Gems&Jewellery

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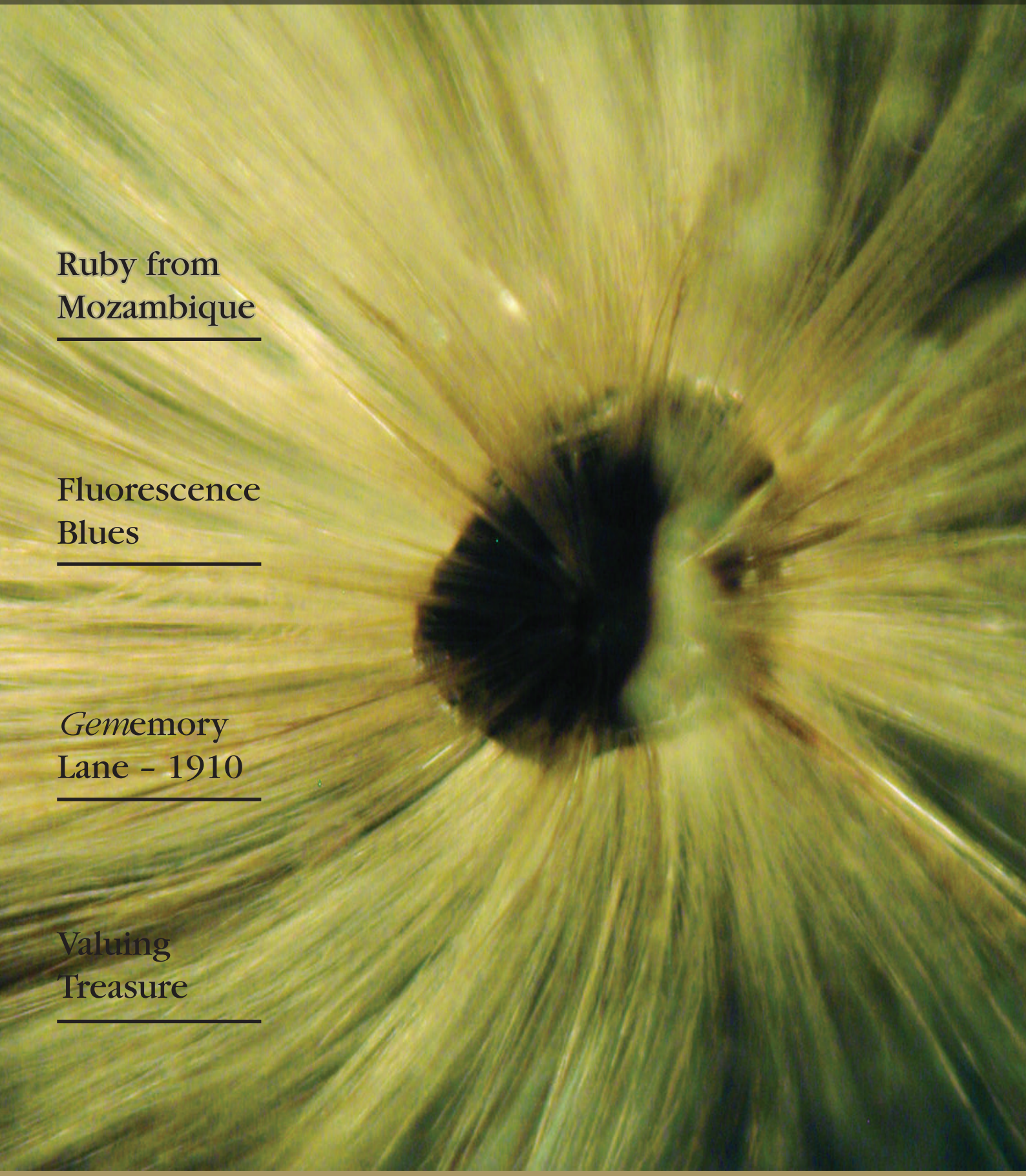


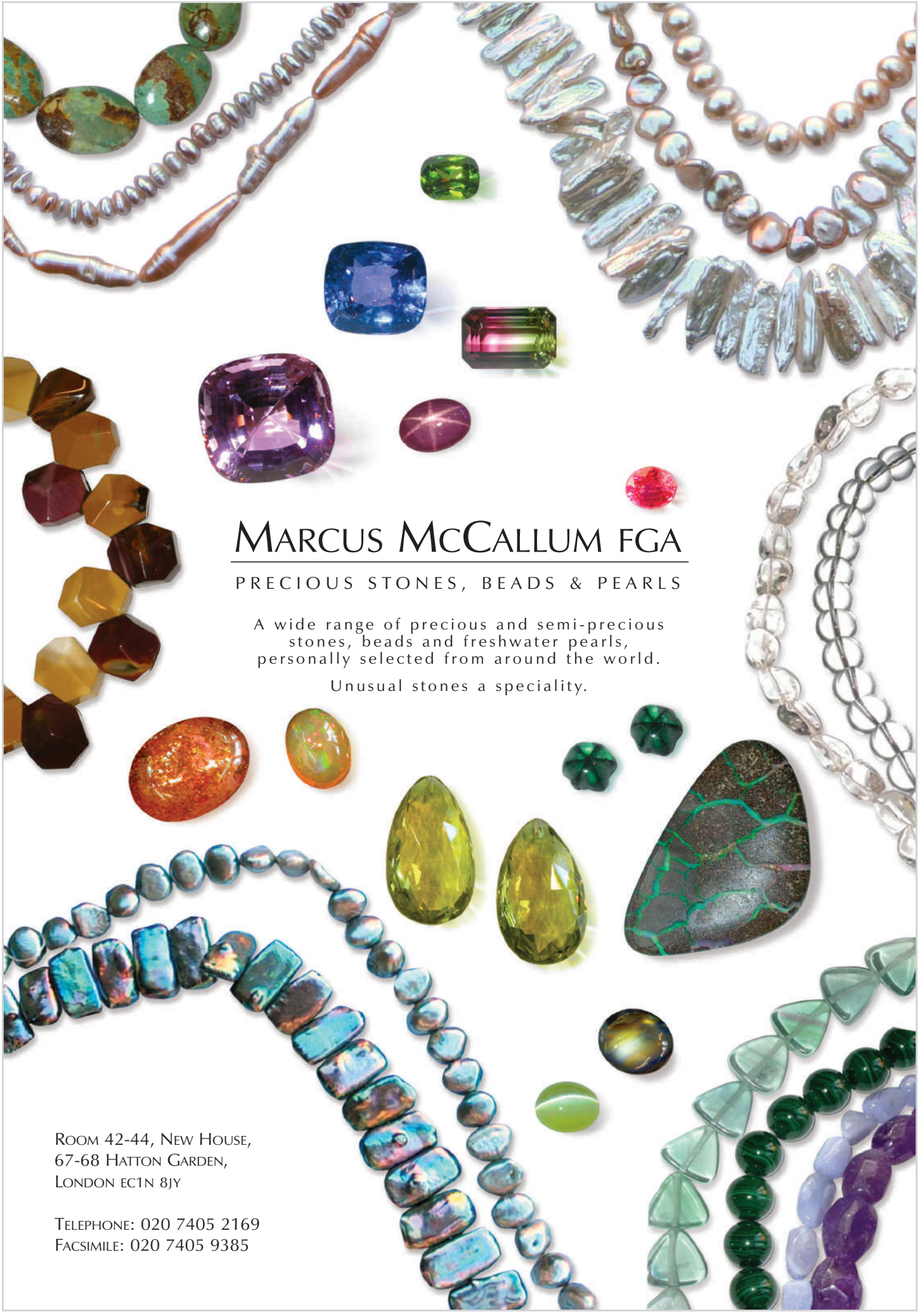
Ruby from Mozambique

Fluorescence Blues

*Gem*emory Lane – 1910

Valuing Treasure

The Gemmological Association of Great Britain



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Editorial

Gems&Jewellery

Spring 10

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The Peanut Pearl

The acres of gemstones at Tucson include some of the world's finest gems, and some of the cheapest. At one booth I bought a bundle of freshwater cultured pearls at US$1 a strand. Not for use or gift, but as an example. Next I bought a small packet of roasted peanuts at the coffee stand opposite. A short and dusty count under the curious gaze of other coffee drinkers revealed that each peanut had cost me more than each pearl.

Can it really cost less to get a cultured pearl to market — opening, implanting, harvesting, cleaning, drilling, threading, transporting and so on — than to sell a peanut? And it's not just cultured pearls. You just have to survey the expanses of gems at the Tucson, Bangkok or Hong Kong shows, the acres of bead necklaces draped like spaghetti around them, and the ubiquitous faceted glass-filled 'composite rubies' as low as $1 a carat, faceted rock crystal beads at less than 10 cents a carat. Tempting. But how can we assure ourselves and our customers that those very low prices have been achieved without unacceptable exploitation or working conditions somewhere up the supply chain? For example, the dreaded lung disease silicosis devastates too many gem cutters working in unsafe conditions — what will cutting gems coated and filled with a lead-based glass do?

There are safe, well-run and efficient producers and there are those that exploit their workers, sometimes in near-slavery conditions.The gem industry is no different to most others in this respect, but it is our industry. It is a paradox that those in the trade who turn a blind eye to ethics and the environment because the end results are good margins at tempting price points, are often those best aware of the ethical and environmental issues. Things will change and I have huge admiration for those individuals and organizations championing change, but I believe that the majority of the trade are still unaware, or deliberately avoid becoming aware, of some of the more pressing ethical issues. So the starting point is to admit that there are problems. Don't necessarily stop buying cheap beads or 'peanut pearls', but ask questions of your suppliers, gauge their feelings about ethical and environmental issues and then decide from whom to buy. Things will take time to change, but undoubtedly they will change if more and more people ask probing questions of their suppliers and demand increasingly robust and substantiated answers.

Jack Ogden
Chief Executive Officer

Cover Picture

'Horsetail' inclusion in a demantoid garnet. Photo courtesy of Mia Dixon/ www.palagems.com. See 'Only 24 hours in Tucson', page 16.

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Mozambique rubies

Christopher Smith of the American Gemological Laboratories (AGL) gives an extended abstract of a presentation given during the Accredited Gemologists Association in Tucson, Arizona, in February 2010

East Africa is host to a number of ruby deposits extending from Kenya, through Tanzania and Malawi, including the island of Madagascar. To the south, relatively recent finds of ruby in Northern Mozambique add this country to the ever-increasing list of ruby producers. Although ruby has been known to occur in Mozambique for several decades, it has only been the more recent influx of rubies being found in the Niassi and Cabo Delgado provinces that are entering the market in significant numbers.

A wide range of colours, sizes and qualities are currently being produced from Mozambique. The workings of miners are mostly in secondary deposits, although some primary occurrences are known. For the better part of two years, mining has been conducted primarily by locals, however more recently some Thai firms have been obtaining mining licences and bringing in more large-scale mining equipment.

Since the second half of 2008, the global market for rubies has welcomed this new source. For the most part, there are three active deposits in Mozambique and they have produced a significant supply of rough for the three main segments of the market, namely unheated ruby, heated ruby and lead-glass-filled or Composite Ruby.

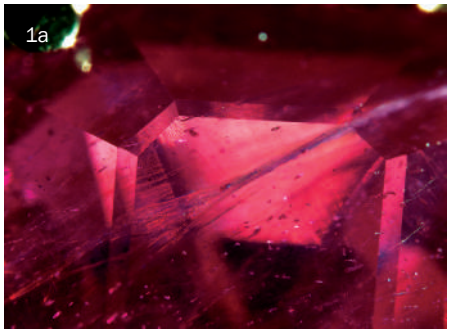
What follows is a short description of these three types of Mozambique ruby.

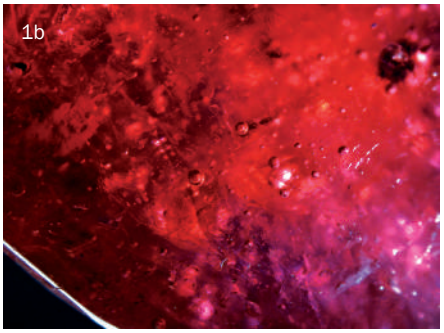
Above: Although ruby represents the bulk of production from Mozambique, a wide range of colours are recovered from purple sapphires to orangey and padparadscha-type colours. Photograph by Bilal Mahmood, AGL.
Left: The rubies in Mozambique are mostly recovered from secondary deposits. A heightened military presence has been initiated in an attempt to better maintain control and security in these areas. Photograph by Richard Hughes.

