There was no evidence that the Afghani emeralds had been exploited to any significant extent during the period in question and a Colombian origin seemed most likely.

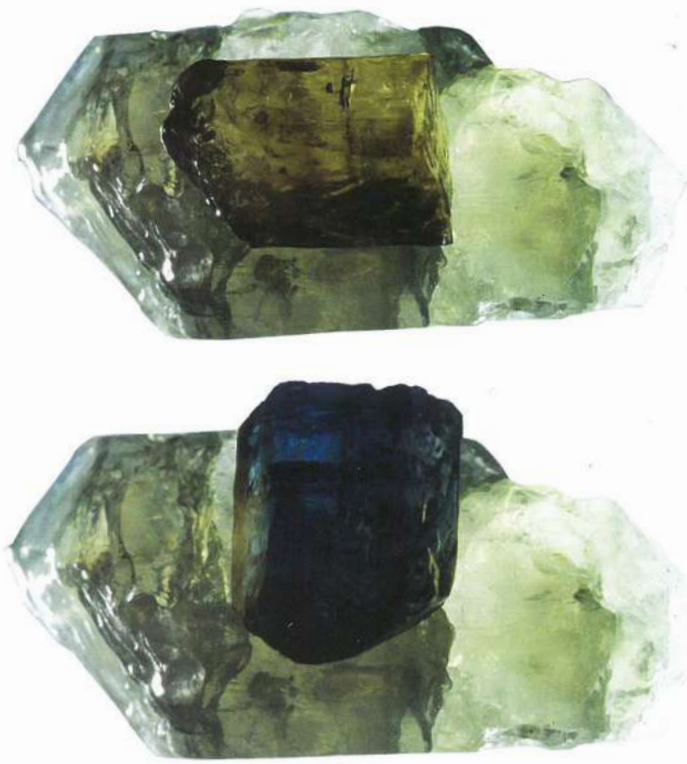
In three brief presentations, Brian Jackson talked about 'Pleochroism in Apatite', Harold Killingback explained 'The How of Asterism' and Anton Vasiliev demonstrated his Facet Designer Software.

Brian (presenting also on behalf of his co-authors Anton Vasiliev and Maria Alferova) described the apatite found near Lake Baikal. The best known gem materials from this region were lapis lazuli and spinel, but the main economic mining today is for phlogopite, a member of the mica family. However, apatite is found in calcite veins that cut through the phlogopite and this olive-green apatite has an extraordinarily strong yellow-blue pleochroism. The polarizing effect of two pieces of such apatite placed one above the other was strikingly illustrated and Brian suggested that a good-looking blue stone could be produced by a doublet made from two suitable oriented pieces of this gemstone.

With a remarkable series of photographs of star stones, a large rose quartz sphere in particular, Harold Killingback explained 'The How of Asterism'. He showed just how much information could be obtained by a gemmologist armed with very simple equipment — in his case a red laser pointer, a screen, a hemispherical white bowl and a translucent glass globe. When the laser beam was projected through the sphere onto a screen, or illuminated with the laser when within the bowl or globe, the projected planes of light clearly showed the nature of epiasterism (star as seen in reflected light) and diasterism (star formed by transmitted light). (see also *Gems & Jewellery*, August 2007, vol 16(3) pp. 10–11.

Anton Vasiliev demonstrated his Facet Designer Software that he had originally developed to help design new, optimum forms for faceted gemstones other than diamond. The 3D software allows the user to enter and adjust a wide range of values, from pavilion angles to orders of symmetry, and to see in real-time how light passes through the stone and is reflected and refracted. The software was designed specifically for the equipment used in Anton's cutting factory and uses a file format that is not directly compatible with other 3D graphic or jewellery design programmes, but the software is freely downloadable from http://www.usfacetersguild.org/software/FacetDesigner/FDSetup01.exe and is interesting to experiment with.

David Callaghan, former Gem-A Chairman and President, provided an erudite and entertaining account of the jewellery of the Duchess of Windsor. In his talk entitled 'Uncrowned Jewels', he explained that for people today it might be difficult to understand the huge constitutional crisis that loomed seventy years ago if the king, Edward VIII, married a twice-divorced woman, Wallis Simpson. By



Brian Jackson's illustration of the polarizing effect of two pieces of apatite placed one above the other. Photos by Brian Jackson.

Recent Events

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modern standards, it was also remarkable how well the secret of their affair was kept by the British media, although foreign media were less restrained. Love won the day, and so Edward VIII became king and then abdicated within the same year, 1936. By a remarkable coincidence he abdicated on the same date — 10 December — that James II had abdicated exactly 250 years earlier. The focal point of David's talk was, of course, neither the politics nor the love story, but the Duchess of Windsor's jewellery that was sold by Sotheby's in in Geneva in 1987, the year after the Duchess of Windsor's death. The jewellery sold for a total of £31m (then about $50m), almost six times the estimated figure. The jewellery encompassed a wide range of makers and designers, including Cartier and Van Cleef & Arpels. The Duchess's favourite piece was a bracelet from which was suspended a series of crosses set with a variety of gemstones and each engraved with a date and a brief and often cryptic legend. More iconic were the magnificent flamingo and panther brooches. David showed illustrations of much of the jewellery, accompanied by photographs of many of these being worn by the Duchess.

Hard rock and heavy metal. The Scots get the hammers out

Haggis rock is probably not that familiar to most gemmologists, but it is a spotted rock found in the Peebles area of Scotland and made up from variable amounts clay, quartz, chert and igneous rocks. It looks fairly unprepossessing when found, but can be polished to provide an attractive ornamental stone. An old quarry (complete with the inevitable dumped detritus from car seats to children's toys) was thus the venue for the traditional Conference Monday field trip. Here there was haggis rock aplenty. There were large boulders that were smashed with the arsenal of sledge hammers and chisels that Brian Jackson had provided, good exercise after the well-catered and well-refreshed conference, but there were also smaller fragments to be found around the ubiquitous rabbit holes where the burrowing animals had brought them to the surface — much as Herodotus tells us the burrowing ants of Bactria brought grains of gold to the surface.

Following the haggis rock expedition, participants went to Lauriston Castle to view the famous Blue John collection held there.

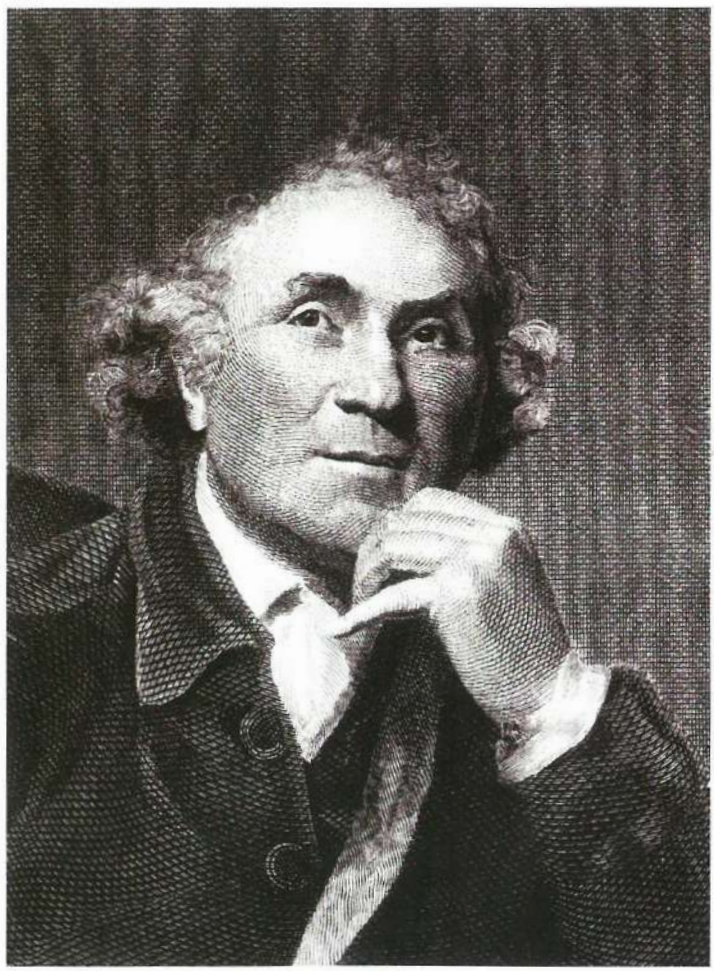
You can learn more about haggis rock in the article by Douglas Nichol: "Investigation of the 'haggis rock' from the Scottish Borders" *The Journal of Gemmology,* 1999, 26(8), pp. 534-38.

Cultured Pearls, Surgeons and an Earls Court Pond

Luck plays a more frequent role in research than many academics might admit. In the April 1958 issue of *The Journal of Gemmology*, Florence M. Vaughan intrigued readers with an article entitled 'Culturing Pearls in Earls Court'. What she terms her 'passion for miscellaneous and ill-regulated reading' had brought her by chance to Lloyd Sanders's book Old Kew, Chiswick and Kensington (1910) wherein she found the brief note that Earls Court resident John Hunter, the eminent eighteenth-century surgeon, had experimented with the artificial formation of pearls in oysters in his pond. This tantalizing mention led Vaughan to the four-volume edition of Hunter's works, published by James F. Palmer in 1835 which happily included the text of a letter from Hunter to his friend Sir Joseph Banks in 1787. Here he says: "I have these two days been draining the pond or rather fishing for pearls, the success of which you will see by the specimens. Those I had made the experiments on were dead but there is one recent. I have a few alive that I mean to put under experiment but I shall open the shell and put in the extraneous body. If any other method suggests itself to you be so good as to inform me."