Gems and Minerals

Mozambique rubies (cont.)

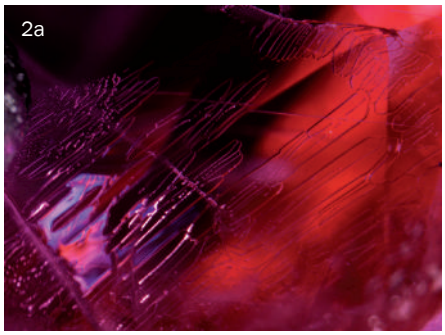
1. Lead-glass filled or composite ruby

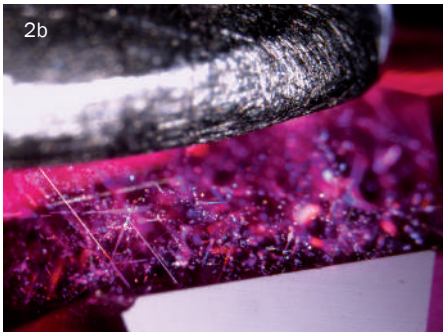


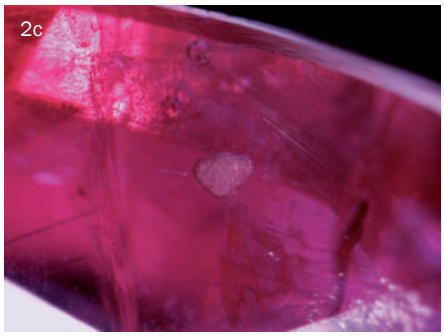


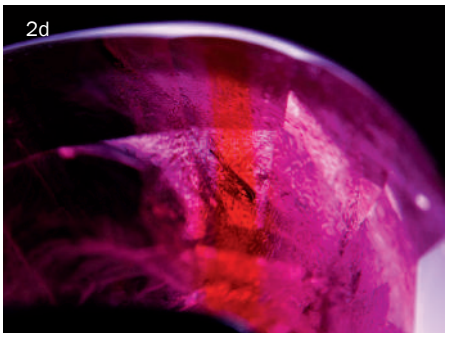
1a: The lead-glass filling of Composite Ruby can be readily identified by the characteristic flash effect of blue and yellow-to-orange colours that introduces a hazy appearance to these stones.
1b: Another characteristic trait of Composite Ruby is the presence of innumerable contraction bubbles within the glass itself and dispersed throughout the stone.

2. Heated ruby









2a: When fluxing agents are used during the heating process to heal fissures, the by-products that remain along the previously open fissures consist of re-grown corundum (synthetic), vitreous melts (a glass) and voids (contraction bubbles), that are collectively described as 'heating residues'.
2b: In the rubies from Mozambique, the temperatures utilized during the heating process are not sufficiently high to dissolve the needles, platelets and particles that are generally referred to as 'silk'.
2c: Most crystal inclusions showed clear signs of heat treatment, as they experienced thermal shock and alteration during the heating process.
2d: Inhomogeneous colour was a common feature in the heated Mozambique rubies. These included zones of distinct orange due to localized concentrations of magnesium.

Mozambique rubies (cont.)

3. Unheated ruby

3a: Perhaps the most distinctive inclusion feature in the rubies from Mozambique was the presence of whitish crystals associated with coarse decrepitation features.
3b: Another recognizable mineral in the rubies from this source is the greyish green inclusion of amphibole, although such inclusions may be encountered in rubies from other East African deposits such as Winza in Tanzania.

1. Lead glass filled ruby

Interestingly, the first wave of rough from Mozambique was a very large supply of low-quality ruby. This rough was very similar in character to the rough from Andilamena, Madagascar, which has been used in bulk for the lead-glass filling of ruby. Lead-glass-filled ruby (also known as Composite Ruby) has been flooding the marketplace with a very low-cost alternative to the more traditionally heated ruby since approximately 2003. The first finds of ruby in Mozambique yielded rough that was too low a quality for the more traditional heating of ruby, yet it proved to be ideally suited for the multi-step treatment process that is necessary to produce Composite Ruby (a composite of natural ruby and glass).

A couple of the most effective means for identifying a Composite Ruby include a prominent flash effect that causes a general 'haziness' (**1a**) and a high concentration of contraction bubbles (**1b**) (see also page 30).

2. Heated ruby

The second major find of ruby in Mozambique yielded a higher grade of rough that lent itself to the more traditional process for heating ruby. With this material, rough was heated to improve the colour by reducing or eliminating a purplish/bluish component and fluxing agents were also utilized to heal fissures, thereby improving the clarity and stability of highly fractured rough (**2a**).

Although rubies in this group commonly possessed acicular inclusions, commonly referred to as 'silk' (**2b**), they also typically revealed thermally altered crystals (**2c**). The heated Mozambique rubies also commonly possessed orange colour zones (**2d**).

3. Unheated ruby

Ironically, the third important find of ruby in Mozambique yielded a significant supply of gem-quality rough that did not need to be heated. Fine iridescent needles, small platelets and pinpoint particles, commonly referred to as 'silk' in rubies, are a frequent feature. The silk patterns generally appear East African in character, however sometimes the silk present in unheated Mozambique rubies can also appear very similar to what may be encountered in rubies from Burma (Myanmar) and other sources.

The unheated Mozambique rubies also revealed a number of distinctive inclusion features that allow this source to be readily distinguished. Most notably these include whitish crystals with coarse decrepitation features (**3a**), as well as crystals of apatite, iron sulphide, amphibole (**3b**) and others.

Conclusion

Mozambique has shown itself to be an important ruby producer. Interestingly, it is able to supply material for each of the three major segments of the ruby trade today, involving unheated ruby, heated ruby and Composite Ruby. Although it is unclear at this time how extensive these deposits are and the reserves that may exist, they appear to show signs of being able to sustain a high production for quite some time.

This source has also come along at a very opportune time, providing a viable alternative to Burmese rubies, as global legislation (but particularly an import ban in the USA) has put pressure on the production and distribution of rubies from Burma (Myanmar).

The Author

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A cure for the fluorescence blues

It only takes one simple test to separate 'true' blue-white diamonds from pretenders. Yet most grading labs fail to perform it — thus costing 'true' blue-whites the premiums they deserve for being 'whiter than white'. Michael Cowing urges a return to earlier diamond grading practices.

Here's a horror story about fluorescent diamonds that illustrates a crucial problem for jewellers — and why it must be solved:

A jeweller obtained two top-quality carat size diamonds for earrings, both laboratory graded D — the top colour grade reserved for the most colourless stones. Both diamonds were identically fluorescence graded as Very Strong Blue. The customer was delighted, especially when she was informed and shown the blue-white appearance of these diamonds in daylight.

At a party one night she was showing off her new acquisition when one of her friends noted that one of the diamonds was not as white as the other. Noticing for the first time this apparent discrepancy in appearance, the horrified and embarrassed woman stormed back to the jeweller demanding her money back and threatening a lawsuit.

When the bewildered jeweller brought the earrings to me for inspection, I suggested we examine the stones in a light lacking fluorescence-stimulating UV but which had a similar colour temperature to the traditional 'northern-daylight' equivalent lighting (sky shaded from direct sun) in which they had been graded at the lab. He was both shocked and dismayed when the two diamonds, which graded D colour in the lab's fluorescent tube grading light, were examined in the new grading light, which to avoid stimulating blue fluorescence, contained both a UV filter and an intensity-lowering diffuser. One of the stones graded an E colour, while the other dropped in colour four full grades to an H. That's right, H.

This wasn't supposed to happen. The jeweller turned to me frustrated and angry: "I've lost an important diamond sale, one of my best customers, and now face a possible lawsuit. What am I to do?"

This story, although a fictional illustration, is based upon an actual group of diamonds (the top row in the photographs opposite) that were graded Very Strong Blue by both the GIA Gem Trade Laboratories (GIA GTL) and the AGS Laboratories (AGSL). They are from an investigation into overgrading of blue fluorescent diamonds.

This fluorescent diamond story is a 'teachable moment' for jewellers and consumers everywhere. The different colours of the two diamonds that the women at the party noticed were due to the diamonds' colours unimproved by blue fluorescence. The diamond trade and some gemmologists refer to this as the diamond's 'true colour'. This colour in the absence of fluorescence is that seen in usual viewing circumstances at night or during the day out of natural daylight. Those schooled in colour science will tell you that an object has no one 'true colour' and that a diamond's perceived colour varies with the spectral content of the illumination, the diamond's selective absorption, the properties of the observer's vision, and the influence of any fluorescence excited by the illumination. Both yellowish body colour and various strengths of blue fluorescence are common in Cape series (type Ia) diamonds that comprise over 98% of the world's gem-quality diamonds. Blue fluorescence excited by the ultraviolet (UV) and visible-violet wavelengths in daylight acts to mask the slight tints of the complementary yellow body colour often improving the colour grade of a fluorescent type Ia diamond.

Understanding all this affords an explanation for the jeweller's and his customer's unfortunate experience. The laboratories colour grade a diamond from a distance of 18 cm or less from fluorescent tube lighting where there is significant grade-whitening UV and visible-violet energy. In this light the perceived colour of both diamonds was improved by their blue fluorescence resulting in the top grade of D for both diamonds. At the party the customer and her friends observed the colour of the two diamonds at normal wearing and viewing distances from typical artificial illumination

where there is insufficient UV or visible-violet to cause grade whitening fluorescence. They observed what is known in the gem trade as the diamond's 'true body colour', that colour unimproved by fluorescence. In the great majority of Very Strong Blue fluorescing diamonds, that unimproved colour is up to four grades lower, as was the case of the diamond whose colour dropped to an H. The other diamond however, was representative of the much rarer diamond the trade considers a true blue-white, because it remained colourless (the GIA equates colourless to its colour grades D–E and some Fs) in the absence of any fluorescence stimulation. This monetarily important colour discrepancy was noticed because the women were observing the diamonds in typical artificial illumination where a diamond is most often viewed and where its 'true colour' is seen. Such discrepancies go largely unnoticed unless, as happened with these earrings, diamonds are compared side by side in artificial illumination.

The database of diamonds that this story is based upon are a key part of an investigation and study of colour grading blue fluorescent diamonds both in lighting environments where they are seen and worn and in lighting used by laboratories worldwide to grade them.

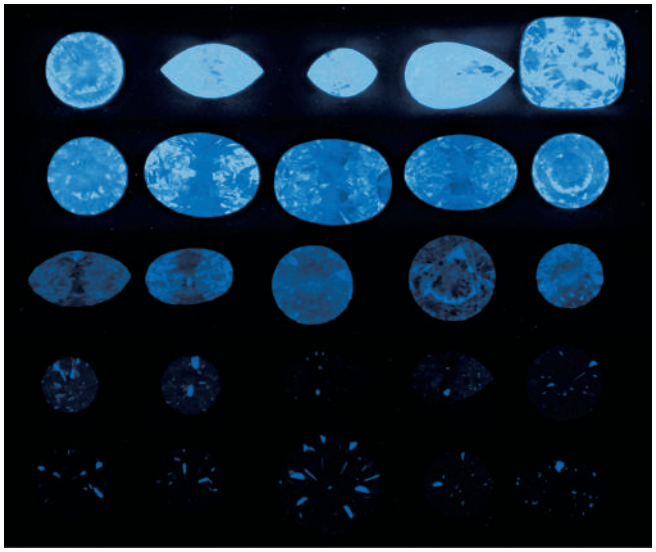
There was a simple way that the situation in the story could have been prevented. And it's a way that is about a century old. Diamond dealers have been aware of the fluorescence problem for generations. What's more, they devised ways to solve it. Sadly, those ways have mostly fallen out of use and been largely forgotten with the introduction in the 1960s of fluorescent lighting in diamond grading.

Ever since, some of the rarest diamonds nature produces are not being recognized and properly valued. It is time for gemmological reform. And we don't have to invent new technologies to do it. We can return to past practices that once guaranteed blue-white and other fluorescent diamonds fair treatment. If you don't believe me, let me take you back in time to the days when the trade knew how to handle blue fluorescent diamonds.

'True' colour versus fluorescence-improved colour

A study of the diamond literature of the early twentieth century makes it abundantly clear that the trade was aware of the fluorescence issue. How do we know? Let's start with the documented fact that 'blue-white' (also called Jager) was the highest established diamond colour category at the time. Next, we can prove that the trade knew that many, if not most, of these stones did not keep their blue-white or snowy white appearance when examined under lighting that stimulated too little fluorescence to improve a stone's appearance. Dealers were aware that many stones showed a yellow tint when blue-fluorescence wasn't present to cancel it.

But they were also aware that some rare non-fluorescent blue-white stones and some blue-fluorescent stones called Jager held their pure-white (D–E) colour in UV-deficient artificial lighting. It was important in the trade to recognize and distinguish these much rarer and more valuable true blue-white and other blue fluorescent



In 'northern daylight' (sky shaded from direct sun), all but one of the Strong and Very Strong blue fluorescing diamonds in the first two rows would receive colour grades in the GIA D–F range. Their colour unenhanced by fluorescence becomes apparent in artificial lighting with little UV or 'visible-violet' to excite yellow-masking blue fluorescence.

While all but one graded in the GIA D–F colourless range when examined in simulated northern daylight, most — but not all — showed some tint of yellow when examined in artificial lighting. A blanket prejudice against fluorescence unjustifiably penalizes the 'true-white' diamonds, which don't need their fluorescence to be top colour.

A cure for the fluorescence blues (cont.)

diamonds that held their white colour in the absence of fluorescence. This is a historical fact of momentous economic and gemmological importance.

Evidence of these distinctions is found in Bauer's *Precious Stones* (1896, in German; in English, 1904, and reprinted by Dover Publications in 1968, see pp 133–4), and in Frank Wade's 1916 book *Diamonds, A Study of the Factors that Govern their Value*. Wade distinguished between diamonds that exhibited a true blue-white appearance and ones of a much more common nature that revealed their yellowish or brownish colour in artificial light that did not stimulate blue fluorescence. He correctly attributed the chief cause of the blue-white appearance to fluorescence. He insisted that stones exhibit colourlessness in artificial incandescent light to qualify as true blue-white diamonds. Abundant historical literature and advertising shows the trade faced rampant misrepresentation involving blue-white wannabes. Yet the threat of deception did not persuade it to abandon use of the term 'blue-white'. This is worth remembering in light of later distrust and disparagement of this classification.

Wade's writing

The significance of Wade's writing cannot be overstated. Through his book and other writings, Wade provides us with what was insider knowledge of the diamond industry's grading and valuation practices in the USA in the early twentieth century.

Quoting from Wade's book, the top colour designation was 'River', closely followed by 'Jager'. Wade says: "Probably the finest white diamonds are those classed as Rivers. These stones are either snowy white or bluish white ... The finest of the old Indian (Golconda) and Brazilian diamonds, when recut to proper proportions, belong in this classification ... A small percentage of African stones belong in this classification.

"Next after the Rivers, come, perhaps, the so-called 'Jagers'. These ... are bluish white stones ... There is really very little difference between some blue-white Rivers and some fine Jagers, and values are closely similar and very high for either class."

Wade's writing makes it clear that there were two types of top-colour, true blue-white diamonds whose "values are closely similar and very high". Today this distinction is preserved in the designations Type Ia and Type IIa. Characterized by the rarest of the Indian diamonds from the region around the ancient market of Golconda, the non-fluorescent River blue-white is a Type IIa, which is the purest of diamonds having no detectable nitrogen. The Jager blue-white is a Type Ia diamond like some rare stones from the Jagersfontein Mine that contain 'aggregated' nitrogen causing their characteristic blue fluorescence.

Wade warned dealers to be "on their guard" against diamonds that "may be very blue when faced up yet brownish or yellowish when seen at some other angle". He said that few bluish-appearing diamonds are really blue in body colour. "Most of them owe their blueness to a bluish fluorescence which becomes more marked the stronger the light. ... Some of these stones are inferior in beauty to pure white stones when viewed under a light which does not cause them to fluoresce."

Later Defenders of the Faith

Decades later, the diamond trade still adhered to a diamond value and colour-grading pyramid with the 'blue-white' Jager at its apex. In his book *Diamonds*, first published in 1970, Eric Bruton stated that blue-white was a term historically reserved for "a particular type of white stone ... that is very slightly bluish, usually owing to its strong blue fluorescence". Bruton noted that the term blue-white "has been much abused" and speculated that 99% of the diamonds sold as blue-white were disqualified from this distinction because they had tinted yellow body colour.

The writings of both Wade in 1916 and Bruton in 1970 support the facts that the blue-white, or Jager, class of diamond is blue fluorescent, and when removed from daylight these rare diamonds still appear white in artificial lighting which does not stimulate fluorescence. On the other hand, the much more common fluorescence-enhanced stone, while sometimes bluish in daylight, shows tints of yellow or brownish colour in artificial lighting.

What is important to remember here is that the trade was long aware that fluorescence was the cause of the blue-white cast in Jager diamonds, and that it protected itself against tinted colour stones by requiring examination in light which did not stimulate fluorescence. Only those stones that remained pure-white were eligible for the coveted ranking of 'blue-white'.

'True' colour: the other half of the coin

Fluorescence concerns can be calmed by the knowledge of something our diamond forefathers paid attention to and extra money for: 'true' bluish white and pure white diamonds. To be considered such, bluish white and pure white diamonds had to hold their colour (or, should we say, colourlessness) in all lighting conditions. Those that didn't were penalized in value to the extent to which their body colour was revealed to be yellowish (Cape) when seen in the fluorescence-deactivated light of truth. The more yellow, the less the stone's value.

Trade insiders like Wade and, later, Shipley and the GIA saw it as a gemmological duty to grade in lighting that did not stimulate fluorescence. In that way, a full continuum of value was preserved and assured fair treatment for all stones, non-fluorescent and fluorescent alike.

What would it take to restore that continuum? Answer: inexpensive modifications of equipment and an extra step in the grading process for fluorescent stones.

Toward this end I, together with the AGA Task Force on Lighting Standards and a growing international body of gemmologists and appraisers/valuers, recommend a new procedure when examining fluorescent stones; before grading them for their fluorescence-improved colour in standard daylight-equivalent light, examine them for their unenhanced body colour in lighting both filtered to eliminate UV and diffused to reduce light intensity, so that neither UV nor visible-violet excite blue fluorescence.

Based upon the new investigation and study, we recommend the use of a polycarbonate plastic (Lexan or Makrolan are examples) as

A cure for the fluorescence blues (cont.)

an effective and inexpensive filter to remove UV from existing grading illumination. Additionally, a white plastic diffuser is recommended to reduce the visible light intensity below 400 foot-candles (fc). The study found fluorescent light intensities below 400 fc contain insufficient visible-violet to stimulate noticeable fluorescence. In addition to lowering the light intensity, such white diffusers were recommended by GIA to reduce spectral reflections and glare from diamonds being graded and to help filter out UV emissions.

An equally effective solution in concert with the movement to the 'green' technology of LED lighting is the use of white LEDs such as the investigation's Dazor LED desk lamp. It not only provides inherently UV-free grading light, but is dimmable without change in colour temperature down to 200–400 fc (~ 2000–4000 lux) to avoid stimulating noticeable blue fluorescence.

A return to lighting standards that allow grading of a diamond's colour unimproved by blue fluorescence would benefit the diamond industry in a variety of ways. First it would remove the distrust and stigma attached to fluorescent diamonds. Second, the rarer blue-fluorescent diamonds that hold their high-white colour in the absence of stimulation of fluorescence would be recognized once again for their superior beauty and rarity. Thirdly, diamonds graded without their blue fluorescence would be shown to whiten, and sometimes appear blue-white in natural daylight, giving them the edge in marketing over their non-fluorescent counterparts that they used to enjoy.

In the final analysis, it would be as beneficial as it is simple and affordable to correct the problem of over-grading blue-fluorescent diamonds. By so doing, we would restore the colour-grading of diamonds based on the traditional diamond industry standard. By grading a diamond's 'true colour' unenhanced by blue fluorescence the diamond world could once again enjoy worry-free commerce in blue fluorescent diamonds.

In short, using new lighting techniques, we urge a return to the past colour-grading practices that involved emphasis on the diamond's colour in fluorescence-deactivated lighting to perform fair colour assessments of blue fluorescent diamonds and to ferret out the true blue-whites. By so doing, the diamond trade would be creating a wider canopy of consumer protection than presently exists.

(This article is rewritten with updates and additions from one in "Colored Stone Gem Mail" free on line at http://www.colored-stone.com/stories/jul09/cowing-on-fluorescence.cfm)

The Author

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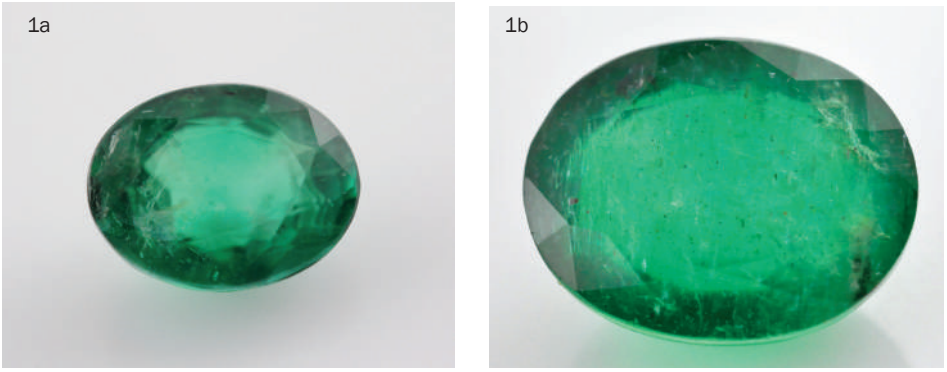
A different kind of composite

Gagan Choudhary reports on two green stones which were submitted to the Gem Testing Laboratory of Jaipur as emeralds, but were identified as composites of an unusual composition.



The two specimens identified as composites (1a weighing 2.64 ct and 1b 7.58 ct) consisting of light coloured beryl and deep green glass.

In 'Innovative composites Fusion' (*Gems & Jewellery,* June 2008, volume 17 no. 2) I described some fancy composites, being marketed as 'Fusion'. These included various combinations of commonly available gem materials such as citrines, amethysts, lemon quartz and topaz. This changed the concept of composites, which are usually made to imitate a well-known gem material or to increase durability. For many years composites have been made using two or three materials joined along or near the plane of the girdle to enhance the colour or durability.

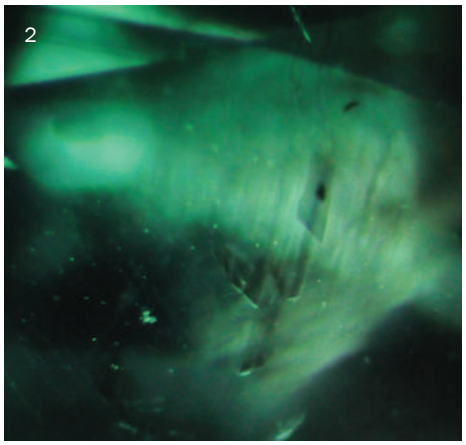
Recently two green stones were submitted to the Gem Testing Laboratory of Jaipur for identification within a period of one month, both of which proved to be composites. The two stones (1a and b) weighing 2.64 and 7.58 ct and measuring 9.93 x 7.62 x 5.50 mm and 13.66 x 10.76 x 7.45 mm respectively, warrant a description because of their unusual features.