Vaughan was unable to find out anything more and simply comments that "One would have thought that the chances would be nil of an oyster surviving sufficiently long in an Earls Court pond to cover an extraneous body, even if the pond water were laced with mineral salts to assist the process." Hunter is known to have kept various 'experimental' animals at his Earls Court house including "chickens, geese, pigeons, rabbits, pigs, opossums, hedgehogs, a jackal, a zebra, an ostrich, buffaloes (or zebus), leopards, dormice, bats, snakes, birds of prey, deer, fish, frogs, leeches, eels and mussels." Mussels seem more likely in fresh water pearl culturing experiments than the 'oysters' mentioned by Palmer and seemingly accepted by Vaughan.

A meandering through publications, on a par with Florence Vaughan's 'ill-regulated reading', led the present writer to *The Annals of Philosophy* for November 1825. This contains a note by John Edward Gray following up his article 'On the Structure of Pearls, and on the Chinese Mode of producing them of a large Size and regular Form' for the same journal the previous year. He explains: "In a late visit to the College of Surgeons, I observed some pearls in the same species of shell *(Barbala plicata)*, which had the external appearance of being formed artificially, which Mr Clift, the excellent conservator of this establishment, very kindly allowed me to examine and describe. These pearls are of a very fine water, and nearly orbicular; their



John Hunter by Sir Joshua Reynolds c. 1786. Reproduced by kind permission of the President and Council of the Royal College of Surgeons of England.

base is supported by a small process, which separates at the end into short diverging processes, which stand off at right angles to the central rib. On more minute examination, it appeared that these pearls were produced by there being introduced between the mantle of the animal (while yet alive) and the shell, a small piece of silver wire, bent into a peculiar form, that is to say, so as to form a right angle, with one arm ending in two diverging processes, so as to make the simple end always to keep its erect position. These wires must be introduced in the same manner as the semi-orbicular pieces of mother-of-pearl in the other method of forming artificial pearls, as there is no appearance of any external injury. The pearls are solid, and nearly orbicular, with a small pedicel, which is continued so as to entirely cover the wire. They may be perforated and used so as to show their whole surface, which I did not expect could ever be the case with any artificial pearls; but they must doubtless, unlike the artificial pearls formed by the other means, be a considerable time in coming to any useful and valuable size."

John Hunter died in 1793 and in 1799 his collection of 15,000 specimens representing anatomy, pathology, osteology and natural history was purchased by the Government and given to the Company (later the Royal College) of Surgeons. Some 3500 of these items form the nucleus of what is still known as the Hunterian Collection and which is now located inside The Royal College of Surgeons of England, 35-43 Lincoln's Inn Fields, London, WC2A 3PE.

So it is possible the pearls described by Gray in the Royal College of Surgeons' collections were produced in Hunter's Earls Court pond, but it is by no means certain. In his The London Encyclopaedia, Or, Universal Dictionary of Science (1829) Thomas Tegg comments that Professor Fabricius says that he saw in the possession of Sir Joseph Banks, in London, large chama [clam shells], brought from China, in which there were several bits of iron wire, encrusted with a substance of a perfect pearly nature. "These bits of wire," he said, "had been sharp, and it appeared as if the mussels, to secure themselves against the points of the wire, had covered them with this substance, by which means they had been rendered blunt." Apart from the mention of iron wire here, unlike the silver in Gray's account, these sound remarkably like the cultured pearls that Gray saw at the Royal College of Surgeons. Sir Joseph Banks, the botanist on Cook's voyage and the president of the Royal Society, is known to have supplied Hunter with many of his specimens.

Nevertheless, it appears that Hunter's cultured pearls did reach the museum. In his 'Hunterian Oration' entitled 'The Hunterian Ideals To-day', delivered at the Royal College of Surgeons on Valentine's Day 1947, another famous surgeon — Sir James Walton — mentioned Hunter's letter about the pearls and the Earls Court pond (see *British Journal of Surgery*, vol. 35, 137, July 1947, pp. 1–6). Walton notes that "Professor Wood Jones told him that 'these specimens were in existence before the war, but were destroyed by the bomb." Professor Frederick Wood Jones was appointed curator at the Royal College of Surgeons in 1945 and his major task was to restore the Hunterian collection that had been damaged by an incendiary bomb in 1941.

Clearly Walton's article was unknown to Florence Vaughan when she penned her note for the *The Journal of Gemmology* a decade later. But if she had been made aware of it, she would have surely enjoyed the remarkable coincidence — the same volume of *The Journal* also contained the announcement of the establishment of the Sir James Walton Memorial Library by the National Association of Goldsmiths and the Gemmological Association. After his retirement, Sir James Walton devoted his time to his hobby of gemmology. He passed the Gemmology Diploma with distinction in 1945 and was curator of the Association's collection from 1947 until his death in 1955 — the same year that he became Chairman of the Gemmological Association. His book *Physical Gemmology* was published in 1952.

Jack Ogden

Birds, beetles and brooches

A box of insects found in a curio cabinet leads **Anthony de Goutière** to research early twentieth-century insect and bird jewellery

During a recent holiday in England while admiring a collection of a relative's antique odds and ends I noticed a small cardboard box in one corner of a curio cabinet. I was intrigued by the label, and asked if I could have a closer look. I opened the box and on a layer of cotton wool was a dried (stuffed?) hummingbird in almost perfect condition, except for its eyes. Under the next layer of cotton wool there were eight green beetles of various sizes and shapes. My cousin asked if I would like to have the box and its contents. How could I refuse?

Once home, I was anxious to examine these artifacts more closely, especially the beetles (**1**), because I knew iridescent insects such as these had been used in jewellery at the turn of the century. On the front of the box is the name and address: M. & E. Natté. 44 Rua do Ouvidor, Rio de Janeiro, and on the back an inscription dated 1888. From a list of items for sale printed on the box cover which included feathers, insects, hummingbirds and butterflies, it was obvious that this shop had specialized in some rather unusual items. This started my thinking of beetle jewellery and I decided to pursue it further.

I recently read an article describing a gown worn at a ball in India in 1903 by Lady Curzon, wife of Lord Curzon, the Viceroy and Governor General of India. It was made up of silver and gold peacock feathers and the eye of each feather was set with a wing of the green scarab beetle. This gown is on display at Kedleston Hall in Derbyshire, England. I also recall seeing a Sotheby's jewellery catalogue a few years ago displaying an antique necklace consisting of a row of real hummingbird heads! Examples of this bizarre type of jewellery are shown in **2** and **3**.

1. A box of iridescent beetles. Photo by Anthony de Goutière.

2. Birds' heads mounted as earrings; possibly bee eaters, hence the motif of the bee on the mountings. English, c. 1875. Photo courtesy of V&A Images/Victoria and Albert Museum.

Some research turned up a very interesting paper by Michelle Tolini, entitled 'Beetle Abominations' published in *Nineteenth Century Art Worldwide,* Spring 2002, 1(1) (http://19thc-artworldwide.org/spring_02/articles/toli.shtml), excerpts of which follow:

"The earliest form of insect-adorned Western dress derived its inspiration from beetle-embroidered fabric from India imported by England in the 1840s and 1850s. Whereas it may have sparked some interest in the use of beetles as decoration, this type of embellishment appears to have been more of a novelty than a widespread trend. The popular interest in whole,

3. Hummingbird heads with gold beaks mounted as earrings in elaborate Victorian settings. Made by Harry Emanuel, c. 1865. Photo courtesy of V&A Images/Victoria and Albert Museum.

Gem and Jewellery History

4. A brooch utilizing the wings of the Peacock Blue butterfly from Brazil. The painting is not done on the butterfly wing but on the inside of the glass. The gold-coloured head and tail of the kingfisher is a butterfly wing of a different species. Courtesy of Cambridge Antiques, Victoria, BC, Canada. Photo by Anthony de Goutière.

5. The gold earrings are each set with a tortoise-back beetle *(cassida vlridis)* and the gold brooch is set with a jewel beetle *(sterocere aequisignata)*. Courtesy of Peabody Essex Museum, Salem, MA, USA.

6. A green beetle brooch from Thailand. The back of the body is a cabochon-cut carnelian. The underside is gold-plated metal and there are five small imitation diamonds set where the head meets the body. Courtesy of Adams and Son, Salmon Arm, BC, Canada. Photo by Anthony de Goutière.

preserved insects and birds as fashionable ornamentation appears to have begun with animal-laden hats and bonnets in Paris in the 1860s, and the style reached its peak in the 1870s and 1880s."

"The Brazil section of the 1873 Universal Exhibition in Vienna included an impressive display of beetle accessories:

"... One branch of bijouterie is certainly unique, combining the natural colour-wealth of the tropics with the unequalled taste of the French artist. In a large case, the adornment of the section, the work of M. & E. Natte, from Rio de Janiero, dazzle the eyes with the gorgeous enamel of nature in innumerable specimens of beetles set in gold as collars, earrings, and pendants."

"The wearers of these items were primarily interested in their aesthetic and fashionable appeal and, in some cases, their extreme novelty. The iridescence of the beetle bodies and the jewel-like tones of hummingbirds were not that easily replicated."

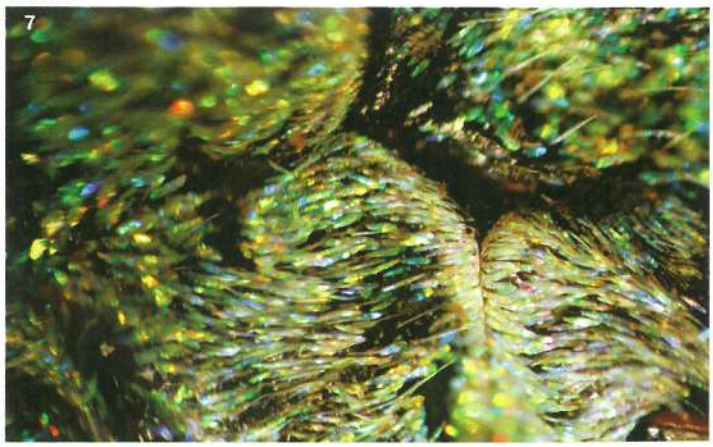
A good example of a brooch that utilized the wings of the Peacock Blue butterfly from Brazil is shown in **4**. This jewellery was popular from about 1920 until 1950 and the practice almost decimated the Peacock Blue species. However, new examples are appearing on the market and are advertised as 'naturally expired butterfly-wing' jewellery.

Examples of beetle jewellery utilizing tortoise-back beetles *(cassida veridis)* and what is usually referred to as a jewel beetle *(sterocere aequisignata)* are given in **5**. Large green beetles, mounted in inexpensive brooches and pendants from Thailand, have been seen on the market in recent years. The beetle brooch in 6 was purchased in Thailand a few years ago and is an interesting example of modern beetle jewellery. Only the head of the beetle has been used.

Except for a few missing legs and small body parts, my collection of insects (**1**) is in remarkably good condition considering they are close to 120 years old. On consulting various insect websites, I've established that the larger beetles are members of the weevil family. The smallest weevil measures 16 mm long and the largest is 24 mm long. The round-shaped beetle measures 15 mm by 12 mm. This beetle *(cassida veridis)* has been described as the 'tortoise-back'. This brilliantly coloured little insect appears to be the same variety as the beetle earrings (**5**).

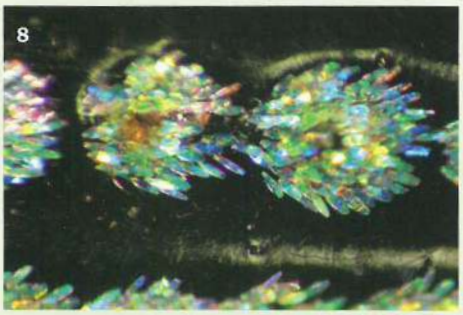
Over many years of examining and appraising all kinds of new and antique jewellery, I'd occasionally seen pieces set with beetles but had never examined the insects closely under high magnification. Curious about the rows of coloured dots on all of the beetles, I examined these insects one by one under the microscope. The dots were a revelation. Each dot was actually a cluster of hundreds of tiny flat rice-shaped platelets displaying all the colours of the spectrum and all precisely arrayed in lines on the beetle bodies. Some clusters are separate in individual hollows; other clusters have joined together giving the appearance of coloured gemstone necklaces or bracelets. Even the hair on the legs and bodies of the insects displayed glints of colour (**7**). ▶

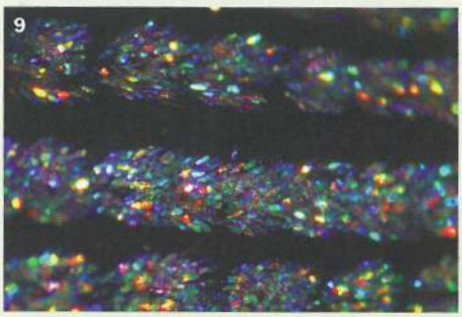
The hair on the legs of a beetle (field of view 2 mm). Photomicrograph by Anthony de Goutière.

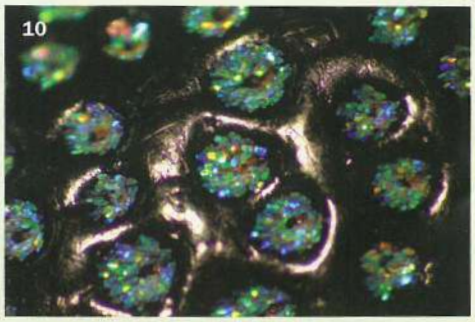


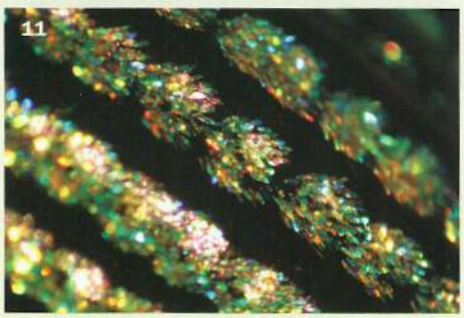
Gem and Jewellery History

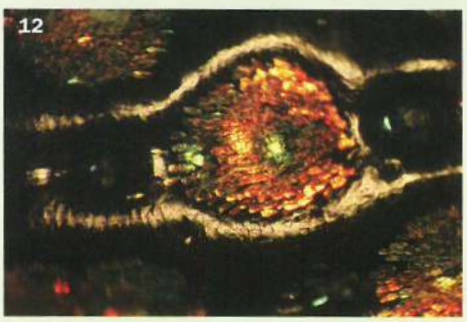
Birds, beetles and brooches (contd)

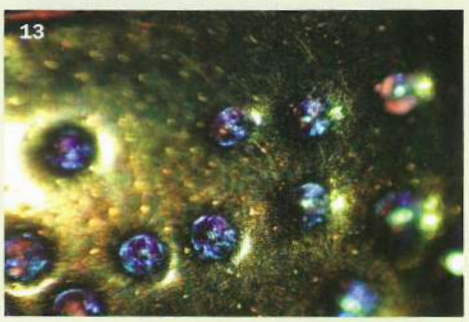








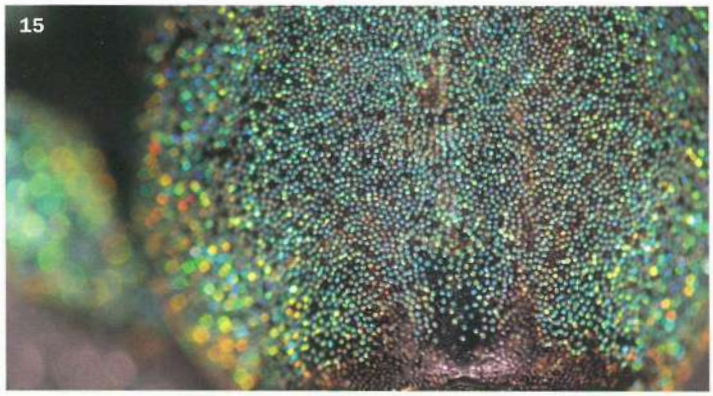




The small clusters of coloured platelets on the beetle bodies are nearly all oriented in the same direction, from head to tail, and the source of each cluster appears to be the tiny hollows or 'pores' on the insect's body (**8, 9, 10** and **11**). The largest of the beetles displayed gold-coloured platelets under direct light (**12**). The small tortoise beetle *(cassida viridis)* (**1** and set in the earrings in **5**) is different in that all the pores contain a floret of iridescent blue that resembles tiny dark-blue sapphires (**13**). Fields of view: 8, 2 mm; 9, 2.5 mm; 10, 3.5 mm; 11, 2.5 mm; 12, 2 mm; 13, 3 mm. Photomicrographs by Anthony de Goutière.

A recently acquired beetle, another weevil variety, revealed a different array of colour spots. Under magnification, the spots are small and very close together giving the appearance of fine pavé work (**14** and **15**). It's not surprising these little insects became known as jewel beetles.

14 and 15. A weevil and (below) the spots on its body under magnification. Field of view 2 mm. Photo and photomicrograph by Anthony de Goutière.



Conclusion

Fortunately for the brightly-coloured insects and birds left in the world, the practice of capturing, killing and using these tiny beautiful creatures for personal adornment diminished considerably at the beginning of the 1900s, although I have heard that in Mexico one can purchase live beetles on little chains that wander around on your clothing. Let's hope that this is just a fad and will never become popular.

Acknowledgement

Thanks to Michelle Tolini for allowing me to use excerpts from her article 'Beetle Abominations'.

Instruments used: Eickhorst Gemmological Microscope, Fibre-optic illumination. Canon EOS 20D single-lens reflex digital camera.

About the Author

Anthony de Goutière GG of Victoria BC, Canada, has been specializing in gemstone photomicrography for many years. His photographs have been published in gemmological journals around the world and his photomicrographs have twice adorned the cover of The Journal of Gemmology.

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Innovative composites 'Fusion'

Gagan Choudhary FGA of the Gem Testing Laboratory, Jaipur, India, reports on some interesting gem combinations

1: The range of innovative composites 'Fusion' used for study and described in this report. Note the range of colours in which this material is being produced. Photograph by G. Choudhary

Recently at the Gem Testing Laboratory, Jaipur, the author had the chance to examine some composites, which are being marketed as 'Fusion'. These rather eye-catching composites are not made simply to imitate a well-known gem or to mislead consumers but to provide something innovative, fresh and fancy. Various materials used to make these composites include different colours or varieties of quartz and blue topaz. This review is presented in the form of a visual guide rather than a detailed analysis.

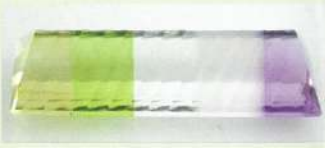
For many decades 'composite' gem materials have been made to imitate well-known gem materials like emerald and corundum, to improve the overall appearance of a gem or to provide durability for a specific gem like opal. However, there are other instances when composites have been made to create fancy materials with their own eye-catching appeal, as the author previously described in ***Midland Focus Magazine,*** 9th issue, winter 2006, pp 19-22.