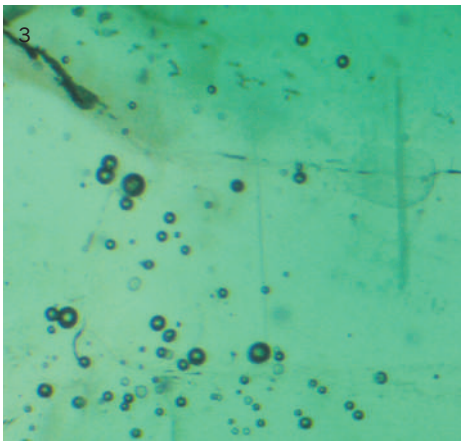
Visual appearance

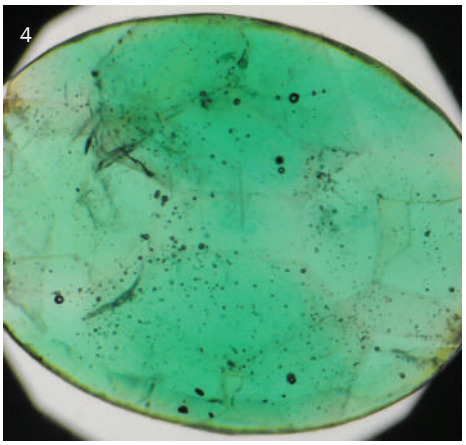
Preliminary observations indicated that the stones could be emerald on the basis of their colour (see again 1). Both specimens were green of medium to high saturation with fairly good transparency, and a few scattered black inclusions along with 'feathers' and tubes were visible. These features were quite enough to identify the specimens as natural emeralds. But gemmology teaches us not to give a conclusive identification of a stone unless it has been analyzed thoroughly and hence we observed the stones under the microscope. The features we saw were shocking.

Magnification features

Both specimens displayed similar features which were unusual but distinct enough to identify the nature of the stones. When seen through the table facets, the 2.64 ct specimen displayed fine blade-





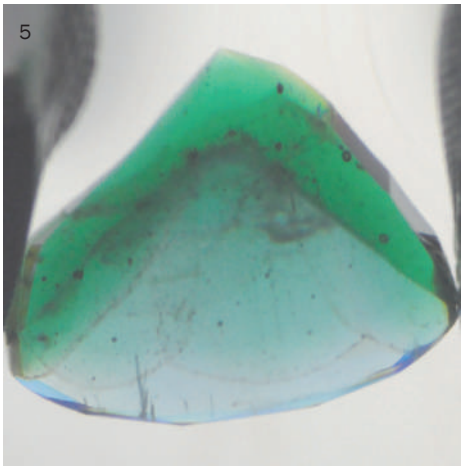


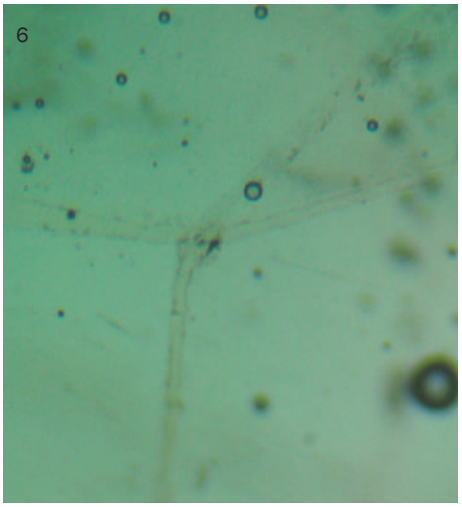
2: The central light coloured portion displayed some fine brownish blade- or tube-like inclusions indicating the natural origin of the material. Magnified 20x
3: Many spherical gas bubbles were observed towards the pavilion areas of the samples; also note the fine circular patterns of inclusions which are associated with the flattened gas bubbles along the junction planes of traditional composites. Magnified 30x
4: When immersed in bromoform, green of varying saturation was observed which followed the pavilion facets/areas. Also note the scattered spherical gas bubbles. Magnified 10x

like features (2) oriented perpendicular to the table facet and some liquid-filled 'fingerprints', while the 7.58 ct specimen displayed many long tubes and scattered blackish crystals. All these inclusion features are associated with an emerald of natural origin. However on careful examination, focusing deep inside the stone, many scattered gas bubbles (3 and 4) were seen. These gas bubbles appeared to be restricted to some specific areas near the pavilion facets, giving rise to doubt about the true nature of these stones.

On further examination fine circular features were also observed (3), typical of the flattened gas bubbles seen along the junction planes of composite gem materials. In order to confirm their exact nature, we observed the stones immersed in bromoform using transmitted diffused light. This revealed the presence of many layers stuck on the pavilion facets. The central area appeared to be pale green or colourless while the pavilion surface areas were deep green (4 and 5). These deep green areas consisted of several smaller units which varied in saturation and these variations followed the surface profile of the stone (4). In addition, there were fine yellowish junctions between various layers (6) which could have been due to glue. The presence of such junction planes proved the stones to be composites. Magnification revealed that they were composed of a central pale coloured faceted material with smaller deeper green pieces glued to the pavilion areas.

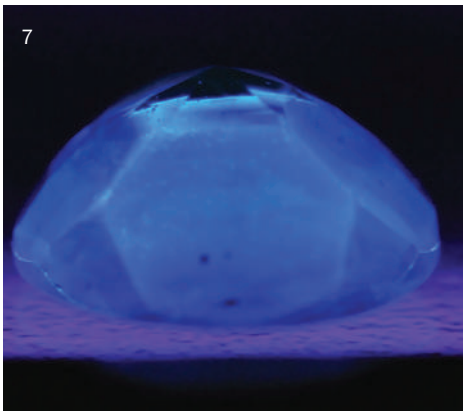
The central near-colourless region and the pavilion areas displayed different inclusion patterns. Features such as crystals, tubes, blades, liquid 'fingerprints', generally associated with a natural stone, were observed in the central area, while gas bubbles could be seen in the pavilion. The inclusion features indicated the use of a pale coloured beryl in the centre surrounded by glass segments. However, further tests were conducted in order to identify conclusively the nature of materials used.





5: When viewed from the sides, distinct deep green areas were visible towards the pavilion; also note the semi-circular edges of the glued pieces towards the table of the specimen. Magnified 10x
6: Edges of the junction planes or glued pieces were observed as yellowish lines on the surface; the yellow appearance could be due to the glue used. Magnified 35x

A new type of composite (cont.)



7: The pattern of UV fluorescence intensity revealed the exact boundaries of the glued pieces. The strong chalky bluish glow is due to the glue used.

UV fluorescence

Ultraviolet (UV) light plays an important role in the identification of composite gem materials and so it proved with these stones; an eye-catching reaction was observed when the specimens were exposed to long- and short-wave UV light. A chalky bluish glow was displayed along the junction planes on the pavilion area (7). This fluorescence effect, restricted to just below the pavilion surfaces, appeared to have been caused by glue.

Gemmological properties

The refractive index (RI) measured on the table facet revealed the values of 1.580 to 1.588 with birefringence of 0.008, while pavilion areas gave values of 1.520 with no birefringence. These RI values were consistent with those of beryl and glass respectively. The FTIR spectrum also identified the central material as beryl of natural origin. Specific gravity was not measured as it is of little diagnostic use for composite stones. No absorption features were seen under a desk model spectroscope and the stone was inert under the Chelsea colour filter. Therefore the stones were identified as beryl at the centre (table) surrounded by pieces of glass on the pavilion.

Conclusions

The identification of these beryl/glass assemblages was not difficult but careful observations were required. So far we have encountered only two specimens of such composites, but we do not know in what quantities these are being manufactured. If mixed in packet lots, identification and separation of these composites would become a real challenge, especially in routine dealings. These instances reveal that innovative minds who try to develop new materials on a regular basis for deceiving and making good profits are currently active in the trade.

All photographs and photomicrographs by G. Choudhary.

About the Author

Gagan Choudhary FGA
Gagan Choudhary has been an Assistant Director of the Jaipur Gem Testing Laboratory since 2001. Currently he is involved in the education, testing and research activities of the institute, and is in charge of the laboratory.
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Australia's secret . . .
the Holy Stone

Deep in the heart of an ancient Australian eucalyptus forest can be found the Holy Stone — interesting specimens of black tourmaline embedded in quartz. Jewellery designer Joanna Angelett tells of her visit to the deposit and legends that surround the stone.

In a remote area of Australia, in an ancient eucalyptus forest on the border of Queensland and New South Wales, long-dead volcanoes conceal a surprise for the gem collector — deposits of coal-black tourmaline embedded in white, pink and golden quartz, amazingly matching the bark of the surrounding trees.

Although the area was mined by a company for many years, the mineral was not advertised or mentioned in the media. When the company left, taking with them the last massive chunks of the mineral (each many metres in size), the smaller specimens were left covering the surrounding ground. From that time the news started to spread that an unusual and attractive material had become available for collectors.

The patterns formed by the tourmaline crystals in the quartz can be equated with symbols, figures, abstract pictures and even some script — all you need is imagination. The locals called the mineral Holy Stone, as it was believed to bring luck and was used as a safety talisman for travellers. In spite of the popularity of the stone, it was never on sale in the local rock shops, probably because according to legend, the stone will be 'empty' and have no power to protect unless you pick up the Holy Stone from the forest floor yourself, or receive it as a gift.

To learn more about this fascinating stone, I visited Glen Innes, situated approximately 150 km from the deposit, with a group of gem collectors. The town is best known in Australia for Minerama, New South Wales's largest annual fossicking and gem show, attracting gem dealers from all over Australia. We came across one of the many small gem shops where the owner, who created an impressive picture with his two Winchesters in the background, told us everything about every stone on display. As soon as the Holy stone was mentioned, he brought out from his pocket a desirable piece of this natural art. "This piece is mine," he said. "Go and pick it up for yourself. I'll draw you a map."

Following our hand-drawn map, we made our way north along an excellent road, and quite soon found ourselves staying near the Wallangra's Tin Hall (a kind of big abandoned garage, positioned close to the road), and behind the Holy Stone's eucalyptus forest.

We drove into the forest until it got too dense and we had to abandon the car. We continued on foot for about a kilometre in the uncompromising Australian sun, and soon a breathtaking picture opened before our eyes. A large field surrounded by the white trees was carpeted in the sparkling Holy Stone.

We picked up from the hot dry surface our specimens that had been 'cooked' in the turbulent geological event millions of years ago, each with its own unique symbols and pictures created by nature.

Camouflage: an aptly coloured lizard scurries away from a piece of tourmalinated quartz as I approach. Photo: Joanna Angelett.

Tourmaline in quartz is rarely seen mounted in jewellery items, so I, like everybody else, kept a piece in my pocket, a nature's talisman, and put the rest on display. But once back in England, it was suggested to me that it would be perfect as a central stone in a pendant or brooch. So I designed a pendant with the Holy Stone in the centre, complemented by baguette diamonds, and mounted in 18 ct yellow gold. It really worked, so now I have sketches for the Holy Stone collection already on my designer's desk.

Left: Holy Stone mounted as a pendant with diamonds in 18ct yellow gold designed by Joanna Angelett. Photo by Jack Ogden, © Gem-A 2010.

Fossicking in Australia — Joanna's tips

Any readers who are considering a trip to Australia to fossick in some of the untouched areas may find the following notes helpful.

You do not need a fossicking licence in NSW (but you do have to purchase one in QLD and WA). There are some government regulations, for example when you are fossicking for minerals you cannot:

- Use any explosives or power-operated equipment.
- Drill or excavate to a depth of more than one metre.
- Damage or remove any bush rock.
- Remove more than 10 g of gold, 20 g of gemstones or 10 kg of any other mineral during any single period of 48 hours.

It is also worth noting that despite the many stories you will be told about the terrifying monsters with blood lust that will be lurking behind every tree and rock, the only ones we actually encountered were the ticks! These are the only monsters that attack deliberately, apart from the crocodiles in QLD (tropical part) and the Northern Territory, and I strongly suggest that you do not visit their habitat.

Shows

Only 24 hours in Tucson

Olga Gonzalez reports on the 2010 Tucson Gem Show.

With only one day and dozens of shows, there was no time to waste on reporting in Arizona. Armed with an electric orange car rental and dynamo sunglasses, I drove down to meet Gem-A and see what the scoop was on the February Fanfare. Overall the pendulum is beginning to swing, a positive and welcome change for retailers and buyers alike. Here are a few of the general trends observed while walking the shows and asking around:

There is a buzz

People are spending and vendors making money. For the first time in two years, things are picking up across the Tucson shows and there was enthusiasm about the turnaround. Vendors interviewed reported they saw serious buyers and an increase in sales.