Some composites examined recently by the author (1) clearly point to innovation. They all have 'concave' pavilion facets, thereby increasing the brilliance, which further enhances their appearance. These composites are being marketed as 'Fusion'

Following is a visual guide of the composites examined.

2: A doublet — pieces of citrine and amethyst imitating ametrine.

2



3a: Top view of stone (left) and pavilion (right)

3 a–c: Several varieties of quartz, viz., citrine (yellow), lemon quartz, rock crystal (colourless), rose quartz (pink) and amethyst (violet), form the components of these composites. The number of pieces varies from five in (a) to four in (b) and three in (c), giving an impression of a 'multi-coloured' stone.

3b

3c

Hands-on Gemmology

4

4: This unusual combination of blue topaz and smoky quartz gives a unique appearance to the specimen.

6

6: This interesting combination of blue topaz and amethyst is cut to enhance its appearance, and to some could resemble tanzanite.

8a

8b

8a and b: 'Canary' tourmaline may be a first impression when seeing this combination of citrine and lemon quartz. The component colours are clearly visible in the side view (b); note the difference in the colours where the yellow of citrine is visible at the left-hand side of the stone while the rest is a 'lemon' greenish yellow.

9a

9b

9a and b: This bright combination of lemon quartz and amethyst gives a distinct look to this composite. Also note the colour zones in the amethyst portion.

5a

5b

5a and b: The 'pastel' shades of this composite are produced by the combination of green quartz and blue topaz, both of low saturation. Note the reflections of blue colour in the green portions and vice versa.

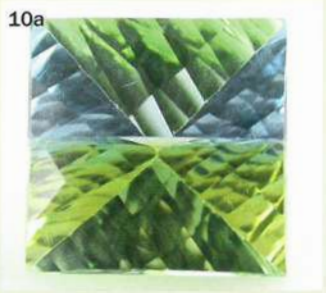
7a

7b

7a and b: Another 'pastel' combination consisting of pieces of rose quartz (pink), rock crystal (colourless) and green quartz, all of low saturation.

10 a–c: This fascinating combination of blue topaz and citrine gives rise to a third colour green (top and bottom – central area). Depending on the angle of viewing, the colours of the specimen also varied. When viewed along the junction plane both portions (topaz and citrine) were clearly visible (b), but perpendicular to the junction plane a combination of these two colours, yellowish green, can be seen (c).

10a

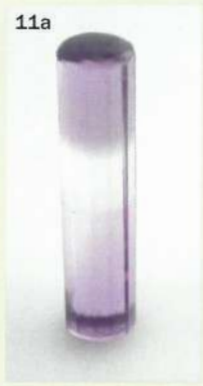


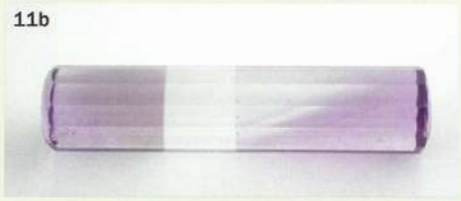
10b

10c

Hands-on Gemmology

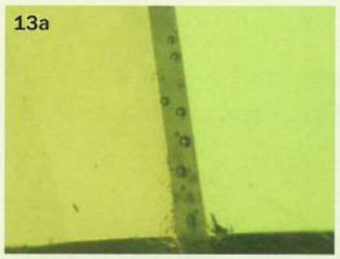
Innovative composites 'Fusion' (Contd)

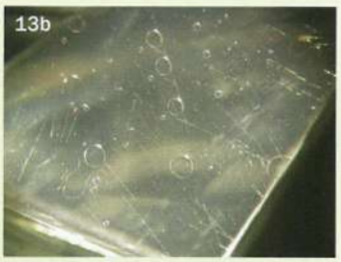


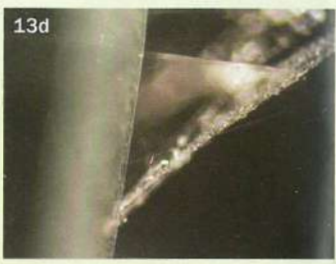


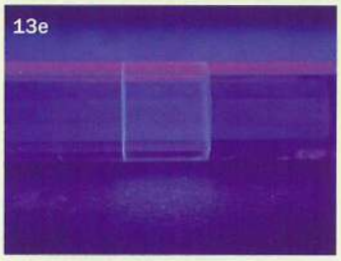
11a and b: This faceted 'pole' of quartz gives an impression of a strongly zoned amethyst (a), but perpendicular to the long axis, a sharp junction between amethyst and rock crystal (b) is clearly visible.

12: Composites? These two multicoloured specimens are not composites as described above, but natural zoned fluorites. Careful examination of colour boundaries is necessary when such stones are encountered.









13a – e: The magnification features including junction plane and features like gas bubbles, spherical (13a) and flattened (13b), dendritic patterns (13c), iridescence (13d) can conclusively identify the composite nature of the stone. Also note the sudden stoppage of the fingerprint at the junction plane in 13d. In addition to the magnification features, the junction plane may also exhibit a chalky blue fluorescence in short-wave UV (13e). Magnification: (a) 35x, (b) 45x, (c) 40x and (d) 40x. Photomicrographs by G. Choudhary.

All of the above-described composites are unique and give a fairly good idea of the new range of gems being produced. However care has to be taken when dealing with them because some can imitate other well-known gems or others could be sold as new gems.

Identification

Identification procedures followed here are similar to those described earlier in literature and are well known. One has to look for the junction plane, which appears as a sharp separation between the two or more layers. The visibility of this plane varies according to the direction of viewing. In addition, the following features may be present along the junction plane:

- Gas bubbles, spherical (**13a**) or flattened (**13b**) depending on the amount of glue used and pressure applied.
- Dendritic flow patterns (**13c**) are quite common along junction planes.
- Iridescence (**13d**) along the junction plane (left) due to the interference of light; also note the sudden truncation of a 'fingerprint' inclusion (right) at the junction plane.
- In addition to these visual features, some glues used along the junctions may fluoresce under short-wave ultraviolet giving a chalky blue to white colour (**13e**).

Conclusions

These gem materials are being marketed as 'Fusion' — a term that reflects their construction, and fulfils a need in the trade to create something fancy. Careful examination of their colours and colour boundaries should enable their identification and distinction from other gems.

Acknowledgements

The author is very grateful to Shyamala Fernandes and Frank Fernandes of Neethi's, Jaipur, for the loan of stones for study.

About the Author

Gagan Choudhary MDGI FGA has been the Assistant Director of the Gem Testing Laboratory in Jaipur, India, since 2001. Currently he is involved in educational, certification and research activities of the laboratory.

Gem Discovery Club

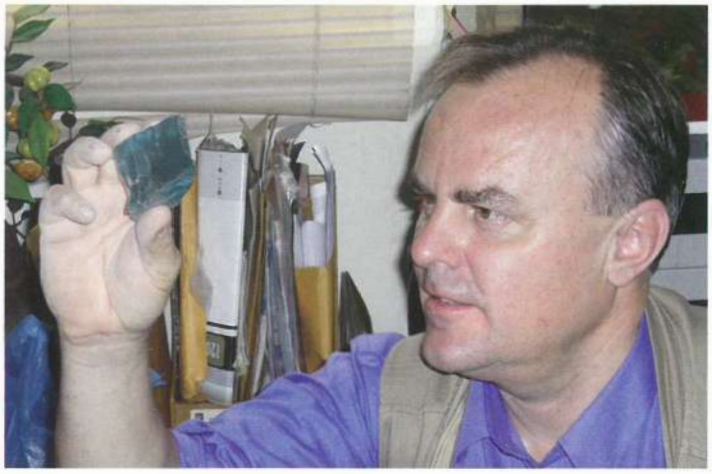
Exploring Zambian emeralds and aquamarines

On 18 March gem merchant and adventurer Guy Clutterbuck gave members a fascinating insight into the mining of aquamarine and emerald in Zambia, the two most important gems from the country in terms of value. Emeralds with deep saturation and lively appearance are produced from mines in an area bordering the Congo, whilst aquamarines similar in hue to the beautiful Santa Maria blue are mined in the Eastern Province near the border with Malawi.

Guy spoke from personal experience; he had been buying the rough directly from the mines for over 25 years, and had invested in two aquamarine mines. During that time he had lived in the Zambian mining villages and had built up a good rapport with the miners over the years. Guy showed a video he had taken of one of the mines and the very basic methods used for extracting the stones. The mine covered an area about the size of an Olympic swimming pool that had been dug by hand, explosives being used only occasionally and with limited success as they tend to destroy more material than they expose. The chief of the area owns the mine and although the central government grants licences for individual plots his approval is crucial.

The material produced is cut and polished in the Far East. Guy explained a system he has devised to track individual stones through the various cutting and polishing processes to ensure that no stones go astray. All of his aquamarines are untreated, as are his top-quality emeralds.

Guy followed his presentation by showing participants a selection of Zambian emeralds so that they were able to appreciate the clarity and colour of the goods and compare a top-quality untreated stone with good quality lightly-treated examples.



Guy holds a large uncut aquamarine crystal (above) and samples of cut untreated aquamarine (below). Photos courtesy of Guy Clutterbuck.

Rough and cut emeralds (left and below). Said Guy: "As they are to be worn next to the skin, that is how I like to display them." Photos courtesy of Guy Clutterbuck.

Hands-on Gemmology

Gem Discovery Club (contd)

Kashmir sapphire mines

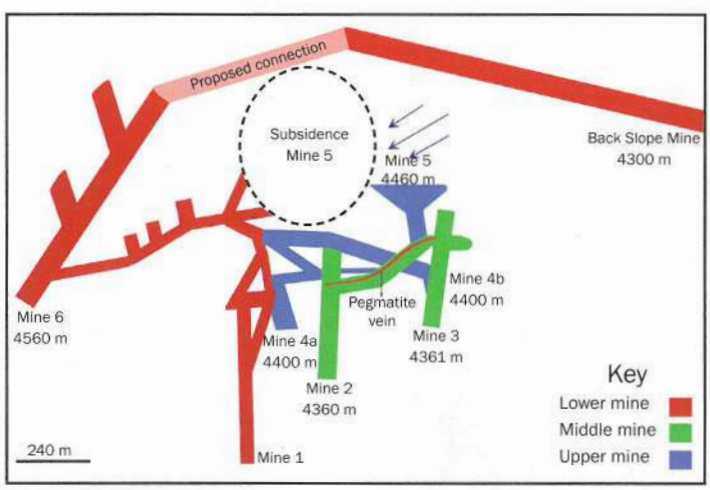
On 4 March Haji Abdul Majid Butt, a geologist and former general manager of the Jammu and Kashmir state company J & K Minerals Ltd, gave Gem Discovery Club members a fascinating talk about the Kashmir sapphire mines and their recent working. The following is a slightly shortened version of the paper prepared by Mr Butt.

Their fine peacock-neck blue has traditionally established Kashmir sapphires as the world's finest. High-altitude inaccessibility with poor communications and severe climate conditions hamper work at the world-famous Kashmir sapphire mines, situated at an altitude of 4742 m above sea level. The mines, a plan is which is given below, are in the area of Padder, Tehsil Kishtwar, District of Doda, north-east of Jammu. These mines have been worked since 1888 and the present leaseholder is J & K Minerals Ltd. Since 1963 some revenue has been earned by the screening of sapphire from earlier mine tailings. Partial mechanization of the mines in 2001 allowed more scientific and modern environmental management. The area being mined in recent times is slightly below the original 1888 mine. The mines are some 116 km from Kishtwar. Now a fair weather motorable road links Kishtwar to Atholi, a journey of 60 km, but for the rest of the journey ascent is on foot or horse, up a dangerous mule track with precipitous drops. The base camp of Sumcham (altitude 3108 m) with little habitation is the last village en route.

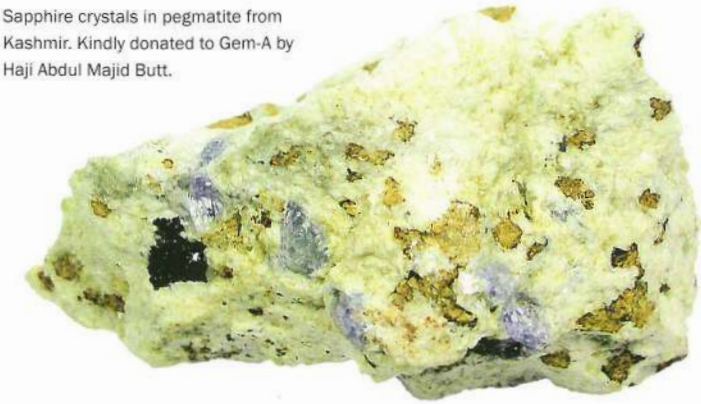
These mines lie at latitude 33° 25' 30" N and longitude 76° 23' 15" E (UT Sheet No.52 C/7). The topography of the area is characterized by snow-covered mountains rising to more than 7000 m, with deep gorges and U-shaped glacier valleys. The elevation of the mine starts at 4500 m and runs up to 5029 m. The climate of the area is very severe and the work season only runs from 1 July to 10 September. During this period there are frequent rain showers, but for the rest of the year there is perpetual snowfall.

Geology

The whole Padder area is basically a sedimentary region consisting of argillaceous (clay grade) rocks which have undergone recrystallization by regional metamorphism. Chlorite is the recrystallized mineral to be encountered initially, followed by biotite which is found in these rocks right up to the mines. Gneiss and schist dominate the mining site and well-developed garnet is found in the area. The age of formation is difficult to ascertain, but the presence of marble with graphite may point to a Cambrian to Silurian origin for the original sedimentary rock — i.e. some time between about 420 and 540 million years ago.



Plan of the sapphire mines at Padder. Based on the plan of J & K Minerals Ltd.



Sapphire crystals in pegmatite from Kashmir. Kindly donated to Gem-A by Haji Abdul Majid Butt.

The sapphire exists in two main occurrences:

(a) Intrusive:
In pegmatite veins and lenses which intrude actinolite-tremolite and biotite schists. Sapphire occurs along with tourmaline, plagioclase felspar and mica.

(b) Disseminated in host rock:
Sapphire and ruby crystals are also found in schists at the mouth of Back Slope mine.

The length of the crystals ranges from 3 mm to 50 mm and they vary in width from 9 mm to 13 mm. The majority of the crystals are 3 mm to 30 mm long and are very transparent. The colour ranges from colourless to velvety blue to blue. Dichroism is prominent. Larger crystals are typically opaque and dark. Some crystals are parti-coloured blue and rosy pink and etch marks in the form of striations are present. Asterism, where present, is due to minute cylindrical cavities which lie parallel to prism faces.

Production and reserves

Early records reveal that the locals used to barter sapphire for salt. General Zorawar Singh, following this trade route during his Ladakh campaigns in the 1830s, was the first Government official to record these mines. However, the mines have only been economically worked since 1888 and, following some Government work there, were worked by private entrepreneurs. From 1963 J&K Minerals Ltd took over the working and development of these mines.

Production figures follow, but from 1888 to 1951 there are no authoritative records of output, and only since 1963 have formal records been kept.

1907 to 1962	62,200 gm
1963 to 1998	15,000,792 gm
1998 to 2001	9,303 gm
2001 to 2007	21,000 gm

Precious stone deposits are notoriously difficult to evaluate. There are potentially high rewards, but also high degrees of risk involved in

Hands-on Gemmology

making an investment based on sparse data. Nevertheless, J & K Minerals Ltd is optimistic about future output from the mines. An attempt has been made to establish probable sapphire reserves at Paddar based on the geology, and these are estimated at about 450 kilos of gem-grade sapphire.

The remote, high altitude and inhospitable location of Kashmir sapphire mines pose huge logistical problems, but as J & K Minerals Ltd adopt more modern mining methods, the mines may prove one of the largest biggest revenue earners of Kashmir in the future.

Readers may also be interested in a reprint of Tom De LaTouche's 'The Sapphire Mines of Kashmir' from the *Records of the Geological Society of India*, May 1890, 23(2), pp. 59 – 69 at http://palagems.com/kashmir_sapphire.htm

From Yakutia with Love

On Tuesday 8 April, Gem Discovery Club members were led on a journey of discovery to Yakutia and into the secretive world of Russian diamonds. In a talk entitled 'From Yakutia with Love', Alexandra Russell-Stoneham (pictured right) presented information about the Russian diamond industry gained when she researched the subject for her dissertation. She explained that the more she researched, the more secrets and intrigues she uncovered. Russia produces 25 per cent of the world's rough diamonds, but in the past it had been notoriously difficult to uncover much information on output. However, in 2005 some information was released in order for Russia to be able to chair the Kimberley Process.

According to most sources, 99 per cent of Russia's diamonds come from Yakutia, known as the Sakha Republic since 1992, a region the size of India in the north east of Russia. It is freezing in winter; steel snaps, rubber tyres shatter and oil freezes. In the few months of summer the top layer of permafrost melts, the land turns into a swamp and the vast open-cast mines, as at Mirny, are liable to flood. Nevertheless, since 1957 the region has produced about 530 million carats of diamonds worth some US$50 billion.

Serious exploration for diamonds in Russia had begun in 1937 and commercial mining was pursued to supply the strategically vital industrial diamonds in World War II and later for the Russian military and space industry. During the Cold War a boycott was imposed on exporting industrial diamonds to Russia and so Stalin made the search for diamonds within Russia a State priority. Diamond deposits were discovered in Yakutia. The industrial diamonds mined were vital for Russia's industry, but gem quality diamonds were neither a priority nor in line with socialist ideology regarding luxury. However, they were a valuable export commodity. The nature of the original deal struck between Sir Philip Oppenheimer of De Beers and the Soviet Union during the Cold War for the purchase of gem-quality rough is still unclear, but with the international boycott of South Africa in the 1960s, a new route to market was needed and a new company called City & West East Ltd was used to quietly channel rough diamonds from the Soviet Union to De Beers, despite the Soviet Union's public assertion that it refused to sell to De Beers' Central Selling Organisation (CSO).

De Beers' arrangement had been only for gem-quality rough diamonds and Russia took advantage of this. In the late 1960s perfectly faceted and polished Russian diamonds began to appear in Antwerp and in America and Japan, a threat to the diamond cutting centres of Antwerp and Tel Aviv and to the CSO. There are no statistics on the value or volume of these fine, Russian-cut diamonds — termed 'silver bears' — exported from Russia.

When Yakutia became a Republic within the Russian Federation in 1992, a new body had to be established which could enter into a contract with De Beers. So that year, President Yeltsin created Alrosa a closed joint stock company owned by Russia and Yakutia, with Russia holding the controlling shares. Alrosa is the second largest diamond mining company in the world after De Beers.