"I have come away with the perspective that the Tucson show was a fantastic event. Despite the current condition of the U.S. and global economy, I found that all who were engaged in the show carried themselves with a phenomenal level of resilience, determination and cordiality. Of course, I was not surprised to observe such professional qualities in our business community since I believe that all involved in the jewellery industry, especially those whose business is entrepreneurial in nature, understand that we make or break our future with each daily action."

T. Stern, Natural Pearl Traders

Now is the time to buy

Right now, it is a buyers market. Buyers in Tucson had a good time this year. Enthusiasm regarding decreased traffic, and therefore less competition within the realm of buying, made them happy as they more easily perused gem and jewellery collections. Those who made it out to the more distant shows were serious about buying although quality, not quantity, spearheaded purchases.

Big Business is found in niche markets

Mark Tremonti from Tremonti Fine Gems put this best when he remarked, "Big things sell. People are shopping for larger and more important gem materials." A general trend observed throughout the recession was that companies who specialized in rare gem materials have been doing exceptionally well. If you are not offering a few specialty items you may want to reconsider, since they are generating serious purchases.

"In general, our traffic wasn't too bad, even though it seemed that there have been less visitors than in recent years — which isn't all that surprising, looking at the past events in the economy. Anyway, we can't complain about sales from our side!"

Tom Munsteiner

'Green Flash' platinum necklace set with 79.93 ct green tourmaline by Tom Munsteiner. Photo courtesy of Tom Munsteiner

When we encounter a gem of a particular green hue, we generally use our loupe to check for a horsetail inclusion to prove that the stone is indeed a demantoid garnet. The loupe wasn't necessary to spot the outrageous inclusion in this 4.24 ct demantoid being exhibited among the fine gems of **Pala International**. An image of the inclusion is shown on the front cover. Photo courtesy of Mia Dixon/www.palagems.com.

Shows

Education is a hot topic

When jobs are not in abundance, the opportunity to go back to school is perfectly timed. Gem-A's Open Distance Learning courses were getting much attention from prospective students, since they provide an affordable way to gain a qualification while working.

Tucson is a must-do

Buying and selling aside, the quality of the networking that takes place in Tucson is invaluable. An international gathering of the industry, walking the shows puts you in touch with those who share your dedication for gemstones and jewellery, whom you otherwise may never have met. Business relationships and friendships are fostered, and the accompanying seminars and networking events taking place over the two weeks provide you with continuing education, as well as the experience of handling gemstones and inquiring about inclusions and treatments that add to your wealth of knowledge.

"This was my first time exhibiting at the Tucson Gem Fair and it was a great experience. I was pleased with the amount and quality of traffic coming by my booth and the positive reaction to my jewelry. Along with sales, I made several good contacts that, I hope, will blossom into relationships. I am considering returning next year and will make my decision within the next few weeks."

Doreen Sanborn, DKS Designs

Blue and pink tourmaline pendant mounted in 14 ct white gold by DKS Designs. Photo courtesy of DKS Designs.

Gem dealers from Afghanistan were present at Tucson at the GJX Pavilion from 2 to 7 February. Booths for ten Afghani miners and dealers were sponsored by USAID/DAI/ASMED. Here **Tahir Mohammad**, from Jalalabad, Afghanistan, is holding a 8.5 kilo kunzite crystal from Konar province.

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Gem-A at IJL 2010

Gem-A will again be exhibiting at International Jewellery London in September. There is to be a new floor plan this year, so don't miss us at **Stand J50**.

Details of the free Gem-A seminars and special offers will be given in your Summer issue of *Gems & Jewellery.*

Gem-Empathy Award

As in previous years Gem-A is sponsoring the Gem-Empathy Award, which will be presented to the exhibitor at IJL whose gem-set jewellery best combines innovation and design flair with a knowledgeable and sympathetic understanding of the materials. The criteria for the award will include accurate gem descriptions, which are of paramount importance in the trade today.
If you are exhibiting at IJL this year and would like to be considered for the Award, please contact Mary Burland on +44 (0)20 7404 3334 or email mary.burland@gem-a.com giving your name and stand number.

Whither the trade — wither the trade

The jewellery trade in 2100: Harry Levy gives us his predictions.

I remember being asked some years back as to what I thought the jewellery industry would be like in fifty or a hundred years' time. To be a prophet at any time is a foolish project, but now with so many changes in every field the task is even more daunting. Let me however attempt a few thoughts for the year 2100.

I have no doubt there will continue to be a jewellery industry, Historically man has wanted to adorn himself with 'jewellery' from the very beginning. Be it shell, carved object or even paint, that desire has always been there. Sometimes jewellery has been used as a protection from the forces of nature or other enemies, as a means of showing wealth or affection, or just an aesthetic desire for objects close by. These thoughts will still be there in 2100.

I am sure that had I tried in 2000 to predict the trade for the year 2010, I would have got much wrong. But we have not seen a qualitative change in our jewellery, but rather a quantitative one in the means and places of production. Places of cheap labour have taken over from many of our Western cities, and we have seen much more mechanization and streamlining in the means of production.

The distinction between a quantitative change and a qualitative change is a useful tool in understanding certain concepts. This was something stated by Hegel and developed by other philosophers. An example will explain this. We start with a baby, who turns into a child, then a teenager, then an adult and so on. At every step in this change there has been a growth, but there are steps when there has been a change in quality — the teenager turning into an adult. I would like to try to predict the qualitative changes.

The first is in the materials we use. We have traditionally concentrated on our so-called precious metals, gold and silver. More recently we have seen the use of platinum and now palladium. We are already seeing uses of other metals such as titanium. In the West, recent uses of other metals has not been common, but I have seen sackfuls of jewellery using brass, bronze, stainless steel and copper. I think these materials will proliferate, we will make new alloys, and move away much more to the use of other materials, such as plastics, wood and paper. Some of these are already used, but their usage will much increase.

There will be changes in the gemstones we now use. The move from natural to synthetic and imitation will increase greatly. This will come about through depletion of natural resources, conservation pressure, need to reduce pollution, awareness of products such as cultured pearls and effects on the oysters in which they are now produced, and probably the changes to natural materials through treatments to improve their colour and clarity. We are already seeing this happening, the effect of having a qualitative change, as opposed to a quantitative one with rubies. Recent moves in the production of lead-glass-filled rubies has generated debates within the industry, such as the ones on Gem-A MailTalk, where some of these treatments, crudely put, entail holding together bits of natural ruby with the glass. I suppose we can say it is now ruby-filled-glass.

Designs will become much more experimental and individual, but with the use of much cheaper materials, much of this jewellery will be disposable. We now have much jewellery designed on computers; this will increase but new parameters will be set as to what can be made.

The traditional jewellery shop on the high street will disappear. There will be a few top-range shops left, to pander to the very rich, but much of what is sold in the traditional jewellery shop will move onto the internet and into other outlets who sell other things. Both of these are now happening, but this movement will accelerate.

The top range jewellery will still be there. It will become even more rarefied than now, with only the very best coloured stones selling, as well as the top range of the larger diamonds. The rich will still want to protect and show their wealth, although I think many of these fine pieces will be reproduced with artificial stones for everyday use.

The production of synthetic diamonds will increase substantially, and those wanting to buy jewellery with natural stones will insist on a third-party certificate to ensure the authenticity of the products, and for much smaller stones than is now the case. Most jewellery will sell under brand names, be it the shop or the designer. We do have this situation at present, but there will be much more marketing, the demand being for a branded piece of jewellery or branded artificial stones, especially with diamonds.

This trend is already with us. With synthetic diamonds people now buy Gemesis or Apollo stones, for example. The latest to come into this field, and somewhat surprisingly, are the Royal Asscher Group. They have been in the diamond market for many years, historically an important House as cutters and suppliers to royality, and still operating out of The Netherlands. They recently announced that

they will be selling synthetic diamonds under the brand name Mine Diamonds. Despite the name, they clearly explain that it is a synthetic product. We have other brand names such as Kimberly Emerald for synthetic stones, and Diamonique which is a man-made cubic zirconia.

There will be a proliferation of brand names for diamonds and gemstones, which will try to by-pass disclosure and make the product appear to be natural. The year 2100 is a long way off, but we seem to have many problems now and in the foreseeable future to maintain the industry on a viable course.

Thrills but no frills

Harry Levy reports on the CIBJO 2010 Congress in Munich

CIBJO (the World Jewellery Federation) held its Annual Congress in Munich this year on 19–22 February. It was different to previous congresses in several ways. Traditionally the associations of the host country arrange the congress. This has always consisted of working sessions during the day, a social programme for spouses, and evenings filled with gala dinners and outings for the delegates. Many of these functions were sponsored.

This year the organizers of Inorghenta, the jewellery show held annually at about this time in Munich, offered to sponsor the whole congress, but without any social events. They laid on conference rooms, office facilities and lunches for the delegates, and we were all invited to a buffet-style evening they normally hold for some of their exhibitors and guests. There was an air of frugality about the whole congress, as every morning we had to be bussed in from the hotel we were all advised to stay at.

Further the programme was arranged so that delegates could attend every meeting, and this meant that there were full working sessions throughout each day.

The Gemmological Group laid on a half-day of seminars and lectures on glass-filled rubies. No conclusions were arrived at as to what to call such stones, other than some form of composite rubies. I noticed that one exhibitor at the show had called his company High Class Jewellery, so I suggested the term ‘high-glass rubies’ which could be punned with high-class rubies (remember Mine Diamonds). I gave this suggestion as a commercial break for a somewhat tired floor.

The Coloured Stone Commission presented a new tag system for treatments; each tag was an abbreviated system of letters and this was agreed by the delegates. This was a significant move by CIBJO, as traditionally they had always advocated a two-tier system of disclosure of treatments, a General Disclosure in which traders warned buyers of the possibility of treatments such as the heating of corundum and the oiling of emeralds, and Specific Disclosure where the seller had to merely put in the term ‘Treated’. Now the trader could specify the treatment.

Messe München International, where this year’s congress was held. Photo credit: MDBC.

The Diamond Commission (DC) was the busiest as there was pressure on CIBJO to adopt two new terms to describe synthetic diamonds, to bring it in line with almost the whole diamond industry. The two terms were ‘laboratory grown’ and ‘laboratory created’. CIBJO has resisted this move for several years, especially by the non-English speaking European countries. They claimed that the single describer ‘synthetic’ was sufficient, and these new terms could not be easily translated into other languages.

There was an intense debate, at times acrimonious and at times a division between the English speakers led by the US, and the non-English speakers led by the Germans. The President of the DC had set out several proposals; the first was an agreement for CIBJO to continue to use the single describer ‘synthetic’ but noted that the other two terms were used by other groups. This in effect meant that CIBJO would still not budge on this issue. A vote was taken which proved somewhat complicated to count.

CIBJO was now operating under new Statutes and Bylaws, and in these the Associate members of CIBJO would be given a vote, but the voting would be weighted towards the Country members, the originators of CIBJO. In the new system each country had one vote, whereas an Associate member would have one third of a vote. Under the new system the resolution failed by one third of a vote, a very narrow margine by any standard. ▶

Around the Trade

Thrills but no frills (cont.)

The next resolution was that CIBJO would permit the three terms 'synthetic', 'laboratory grown' and 'laboratory created'. After further debate this was passed with a healthy majority. I asked those delegates who had changed their vote, why they had done so. Most said that they were initially embarrassed and unwilling to be seen to be voting for something that was held for many years by CIBJO, but since the initial vote failed they felt free to vote as they felt. Some of the firmest believers in the old CIBJO stance added that they were pleased to see this change. One delegate who did not change his vote, thought that the new position would mean the abolition of the term 'synthetic' to be replaced by the two new terms.

After the vote two riders were added to the resolution. The first stated that should these additions be contrary to national laws, then only the term 'synthetic' should be used; this applied to France who have a National Decree on this. The second rider added that where a translation of the two new terms was problematic, they could continue to use the single term 'synthetic', or use other terms approved by the National Association. In a sense this was problematic in that the resolution gave a closed solution, but the rider opened up the whole issue to possible abuse, with no one able to check the translation.