The last formal agreement between De Beers and Alrosa was rejected by the European Commission on competitive grounds and in 2003 Alrosa and De Beers made an agreement to phase down sales until a sustainable US$275 million per annum was reached down from $800 million per annum. However, and to Alrosa's disapproval, De Beers later made an agreement with the European Commission to cease buying from Alrosa. Nevertheless, De Beers and Alrosa have recently concluded a joint diamond prospecting and exploration agreement, to include activities in Africa and Russia.

Alexandra, formerly with Tiffany & Co., now works for a major diamond broker.

Education

Designers awarded Gem-A Scholarships

The Goldsmiths' Craftsmanship and Design Awards 2008

Two jewellery designers, Lizzie Rasche and Zoë Harding, won the Gem-A Diamond Scholarship in this year's Craftsmanship and Design Awards, part of the Goldsmiths' Craft & Design Council's programme to promote excellence amongst those engaged in the trade. The awards ceremony and exhibition held at Goldsmiths' Hall in March revealed today's talent and the designers of the future.

Gem-A Diamond Scholarship applicants are judged not only on the originality and quality of their designs, but also on written submissions explaining how they would benefit from the Scholarship. The designs submitted by this year's winners backed by their written submissions convinced the panel that they could gain most from Gem-A's approach to practical matters to advance their design work. Ian Mercer, Gem-A's education director, later remarked that Gem-A's style of training emphasizes the art of observation plus skill in accurate reporting of those observations, so important in all areas of the trade, not least in jewellery design.

Gem-A is pleased to continue its support for the future of the industry by awarding Practical Diamond Certificate courses and examinations as Scholarships.

Gem-A Scholarship winners Zoë Harding (left) and Lizzie Rasche with Ian Mercer. Photo courtesy of Steve Tanner.

Lizzie Rasche

Photo courtesy of Bill Burnett Photography

Lizzie's winning entry demonstrates her imaginative use of gemstones.

After completing her BA Hons degree in jewellery design, Lizzie developed her interest in gems, their forms and optical effects within jewellery design. She qualified for her Diploma in Gemmology with Distinction and is a Fellow of the Association (FGA).

"Gems and jewellery are a big part of my life", said Lizzie. Hoping to continue her development into valuation, she added: "I believe the Gem Diamond Diploma would be an invaluable tool in the process of moving towards this goal."

Zoë Harding

Research into heraldic art had been Zoë's inspiration for the design of her winning entry, an emblazoned bird pendant.

After graduating with BA Hons in metalwork and jewellery, Zoë set up her own business designing and making contemporary gem-set jewellery. She also works as a Design Assistant for Vivienne Westwood in London.

Photo courtesy of Bill Burnett Photography

Said Zoë: "For a long time I have wanted to learn more about diamonds and confidently select stones using only a 10x loupe." She sees the Scholarship as the first step in putting together a useful collection of diamond set jewellery.

Gem-A Centenary Conference and The 2008 European Gemmological Symposium

Saturday 25 – Sunday 26 October 2008

The Hilton London Kensington

Gem-A is proud to be hosting this year's European Gemmological Symposium in conjunction with our centenary celebrations. This dynamic two-day conference will highlight both the history of gemmology and the jewellery trade, and will discuss tips and new technologies that are relevant to today's gemmologists. Our gathering of international speakers and members promises to make this an historic event.

Day 1: The Foundations of Gemmology

There will be a range of papers reviewing the history of gemmology from many perspectives, including the history of diamonds, Portuguese gems, the history of inclusions, the life of George Frederick Kunz and the gems in the Swedish Crown Jewels.

Speakers include: Sandra Brauns, Rui Galopim de Carvalho, Al Gilbertson, John Koivula, Yvonne Markowitz and Jack Ogden.

Day 2: Practical Gemmology in the Modern World

Papers will discuss the practical use of gemmological instruments which are significant to gemmologists today and the analysis of certain gem materials, as well as new developments and discoveries.

Speakers include: Emmanuel Fritsch, Henry Hänni, Ulrich Henn, Alan Hodgkinson, Michael Krzemnicki, Duncan Parker and Brad Wilson.

Conference Dinner/Dance

A Conference Dinner/Dance will be held at the Hilton London Kensington on the Saturday evening.

Fees and booking details

The fee for the Conference, to include lunch, is £135.00 plus VAT for one day, or £255.00 plus VAT for two days. An early-bird discount of £10.00 per day may be deducted by those booking by 31 August. Tickets for the Dinner/Dance are £35.00 plus VAT.

For full details of the event, how to register and how to book a room at the Hilton, visit our website at www.gem-a.com or contact Olga Gonzalez at Olga.Gonzalez@gem-a.com or tel: +44 (0)20 7404 3334. Details of sponsorship are available on request.

Photo: Kunzite and spodumene crystals © L Kuchn

Salesroom News

Antique Indian pearl necklace

Arab singer Umm Kulthum's 'most treasured jewel' sells for $1,385,000 in Christie's Dubai sale

Umm Kulthum wearing the necklace, c. 1970.

An antique Indian natural pearl necklace, which had been owned by Umm Kulthum (1904-1975), unquestionably the greatest Arab singer of the twentieth century, sold at Christie's Dubai sale on 29 April, for $1,385,000, over ten times the estimated sale price of $120,000.

Known as 'The Shining Star of the Middle East' (Kawkab El Sharq), Umm Kulthum's importance in the Arab countries was so great that she was received with the same ceremony as heads of state. By 1948 her fame came to the attention of Gamel Abdel Nasser, who was to become president of Egypt. Nasser's speeches and other government messages were frequently broadcast immediately after her monthly concerts, which were listened to avidly by the masses.

Umm Kulthum was relentless in her charitable work and was the spokeswoman for numerous good causes. She advocated governmental support of Arabic music and musicians, and after the 1967 Arab–Israeli war she toured throughout the Arab world giving concerts and donating the proceeds to the Egyptian Government. Her funeral in 1975, led by the presidential court, drew more than four million people to the streets of Cairo.

The nine-row pearl necklace was gifted to Umm Kulthum by His Highness Sheikh Zayed Bin Sultan Al Nahyan, the late ruler of the UAE, in the early 1970s. It was offered for sale by descendents of the famous singer who remember how she used to treat the necklace with absolute care as it was one of her most treasured jewels.

Designed in the traditional Indian 'Satlada' style in, the necklace (c. 1880) comprises approximately 1888 pearls with multi-coloured enamel and white stone detail. The necklace was accompanied by report No. 0128010 dated 03 March 2008 from the Gem Testing Laboratory of Great Britain (Gem-A) stating that extensive samples are natural pearls with one beaded cultured pearl.

The antique Indian pearl necklace in the 'Satlada' style and (inset) detail of the reverse of the piece. © Christie's Images 2008.

The Flame Queen

A famous opal, displayed in London in 1981 to mark Gem-A's Golden Jubilee celebrations, to be auctioned in America

An important opal, extraordinary not only for its large size (263.18 ct) but also for its unusual shape and colour pattern, the Flame Queen is to be the highlight of a Natural History auction by Bonhams & Butterfields in June. The oval opal, with a flat central dome surrounded by a blue-green band, giving it the appearance of a fried egg, changes colour when viewed from different angles.

The Flame Queen opal was discovered in 1914 at the Bald Hill Workings in Lightning Ridge, Australia, by three partners, Jack Phillips, Walter Bradley and Joe Haggarty. Speculating at Lightning Ridge was a risky venture and these miners had begun working the land after another miner had abandoned his plot to fight in World War 1. After completing a tunnel 30-feet down, traditionally 'opal level', the dig appeared worthless to Haggarty. The clay revealed none of the telltale colour that indicates the presence of gemstones. Haggarty and Bradley then attempted to redirect the digging vertically — a dangerous endeavour that could result in a collapse of the entire site.

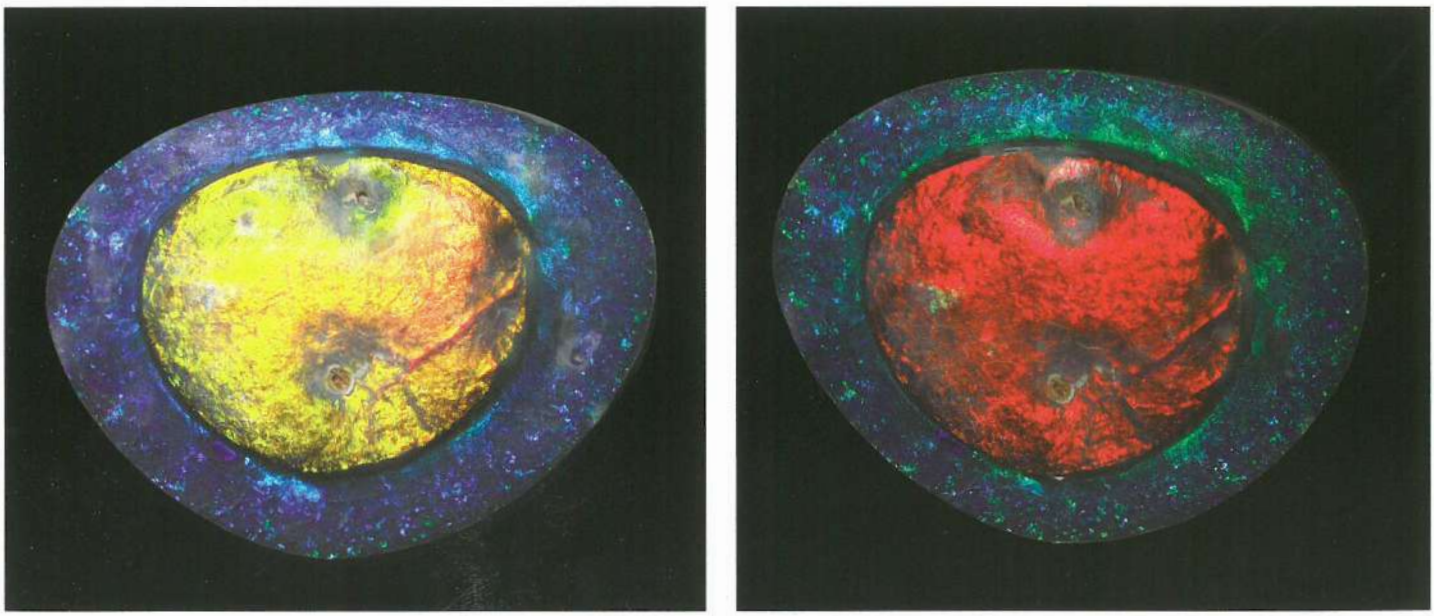
Almost 35 feet below the surface, in a 2 foot wide tunnel, Bradley, suffering from lack of ventilation and light, discovered a 'great nobby', that is an opal nodule that is clay-like in composition filled with opal-producing material. He signalled his crew to hoist him up to examine the stone in daylight.

Bradley was the most skilled lapidary of the three partners and was entrusted to polish and cut the rough stone. His labours produced a brilliant red-domed raised centre surrounded by a strong expanse of green-blue border. Exhausted and broke, the miners sold the stone in 1914 to a gem buyer for a reported £93. It has been estimated that the opal could realize as much as $150,000–250,000 in the June 2008 sale.

The stone later formed part of the famous Kelsey Newman Collection and was sold by Christie's in an auction in Geneva in 1973 for £20,000. It was bought on behalf of a client by David Callaghan of Hancock & Co.

The Flame Queen has been displayed twice in London, the first occasion being during the coronation of King George VI in 1937. The second was in 1981 when David Callaghan, newly appointed as Chairman of the Gemmological Association of Great Britain, negotiated with his client for the stone to be exhibited at the Geological Museum, South Kensington, to mark the Golden Jubilee celebrations of the Association.

The Flame Queen will be the highlight of an opal collection on offer in Bonhams & Butterfields' simulcast Natural History sale on 22 June from San Francisco and Los Angeles salesrooms. Go to www.bonhams.com for further information.



The remarkable change of colour of the Flame Queen when viewed in different angles. Photographs courtesy of Bonhams & Butterfields.

Salesroom News

Celestial jewels

Emma McMillan of Lyon & Turnbull explains some of her criteria for dating late nineteenth-century diamond-set brooches.

Crescent moons (often associated with Diana the goddess of hunting), sunbursts, stars and comets were popular motifs for brooches and pendants throughout the eighteenth and nineteenth centuries. Close examination is essential in order to determine the age of brooches, such as the two illustrated (highlights of Lyon & Turnbull's Fine Jewellery auction held on 28 May).

The cut of the diamonds, described as old European, indicates manufacture during the late nineteenth century. Prior to this date, and the introduction of mechanization, diamonds were usually cut with a squarer or cushion-shaped outline. The discovery of diamonds in South Africa in 1867 resulted in an increase in the number available, reflected in these pieces by the well-matched graduated stones.

Furthermore, until the beginning of the nineteenth century gems were still most typically mounted in closed settings. This did not allow light through the back but enabled jewellers to enhance, match and modify the gem's colour through the use of coloured foil backings. However, it is often thought that a closed setting reduced the brilliancy and fire of a diamond. As a result, cutting techniques developed to reveal the importance of light to the brilliancy of diamonds. Jewellers also began to produce more open collets and claw settings, as was the case in these examples.

In both of these brooches the diamonds are mounted in a laminate of gold back and a silver-coloured front. This silver-coloured front on such jewellery can be silver or a silver-gold alloy to enhance the whiteness of the diamonds, while the gold back prevented staining of skin or clothes.

Finally the design of the brooches, particularly that of the star, offers another clue to the date of manufacture. Late nineteenth-century stars are generally more three-dimensional in form than earlier examples. Often of elaborate design, the star brooches may incorporate six, eight, twelve or even sixteen points, and may be decorated between each set of arms with a single diamond set at the end of a knife bar, as in this example.

Generally Victorian items of jewellery, especially if set with large diamonds, continue to sell well at auction. The crescent form brooch (main diamond approximately 1.81 ct) was estimated at £5,000-£6,000, while the diamond-set star form brooch (centre stone approximately 1.25 ct) with additional pendant fittings, was estimated at £2,400-£2,800.

Auction Houses

Photographs courtesy of Lyon & Turnbull.

Listed is a selection of auction houses specializing in jewellery. Visit their websites for details of forthcoming sales.

Bonhams	**www.bonhams.com**
London, Knightsbridge	t: 020 7393 3900
London, New Bond Street	t: 020 7447 7447
Edinburgh	t: 0131 225 2266
Los Angeles	t: +1 323 850-7500
New York	t: +1 212 644 9001
San Francisco	t: +1 415 861-7500
Lyon & Turnbull	**www.lyonandturnbull.com**
Edinburgh	t: 0131 557 8844
Glasgow	t: 0141 333 1992
London	t: 020 7930 9115
Christie's	**www.christies.com**
London, South Kensington	t: 020 7930 6074)
London, King Street	t: 020 7839 9060
Amsterdam	t: +31 (0)20 575 5255
Dubai	t: +971 (0)4 425 5629
Geneva	t: +41 (0)22 319 1766
Hong Kong	t: +852 2521 5396
Milan	t: +39 02 303 2831
Beverly Hills	t: +1 310 385 2600
New York	t: +1 212 636 2000
Fellows & Sons	**www.fellows.co.uk**
Birmingham	t: 0121 212 2131
Sotheby's	**www.sothebys.com**
London, New Bond Street	t: 020 7293 5000
Geneva	t: +41 (0)22 908 4800
Milan	t: +39 02 295 001
New York	t: +1 212 606-7000
Hong Kong	t: +852 2524 8121
Woolley & Wallis	**www.woolleyandwallis.co.uk**
Salisbury, Wiltshire	t: 01722 424500

Crystal Balls

The plot of the recently opened Indiana Jones movie, 'Indiana Jones and the Kingdom of the Crystal Skull', revolves around a race to find the magical ancient Mayan rock crystal skulls which, naturally, will somehow save the human race. It is sad to relate that in recent years experts have pretty well unanimously condemned the actual surviving crystal skulls that have been scientifically examined, in museums and private collections, as fakes. Research shows that these so-called 'Mayan' skulls began to appear on the market in the nineteenth century. To date, a truly ancient example has not come to light in an official excavation.

As an example, the famous crystal skull in the British Museum — which graced many a postcard in the past, despite doubts as to its age — was studied in the museum's research department. It was concluded that the rock crystal was probably from Brazil and that neither the carving nor the high surface polish were consistent with ancient Pre-Columbian practice. This skull, like several others, passed through the hands of the French dealer Eugène Boban. It was bought at auction by Tiffany & Co. in New York and purchased from them by the British Museum.

However, one enigmatic example of a crystal skull may have a more authentic Mayan history. It was seemingly made more in line with ancient technology and was supposedly discovered in the mid 1920s by Anna Le Guillon Mitchell-Hedges under an altar in a temple in Belize (then British Honduras). She was the adopted daughter of the F.A. Mitchell-Hedges, a colourful adventurer who spent time in Central America and has been variously described as a mercenary, spy, explorer, crocodile hunter and prisoner of Pancho Villa. He was even sponsored by the UK's *Daily Mail* and donated finds to the British Museum. The *Daily Mail* serialized accounts of his life and adventures which, as the *Mail* recently admitted, "presented such a daredevil, he almost makes Indy [Indiana Jones] look like an accountant." His books do little to dispel this image — one published in 1924 (and translated into several languages) was called *Battles With Giant Fish* and his later autobiography was entitled *Danger, My Ally*. Many assume that Mitchell-Hedges was the true-life inspiration for the fictional Indiana Jones.

Jack Ogden

Where there's Brass...

Those interested in the development of chemical methods in the characterization of precious metals might like to learn of an early instance of analysis by a form of paper chromatography. In his *Oriental Commerce, or, The East India Trader's Complete Guide* (1825) William Milburn warned merchants that in Malaya and Borneo gold dust was sometimes adulterated with brass filings. He advised his readers to spread the supposed gold dust on a sheet of paper that had been moistened with stale urine. If brass filings were present they would impart a blue stain to paper.

Bling Towns

A recent survey by Halifax Home Insurance in the UK has established that in total Britons own about £52 billion worth of jewellery, with the average British home containing jewellery to the value of £1,986. Remarkably it was determined that 11% of Brits own £5,000 worth of jewellery or more. Things vary from town to town, of course. Northampton leads the pack with the average local wearing £469 worth of jewels a day.

Flux

The use of borax to 'heal' fissures in rubies is well known, although this treatment is all too often confused with glass filling in the trade. At elevated temperatures the borax acts as a flux, dissolving the ruby on the internal fissure surfaces. This then recrystallizes and in effect heals the fissure with synthetic ruby. The treatment is best known for its almost universal use on rubies from the Mong Hsu mines in Burma and first started to come to the industry's attention in the early 1990s. However, was this treatment ever used at an earlier date on rubies from other sources? I do not know of cited examples, but it is worth noting that by the end of the eighteenth century mineralogists were well aware that ruby could be fused using borax as a flux and by the 1840s borax was being used as a flux in early experiments to grow synthetic ruby.