This topic is not yet completed, as there are attempts to make it a law in Europe through a European Committee for Standardization (CEN) standard.

The Metals Commission had been active during the year and wanted to change new rulings proposed in Europe for nickel content in gold. Nickel is used to make gold white, but basing its use solely on the quantity of the metal present was wrong, as any potential release of nickel from jewellery on to the skin varied depending on the type of alloy used.

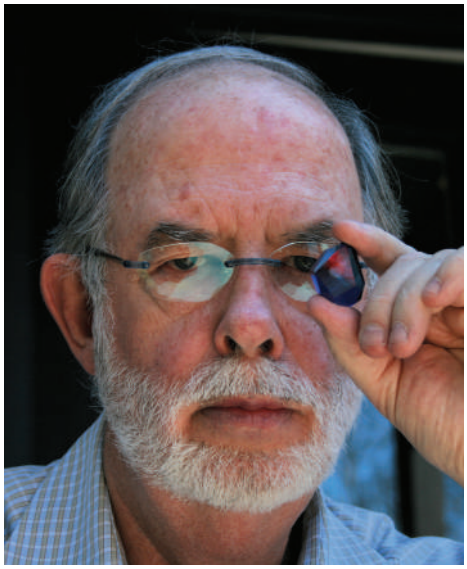
CIBJO is now divided into three Sectors reduced from the original four. The Wholesalers and Retailers have been combined as the Distributing Sector, there is the Manufacturing Sector, and the Products Sector dealing with Diamonds, Gemstones, Pearls and Laboratories.

CIBJO also has a number of Commissions including ones dealing with Education, Marketing, Ethics, as well as Diamonds and Pearls and so on. This division between Sectors and Commissions caused some confusion as there was little to differentiate them now. Perhaps this is something that could be looked at by the CIBJO Board.

There were invitations from Denmark and Portugal for the next CIBJO Congress in 2011. The Board will decide on one of these or some other venue.

Fact and Fiction

The French Blue, a novel by Richard Wise



When you get drawn into the history of the gem trade, one work stands out high on the list of sources that must be read — *Tavernier's Travels*. Jean Baptiste Tavernier was born in Paris in 1605 to a family of map-makers, so it is probably not surprising that he was lured by thoughts of adventure and distant lands. This was a time of rapidly developing trade between Europe and the rich gem-lands of India and the East Indies; the East India Company had been established in London in 1600 and the Dutch equivalent in 1602. So Tavernier pursued his dream and passion. He made a total of six voyages to the East as a gem dealer, bringing back fine diamonds and pearls — including the large blue diamond later to be called The French Blue and later still recut and renamed The Hope — and he left an absorbing, frank and detailed account of his travels, with all the wonders and dangers he encountered along the way.

Author Richard Wise. Photo courtesy of R. Wise.

Richard Wise, gemmologist and 'gem hunter', and author of *Secrets of the Gem Trade* (2003), has taken Tavernier's two volumes of Travels, filled in some of the gaps through detailed research and inspired imagination, and come up with his first novel *The French Blue*. At Tucson I asked Richard a perhaps unnecessary question for a gem hunter: "What drew you to Tavernier for your first novel?" The answer was not quite what I expected. "Water", came the reply.

Richard had been intrigued by the frequent use of the term 'water' to described diamond quality by Tavernier and his contemporaries. On carefully reading Tavernier, Richard realized that water here was a subtle combination of colour and transparency, very much the overall qualities of a gem for which experienced gem buyers develop almost an instinctive sense, and a skill he had tried to explain to the readers of his *Secrets of the Gem Trade*. This drew him closer to Tavernier, whom he began to see as a kindred spirit. The novel was the natural outcome.

"How truthful was Tavernier?" I asked. The veracity of some parts of his account had been questioned over the years. "What he saw, he saw." Came the answer. Indeed, as an essential part of his research, Richard worked out a precise timeline. It worked. (The time line can be seen on Richard's website http://www.thefrenchblue.com/timeline.htm.) There were gaps to fill and some invention necessary to explain how Tavernier was funded (an aspect upon which he himself is remarkably reticent). Love interest had to be added, of course; here the voluptuous daughter of a French courtesan who had been mistress to the Persian Shah and had some involvement in French and European political shenanigans, including dealing with Cardinal Richelieu.

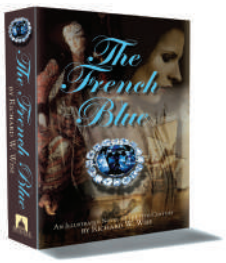
Historical and fictional characters weave an intricate tale and it is good to have the table of characters in the book annotated to say whether they really existed or not. Overall the mixture of historical accuracy and rollicking fiction is reminiscent of George MacDonald Fraser's Flashman books. And there are some fun, low-key comments that will bring a smile to the careful reader — for example Cardinal Richelieu's lament that he feared history would miscast him: "Who knows how history will remember a simple priest ... I rescued no damsels, I slew no dragons. More likely I will play the villain in some romance."

It is hard to imagine any gem-lover with a liking for historical fiction not enjoying this book. It is fun, informative and well written. The question is, of course, whether there is enough here for the non-gem enthusiast? Amazon ratings will reveal the answer to that in due course, but to my mind the gem-neophyte will be intrigued rather than off-put by the revelations about the gem trade. If you are in the gem trade and need a present for a non-gem-professional, give them this book. It will entertain them, open a new world for them and maybe give you some of the aura of an adventurer.

Does the book give likely answers to all our questions about the magnificent French Blue? Fiction aside, the answer is "No". Tavernier was strangely silent about this extraordinary stone, and Richard has had to resort to his fertile and experience-fuelled invention to flesh out the narrative. But, on balance, perhaps it is good that mystery remains — the gem trade still needs some secrets.

Jack Ogden

The French Blue by Richard W. Wise is published by Brunswick House Press, Lennox Massachusetts, 2010. ISBN 0-9728223-6-7



Over the Counter

Over the counter gemmology is very different to gemmology practised in the classroom or the laboratory. Retailer Kerry Gregory gives examples of real-world testing with limited tools and time.

Testing times

Customers have seen jewellery experts on the BBC's Antiques Roadshow talking eloquently about the gems and jewels without testing or looking anything up. So they expect us to be able to do the same. What they don't know is that the experts have researchers, they check their Bradbury's for hallmarks and they look at the spectra; they just don't do it on camera!

We are put in the position of having to make a decision about the identity of a gem very quickly. I would imagine that as soon we see a gemstone most of us will have a good idea of what something is, or certainly what it isn't. However, we need to be sure. It is a tricky business giving enough information to imply that you are an expert, but at the same time avoiding a firm opinion, so that you have the opportunity to carry out appropriate tests to confirm the identity. I do know from personal experience a lot of you are very skilled at this, but after my attempt to get an opinion about a yellow trilliant last year, when the only person to come out with a bold identity was wrong, we are quite right to exercise caution in our opinions.

When we have a customer in store we don't have time to set up immersion cells and tricky microscope angles, and most of us don't have a Raman to hand. We have to get information quickly and simply and make an assessment of what we have in front of us. It is important to know what tests to use and how to work efficiently. So when confronted with a red stone most of us would look to our spectroscope first, colourless stones maybe ultraviolet light, and for a suspected synthetic the microscope could be the choice.

On a number of occasions recently I have had to make a quick decision on the identity of a gemstone with the customer present but with very little equipment to help.

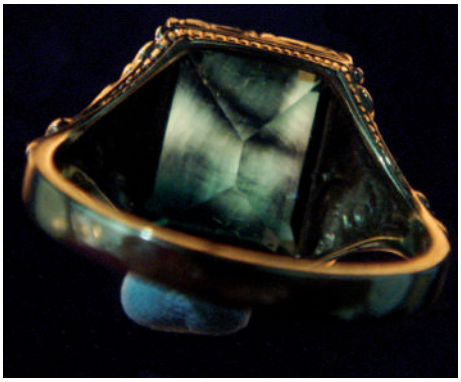
Tourmaline

One such item was a 'tourmaline' ring. The deep bottle green octagon-cut stone was set in an ornate carved mount. At first glance it would be easy to think tourmaline, which is what the customer believed it to be and had been assured by another jeweller that it was. Through a loupe, the setting appeared to be a fairly modern casting, not hand carved but mass produced, and the stone did not suggest tourmaline. Looking into the stone with a 10x loupe, there were no typical tourmaline trichite inclusions, but more tellingly when tilted to the side there was no visible pleochrosim. (You must excuse the big fingerprint on the table of the stone, as I said earlier I am often in a hurry!)

A quick spin on the polariscope told me all I needed to know; the 'tabby extinction' so often seen in synthetic spinel was apparent. This was backed up by an RI reading of 1.727.

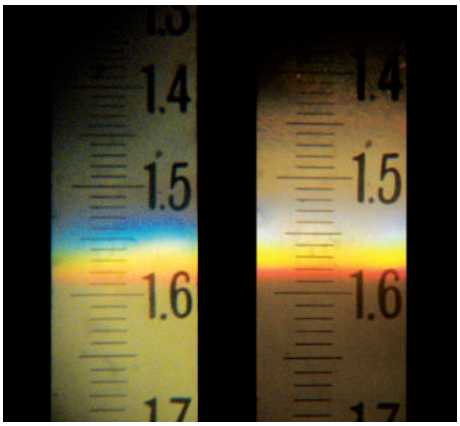
Topaz or aqua? Horse or zebra?

I was sent a pendant set with transparent, deep sky blue, pear-shaped stones, by a friend who asked whether they were topaz or aquamarine. One stone had already been removed for identification but had been chipped in the process. It was, however, possible to carry out the necessary tests with the stones in the setting, so the chip could have been avoided, which demonstrates the importance of knowing which tests will give you the answers you want.



The 'tourmaline' ring. Tabby extinction seen through the polariscope (right) gave the clue to its identification — synthetic spinel. Photo by Kerry Gregory.

Over the Counter



Left: The aquamarine pendant.
Above: The readings taken on the refractometer showed the dark blue of the E-ray (left) and the very pale blue of the O-ray (right).

A quick spin on the polariscope, the addition of a conoscope, and a handy stone box top (later used as a makeshift retardation plate) and the answer was aquamarine. The stones showed a uniaxial negative sign, whereas topaz would have shown a biaxial positive sign. Many of the stones also showed 'rain' inclusions typical of aquamarine.

However, not being one to stop when I can cause myself unnecessary grief, I decided to go a bit further. The person who sent me the pendant had mentioned they found the RI of approximately 1.58–1.59 a little high for aquamarine, and sure enough the book I had to hand quoted 1.56–1.58 for aquamarine. Now this is the bit where I should have thought 'horse', but thinking 'zebra' I considered maybe it could be maxixe beryl, and I got excited.

In order to prove I had aquamarine (horse) not maxixe (zebra) and rather than going to the expense of a laboratory report for the £150 brooch, I used Alan Hodgkinson's top lighting method to obtain RI readings. This gave me an RI of 1.584–1.592 and birefringence of 0.008.

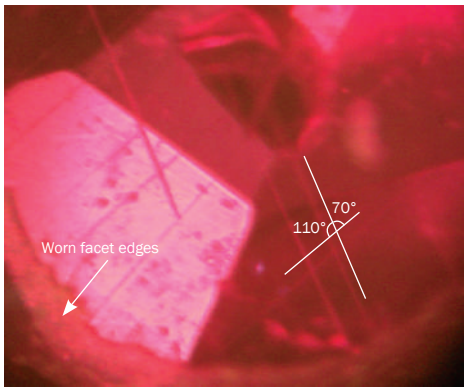
Having done further research, I realized my book was horribly out of date and the range is now known to be 1.56–1.60 for aquamarine, so my stones were well within the parameters. However, what I was looking for were the pleochroic colours transmitted by the O-ray and the E-ray. The O-ray was a very pale greenish blue and the E-ray was a dark sea blue, which confirms I had aquamarine, as the pleochroic colours are reversed in maxixe and the darker colour is carried by the O-ray.

Free advice?

Very often customers want you to tell them what their stone is but they don't want to pay, so in the interest of goodwill, and hopeful of future sales, you have a look. However, time is money, so you have to balance it out; do you take a quick look at their 'diamond' ring and say, "It is not a diamond", or do you spend half-an-hour of your time proving conclusively it is CZ not white sapphire? Easy. You say to the customer: "I can tell you it is not a diamond for free, but if you would like to know *exactly* what type of diamond simulant it is you will have to pay me £50." They are always very happy to have the free advice.

It's red but is it a ruby?

A customer brought in a ring she was thinking of part exchanging with us. She told me it was a ruby and diamond three stone given to her mother by her father, and that it had cost him a lot of money. Looking at the ring the hue of the red just didn't look right for ruby. The stone was quite worn and as there was no evidence of retipping or remounting, the wear seemed excessive for ruby; all other observations suggested garnet to me. I tentatively enquired whether it may be a garnet not a ruby, but the customer was adamant it was a ruby. I asked if I could have it for half an hour to test while she did some shopping, and she was more than happy.



The angles of the intersecting rutile inclusions in this stone and the worn facet edges indicate garnet rather than ruby.

On getting to my office I realized I had a problem. All my testing equipment was at home where I had been working on some stones, so all I had in the office was a loupe and a microscope. How was I going to prove categorically that this was a garnet not a ruby? Luckily for me the stone had some rutile inclusions. Looking through the microscope it was clear they were oriented at 70° and 110° conforming to the cubic crystal symmetry, proving the stone to be garnet not ruby. In ruby the rutile would have been oriented at 60° or 120°.

When I told the customer my opinion she was a little disappointed, but not wildly unhappy, and she did tell me that her dad was often 'taken for a ride' so she was not surprised.

Oyster breeding on Sulawesi, Indonesia

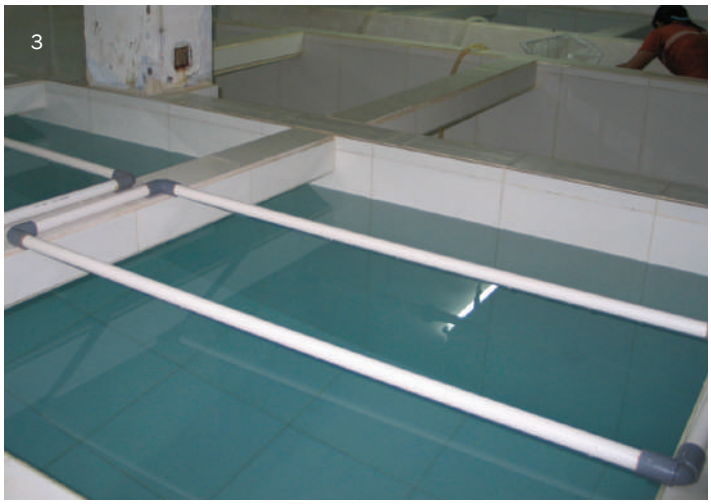
Peter Groenenboom reports on methods used to breed oysters for pearl cultivation in North Sulawesi, Indonesia.

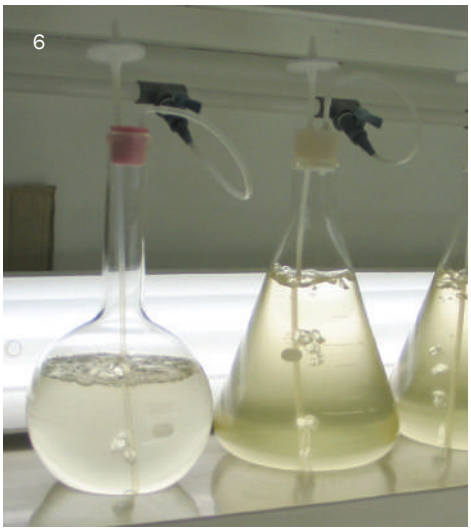
1. Breeding station at Bitung, Indonesia.

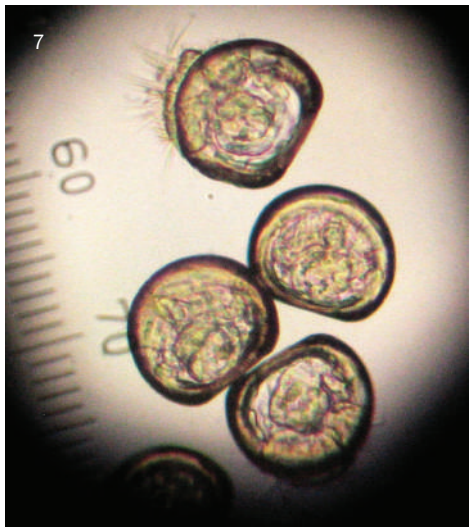
Nowadays the majority of oysters used for pearl cultivation are from breeding stations but, although the science of aquaculture breeding of edible oysters, mussels and other bivalves is not new, little about the breeding of pearl oysters is published in general gemmological literature. The following information is based on the processes used at the two breeding stations I visited in North Sulawesi, Indonesia, in March 2008 (**1**).

The parent oysters are either taken from the wild or from the best quality mother-of-pearl producing oysters at the pearl farm (**2**). At the hatchery visited by the author a female oyster is first killed, the mature gonad taken out and the quality of the eggs is checked under the microscope. The same is done with the seed of a male oyster, and eggs and the sperm are put together into a tank (**3**). Most other hatcheries use live oysters and encourage them to spawn in a manner replicating natural reproduction, thus avoiding the necessity to kill the oysters for breeding.

2. Parent oyster Pinctada maxima, *size 14 cm.*







3. Tanks containing the larvae. 4. Seawater filter installation. Inset: two filters showing the change in colour from white to brown after just a few days. 5. The black nylon ropes attached to racks suspended in the tanks. The white/silvery spots are the spat which attached themselves to the ropes. 6. The retorts filled with purified and boiled seawater in which the plankton production takes place. Under the microscope the plankton can be seen as very small square spots. 7. Under the microscope it can be seen that the larvae have taken the shape of a shell and the protruding mantle is visible. At this stage the spat should be very active, which is a sign of good health.

The tanks (bassin) used for the hatching and breeding of the oysters at the stations visited were made of concrete covered with tiles, but today fibreglass tanks are more commonly used. One of the most important factors for successful breeding is the cleanliness of the tanks and the water. The tanks are filled with seawater which has been cleaned by a sand filter to remove most of the organisms, followed by a filter system which removes any bacteria (**4**).

When the water in a tank gets dirty or contaminated with bacteria, the larvae are removed using a nylon sieve of a fineness appropriate to the size of the larvae, so that the tank can be cleaned and filled with fresh water.

When the larvae are about 280 microns in size, or between 16 and 20 days old, racks with two pieces of nylon rope are hung in the tanks (**5**). The larvae attach themselves to the ropes and at that stage are known as spat.

The growing oysters are fed on plankton. At the hatcheries I visited the production of plankton was concentrated on one kind, a variety of *Chaetocheros sp.*, which has a size of only 5 to 8 micron, although another species, *Pavlova,* have also been tried. Many hatcheries use multiple species of algae to produce a balanced, nutritious diet.

The plankton is taken from the natural seawater, the right species is selected and then cultivated in purified seawater in containers known as Erlenmeyer retorts and fed with a mix of vitamins, trace metals, phosphates and nitrates (**6**). Plankton is also grown from cultures in rooms that are either air-conditioned or have outside

Organic Gem Materials

Oyster breeding on Sulawesi, Indonesia (cont.)

8. When the oysters are transported they are put in styrofoam boxes and cooled down. This way they will survive about 24 hours out of the water. 9. When the oysters reach the place where they are to be put to sea, the boxes are opened and the oysters are placed in racks. 10. When the oysters are large enough to be operated on, they are removed from the sea. Some oysters will die during this period, as indicated by the empty places on the ropes.

temperatures; the higher the temperature, the more likely it is that the plankton will be contaminated by bacteria. Most hatcheries try to keep the temperatures below 24 °C.

The amount of plankton used depends on the size of the larvae or spat. The cultures are carefully controlled for the amount of bacteria as a whole tank of oysters could be destroyed if the amount was too high.

Growing of the oyster

When the spat has attached itself to the rope they are transferred to the sea. They are placed in small baskets which are covered with a very fine net to protect them against many of the sea creatures that may attack them. Nevertheless, most oysters will die for various reasons. At the Sulawesi hatchery about 1.2 million oysters are grown every year, about 100,000 of which are used on the company's own pearl farms; of the remainder most are sold, some are eaten by fish or conch, and some die for unknown reasons.

The survival rate depends on many factors which are difficult to control. These include abundance of plankton, the temperature of the water, the weather conditions, the presence of disease, the 'quality' of the parent oysters and the handling of the oysters.

Frequent and careful checks are made on the oysters until they are about 8 mm in size, as they are particularly at risk during that time.

After about eight to ten months when the oysters have grown to a size of about 60 mm, they are transferred to a different type of basket. These differ with each locality. At Sulawesi they consist of vertical frames with pockets, with two oysters occupying each pocket (9). In Papua, square baskets with horizontal layers are used for the first four weeks with four oysters in each layer. After this period the oysters are transferred to frames similar to those used in Sulawesi.

The survival rate in this period is about 80%. After about another eight to ten months when the oysters have grown to 120 mm, they will be ready for the operation to insert the bead nucleus.

Quality of the oyster

The quality and health of an oyster is determined by various factors:

Internal:

- Food intake: the darker the intestines (around the abducter muscle), the more food the oyster has taken, which indicates good health.
- The layer of fat around the abductor muscle: the more fat the better the condition of the oyster.
- The ruster (used for crushing the plankton): the size is a measure of the condition of the oyster.
- The colour of the liver, which should be black and red.

External:

- The condition of the 'fingers': this is the part of the mantle which stretches out of the shell when it is open.
- The byssus threads: the stronger they are the better the oyster. These are checked by simply feeling and pulling on the oyster.
- The layers of conchin of the shell.

Acknowledgement

The author would like to thank George Kakuda, Japan, and Rajendra and Fara Nasution, Indonesia, for their useful information and reviews.

Further reading

P. Southgate and J. Lucas (Eds), 2008. *The Pearl Oyster*. Elsevier, Amsterdam. pp 544

All photos by Peter Groenenboom.

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Education

Home and abroad

Despite the almost universal economic woes of 2009, the draft accounts (pre-audit) show Gem-A having had a successful year and showing a healthy surplus. This can be attributed to a good year in terms of educational enrolment — a feature of recessions, when people are attracted to education that may improve their careers — and a cautious decision not to replace staff who had left in 2008 and early 2009.

Recognitiion

Gem-A now has to comply with considerable bureaucracy to retain its exam accreditations, its Awarding Body status and to allow foreign students to obtain student visas to study with us in London. We can understand the need for robust border controls and heightened security checks on people visiting the UK, but these have impacted on all teaching organizations in the UK, large and small. In particular they a place a huge administrative burden on Gem-A.
Gem-A is already an accredited awarding body for its qualifications and has been approved by the British Accreditation Council which provides accreditation for the teaching centre itself. All such accreditation is a necessary part of maintaining Gem-A's integrity and recognition in the educational field, demonstrating our commitment to education and educational development that benefits our membership and the gemmological community as a whole.

Translations

The new course notes — we make no excuse for bragging about these — are now being translated into Chinese (simplified and traditional) for use in our four Hong Kong teaching centres and five mainland Chinese ones. Discussions regarding French and Japanese translations are underway. Sadly, it is possible that it will prove uneconomic to provide the gemmology Foundation and Diploma Courses in certain other languages in the future unless suitable sponsorship can be obtained. Translation is not simply a matter of translating the course notes, there are also the on-line components (and their marking) and the exams and answers. Ensuring consistent, non-ambiguous exam questions around the world in various languages and demonstrably equal marking, is a requirement of our accreditation, as well as an essential part of the academic excellence and fairness our students expect.

The economic realities of providing our courses in other non-English-speaking countries is why we often seem to respond negatively to members and others who propose additional markets for us. It is not that we doubt the potential demand for our courses in certain countries, it is just that without very significant sponsorship, and guaranteed sponsorship over several years, they are just not a viable proposition. We help where we can, of course. Thus while we were unable to respond fully to a request to establish courses in Afghanistan, we were able to help with advice and the supply of equipment. On the other side of the border, however, in Peshawar, Pakistan, where English is spoken, we are delighted to report that a Gem-A Teaching Centre is being estabilied by Ehtesham Ullah Khan FGA, at the Gemstone Development Centre at the University of Engineering and Technology. This is being sponsored by USAID and will be linked with the Pakistan Gems and Jewellery Development Corporation. USAID also funded Gem-A's visit to the region in 2008 when initial discussion with University of Engineering and Technology and the Pakistan Gems and Jewellery Development Corporation were held.