Upcoming Events

Gem-A Centenary Dinner

Celebrating One Hundred Years of Gemmological Education

Thursday 3 July 2008, Goldsmiths' Hall, Foster Lane, London, EC2V 6BN

The Gemmological Association of Great Britain is proud to announce our Centenary Dinner, which will be held from 7:00 to 11:00 pm on Thursday 3 July in the magnificent Livery Hall at Goldsmiths' Hall in the City of London. The dinner will be a joint charity fundraiser for our educational aims, as well as a celebration of the past one hundred years of gem education, innovation and trade.

Full details of the event are given on p. 2

To find out about sponsorship opportunities for this important event contact Olga Gonzalez at olga.gonzalez@gem-a.com

Hong Kong Graduation and Awards Dinner

Tuesday 16 September

Royal Palace Chinese Restaurant, Kowloon

Timed to coincide with the Hong Kong Jewellery and Watch Fair

Gem-A Centenary Conference and 2008 European Gemmological Symposium

Saturday and Sunday, 25 and 26 October

The Hilton London Kensington

Details of the event are given on p. 27

Gem-A Graduation Ceremony

Monday 27 October

Goldsmiths' Hall, London

Nature's treasure: Minerals and Gems

Sunday 7 December

The Flett Theatre, The Natural History Museum, London

A joint Gem-A/Mineralogical Society one-day seminar.

Gem-A Annual General Meeting and Surviving a Life Sentence at Christie's A talk by David Warren

Monday 30 June 2008, at 5:45 for 6:00 pm
The National Liberal Club, Whitehall Place, London SW1A 2HE

The AGM will be followed by a presentation by our guest speaker, David Warren, Jewellery Department head of Christie's London King Street and Dubai. In his talk David Warren will share thirty years of anecdotes and tales of working with the firm.

Visit our website from 9 June for further information on the meeting and to download the AGM agenda, annual report and accounts.

Gem-A Branch Events

Midlands Branch

Contact: Paul Phillips
02476 758940
email:
pp.bscfgadga@ntlworld.com

Friday meetings will be held at the Earth Sciences Building, University of Birmingham, Edgbaston.

Saturday 16 June
Summer Luncheon Party

North West Branch

Contact:
Deanna Brady 0151 648 4266

Meetings will be held at YHA Liverpool International, Wapping, Liverpool L1 8EE.

Thursday 19 June
Gem Evening
A hands-on session on natural, treated and synthetic gemstones.

Thursday 18 September
Fakes and Forgeries in the Silver Markets
ANDREW SPICER

Scottish Branch

Contact:
Catriona McInnes
0131 667 2199
e-mail:
scotgem@blueyonder.co.uk

Website:
www.scotgem.demon.co.uk

Meetings are held at the British Geological Survey, Murchison House, West Mains Road, Edinburgh, EH9, unless otherwise stated.

Wednesday 11 June
The Identification of Colourless Stones in jewellery
GWYN GREEN

South East Branch

Contact:
Liz Taylor on 07733 112849
email: liz@ga-seb.org

Saturday 14 June
Viewing of a private collection of African gems and minerals.

For the latest information on Gem-A events visit our website at www.gem-a.com

Gem-A Diploma in Gemmology

EIGHT-MONTH LONDON DAYTIME COURSE

- This eight month course includes both the Foundation and Diploma sections of the gemmology course, and enables students to see and test a wide range of gem materials under the supervision of experienced Gem-A tutors.
- Classes are held at Gem-A's London headquarters from 10:00 am to 5:00 pm on Tuesday, Wednesday and Thursday* each week.

* Supported study

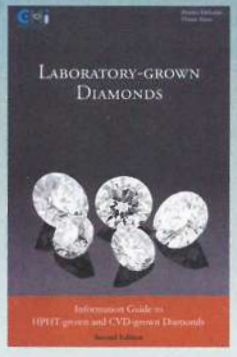
The course fee of £6895 (payable in five monthly instalments of £1379 commencing July) includes tuition and practical classes, access to study stones, course materials, the Foundation and Diploma examination fees, and a one-year subscription to *Gems & Jewellery.*

Start date for the next course: **30 September 2008**

For further information contact Gem-A Education on **+44 (0)20 7404 3334 email education@gem-a.com**

Details of this and other gemmology and diamond courses run by Gem-A are given on our website at **www.gem-a.com**

DIAMONDS: NEW TITLES FROM GEM-A

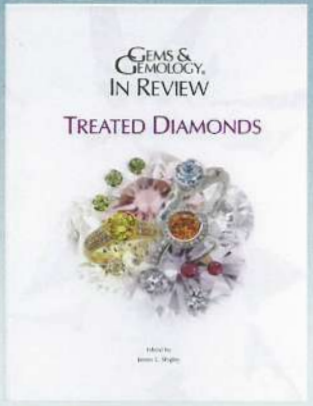


LABORATORY-GROWN DIAMONDS
Information Guide to HPHT-grown and CVD-grown Diamonds

Branko Deljanin & Dusan Simic

GHI, Mumbai. 2nd edition 2007

£12.50*

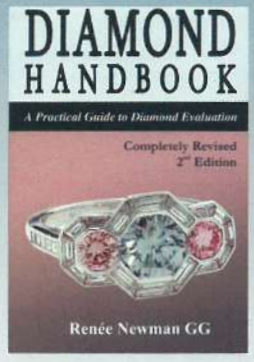


TREATED DIAMONDS
Gems & Gemology In Review

Edited by
James E. Shigley

The Gemological Institute of America, Carlsbad. 2008

£49.50*



DIAMOND HANDBOOK
A Practical Guide to Diamond Evaluation

Renée Newman

International Jewelry Publications, Los Angeles. 2nd edition 2008

£17.50*

* Plus postage and packing

Available from: Gem-A, 27 Greville Street (Saffron Hill entrance), London EC1N 8TN
t: +44 (0)20 7404 3334 f: +44 (0)20 7404 8843 e: shop@gem-a.com w: www.gem-a.com

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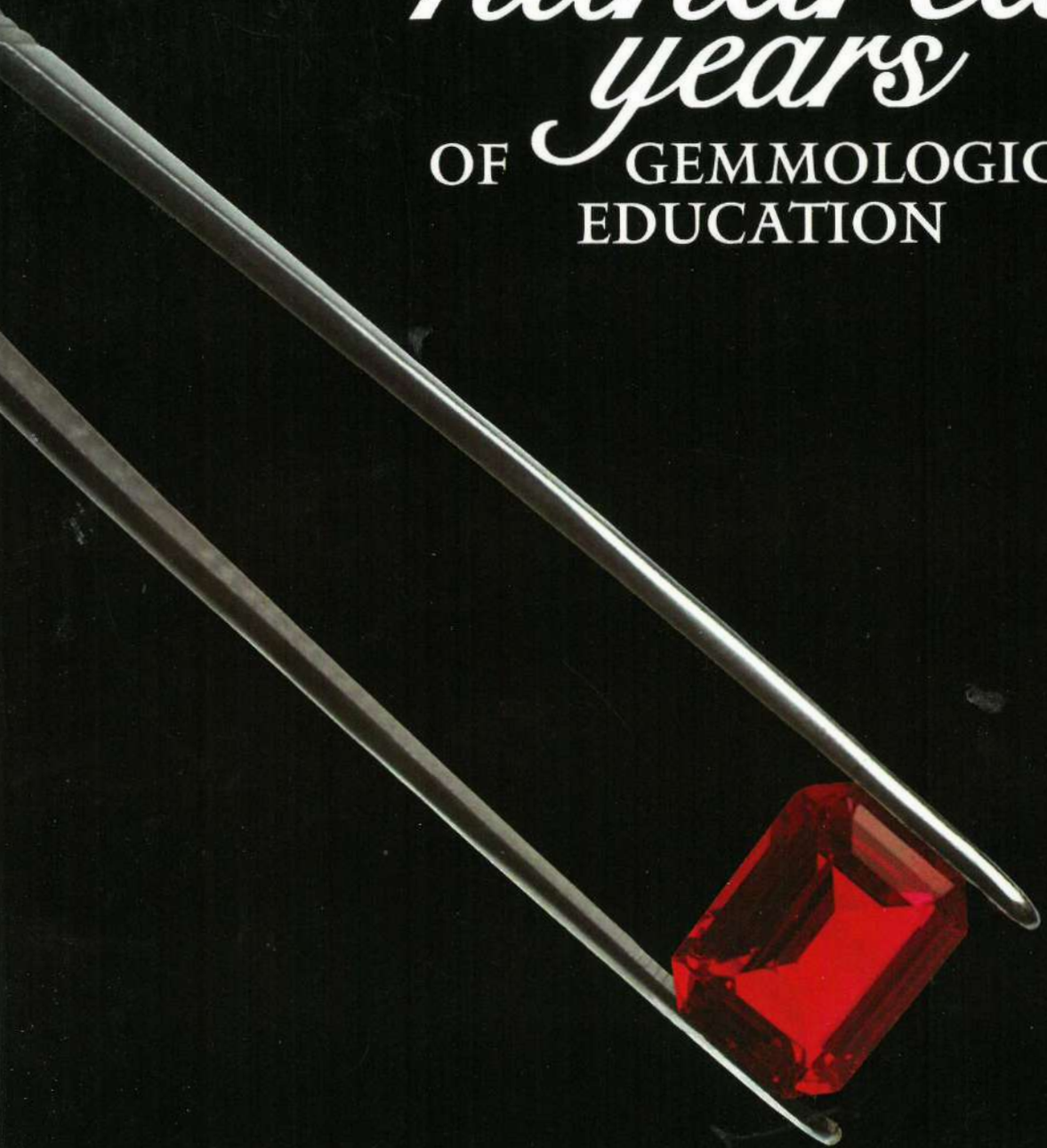

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