Ehtesham Ullah Khan FGA (left), of the Gemstone Development Centre at the University of Engineering and Technology, Peshawar, examining kunzite and other gems with a Peshawar dealer. © Gem-A, Photo Jack Ogden.

Gem-A News and Views

Education (cont.)

Gem-A Diamond Scholarship Awards

Congratulations to Annie Cracknell and Adam Claridge, winners of the 2010 Gem-A Diamond Scholarships in the Craft and Design Awards. These annual awards are organized by the Goldsmiths' Craft and Design Council as part of their programme to promote excellence amongst those engaged in the trade. Gem-A is pleased to continue its support for the future of the industry by awarding Practical Diamond Certificate courses as scholarships.

Smart links

The entry of self-employed gem carver and jeweller Annie Cracknell was a pair of carved tourmalineated quartz cufflinks. Said Annie: "For me, gemstones form the link between my passions for jewellery and for science. My father was a scientist and my mother an artist, and I have always been torn between the two subjects. I chose chemistry, biology, textiles and jewellery for my A-levels and ultimately jewellery won me over as I could see more ways in which science and art could be combined. I studied for a degree in jewellery and silversmithing and during the course I became more passionate about gemstones, not just because of their beauty but because of the history and science. For my final year dissertation I based my research on the value and history of gemstones which involved the study of the treatment, synthesis and manufacture of the stones. I found it so interesting and so refreshing to be looking at things from an academic point of view and I thoroughly enjoyed it. It is for that reason that I am really looking forward to furthering my studies by taking the diamond course, not to mention its usefulness in my career as a jeweller."

Gem set and match

Adam Claridge, an apprentice diamond mounter at Spectrum Fine Jewellery, has followed his father, gold and silver engraver Peter Claridge, into the trade. Said Adam: "For the last eighteen months I have been involved in the UK and World Skills competitions, and was fortunate enough to win the position of the UK representative in Jewellery at the competition in Canada." Adam works in a trade workshop that also has a retail shop and is delighted that he will be studying the diamond practical course. "Not only will the knowledge I gain enhance my career as a diamond mounter, but it will also help me to promote the gems in the retail sector."

Gem-A Scholarship winners Annie Cracknell and Adam Claridge and the Design Awards ceremony held at Goldsmiths' Hall, London, on 1 March.

Photos by Bill Burnett (www.billburnett.co.uk); © Goldsmiths' Craft and Design Council.

Tourmalineated quartz cufflinks by Annie Cracknell.

Gold and silver diamond mounting by Adam Claridge.

Education (cont.)

The class of 2008

Three graduates of the new BSc (Hons) degree in Applied Mineralogy and Gemmology, Kingston University, report on the first running of this innovative degree route open to all those who hold the FGA. They were each asked for their opinions of the course and what they felt it had done for them.

The group 'go underground' at the Rosevale tin mine near Zennor, Cornwall.

A visit to the SSEF Swiss Gemmological Institute laboratory in Basle.

Rupert Huddy is a ninth-generation son of a retail jeweller and has spent all his life within the industry.

Huddy considers that this degree — the first gemmology degree in the UK — is the next step up the 'ladder' from the FGA and should be considered a 'must' for all those who have a serious interest in gemmology. He says: "I was part of the first group to take the course that consisted of ten students with an age range from 24 to 63, and it was great to be part of such a diverse but enthusiastic group. The degree consists of eight modules, four in the first semester and four in the second, and a bridging module which is held at the start of the course, which provided a grounding in basic geology. It introduces you to the origins of crystal growth, often read about but seldom experienced firsthand in the field. Although as the first students we were the 'guinea pigs', I'm sure everybody enjoyed the course as much as I did — attending lectures, the self-study days and the many field trips including the British Geological Survey in Nottingham and the SSEF coloured gemstone laboratory in Basle. The degree has broadened my horizons giving me a greater range of job opportunities, and not just those directly connected with the jewellery trade."

Richard Taylor, who recently sold his jewellery valuation and diamond grading business Safeguard to the Birmingham Assay Office, has spent his entire career within the industry.

Taylor said: "The course was all I hoped for and more; it significantly expanded both my knowledge and my ambition. Without the Kingston degree I would never have got to where I am today, doing a PhD at the University of St Andrews. Personally the Kingston degree acted as a real springboard. I found the syllabus both challenging and enjoyable; it was well presented, well thought out and resourced. The real highlights for me were firstly the shared modules with students from other associated disciplines, and secondly the inspirational teaching from Professors Andy Rankin and Peter Treloar. The opportunity to complete a dissertation as part of the degree was another of the high points. It was a great learning process; we each selected the techniques and equipment we wanted to use, collected and analysed the data and presented our work in the form of a bound dissertation that we could take real pride and satisfaction in."

Janice Kalischer is the successful owner of a number of retail jewellery outlets specializing in antique and estate jewellery.

Kalischer said: "The gemmology degree course covered a wide body of knowledge taking in aspects of geology, igneous and metamorphic petrology and mineralogy. This gave a foundation which enabled the student to take their existing gemmological knowledge to a much higher level. Part of the course also involved academic skill in science which covered researching a project, academic writing and how to make a formal presentation. This gave all the students the skills and confidence to speak in public on their chosen subjects. I found this especially useful and this year I have three lectures booked to speak on diamonds and gemstones, something I would not have been able to take on before the course. The study skills and research methods module was invaluable, not only for the preparation of one's dissertation but also because the skills learnt are now being put to good use. I am researching and writing on gemmological and mineralogical subjects for publication at the moment."

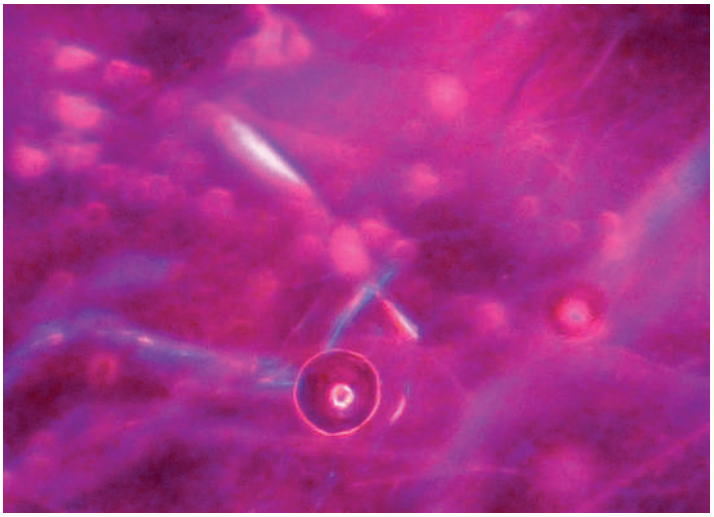
In the news

Trade Forum

On 15 February Gem-A held its first Trade Forum, an initiative to link in with the new UK category of Gem-A Corporate Membership, but open to all members and students. It took place between 12:00 and 14:00 and a sandwich lunch was served. The topic was glass filled rubies and the meeting was divided into three parts. To begin, the background to the rubies and their treatment was explained. Glass filling in rubies was not a new treatment — indeed an example was reported in Gem-A's *Journal of Gemmology* in 1984. However the recent wave of rubies treated in this way was first noted in 2004 and now vast quantities are on the market, some at extremely low prices. It was explained that very poor quality rough ruby, seemingly mainly from Madagascar and Mozambique, was being acid cleaned or bleached, impregnated with glass, often of yellow or pink colour, and then faceted or formed into cabochons. The resulting stones were often superficially attractive, but their durability could be suspect, a problem that might come to light when jewellery containing the stones was cleaned or repaired. Most recently, there were reports from the GIA laboratory in Thailand of glass filled star rubies which were likely to be on the market soon.

The second part of the meeting was a hands-on session in which participants were able to use microscopes and loupes to examine rough rubies, before and after glass impregnation, and a selection of faceted and cabochon examples. The samples showed the various ways in which the glass treatment can be spotted, including 'blue flashes', bubbles, variations in surface texture and cavities and cracks containing glass. In one case, one end of a large cabochon could be seen to be composed of ruby fragments in a glass matrix.

The third and final part of the meeting was a discussion about the rubies in which various aspects of their marketing, identification and disclosure were raised, including what they should be called. It was agreed that they were best known in the trade as 'glass filled rubies', but that other terms such as 'composite rubies', 'bonded rubies and 'stabilized rubies' had been proposed. It was explained that an international task group had been established by the Gemstone Industry and Laboratory Conference (GILC), held in Tucson on 1 February, to advise on this naming issue. Gem-A was represented on this task group and some of the matters raised at this Gem-A Trade Forum would be relayed to the Task Group (see facing page).



Glass-filled 'composite ruby' under a microscope showing blue flashes and gas bubbles. © Gem-A. Photo Jack Ogden

International conferences and meetings

AGA Conference

The Accredited Gemologists Assocation (AGA) held their annual conference on 3 February during the Tucson Gem Show. The AGA, which has a long association with Gem-A having first started as a North American alumni of the Association, is a very active group of gemmologists that attracts members from the USA, Canada as well as the rest of the world.

The first speaker was Chris Smith, President of the AGL, New York, who gave a presentation on Mozambique rubies, including heated and unheated stones and those that had been glass filled (an extended abstract of his talk is given on pages 3 to 5). Antoinette Matlins and Craig Lynch also spoke about glass-filled rubies, covering not only the identification features of the material but also durability problems that can occur with it. Dr Cigdem Lule from GIA London, gave an insight into archæogemology, a combination of gemmology and archæology, and how the concept could assist in identifying material in museums and collections. Thomas Hainschwang of GEMLAB, Liechtenstein, spoke on advanced gemmological instrumentation, its uses, and the advantages and risks involved. David Blount-Porter spoke on the natural pearls found in Sulu and

Gem-A News and Views

North Borneo. The last speaker of the day was Dr Don Hoover on the magnetic susceptibility of gems.

Richard W. Hughes was declared the 2010 winner of the Antonio C. Bonanno Award for Excellence in Gemology, an award presented annually by the AGA. Richard gave a brief address on the romance behind gemstones.

The conference concluded with a dinner dance.

Gemstone Industry and Laboratory Conference

A Gemstone Industry and Laboratory Conference (GILC) meeting was held in Tucson on 1 February and included representatives of Gem-A (Jack Ogden), GIA, CIBJO, International Colored Gemstone Association (ICA), American Gem Trade Association (AGTA) plus labs, dealers and retailers. The latter include representatives of Jewelry TV and GemsTV.

There were various presentations and discussion, including such topics as andesine feldspar, colour master stones for colour grading corundum, and oils and resins in emeralds, but a major focus was on glass-filled rubies and, after considerable discussion about durability, nomenclature and disclosure, a Task Force was established to consider an acceptable commercial name for this material and how it should be disclosed, and then report back to the GILC members. The main terms proposed — and subsequently discussed at length by the Task Force via email — were 'glass filled ruby', 'composite ruby' and 'bonded ruby'.

What to call Synthetic Diamonds

On 10 February, Gem-A was represented at the Cross Industry Meeting on Diamond Nomenclature and Consumer Confidence, hosted by the International Diamond Council and held at the European Commission's Representation in London. The meeting was a follow up to meetings held in Brussels and Antwerp in 2008 in which a wide range of diamond industry participants, from miners to synthetic producers, from diamond dealers to laboratories, participated, including Gem-A. The Brussels and Antwerp meetings had been proposed by CIBJO (the World Jewellery Confederation) under the auspices of CEN (the European Standards Organisation) and resulted in a CEN Workshop Agreement (15865:2009) that was published in May 2009 and, by consensus, permitted the words 'laboratory created', 'laboratory grown' and 'synthetic' to be applied to synthetic diamonds.

This agreement was in line with the nomenclature agreed by the International Diamond Council, The World Federation of Diamond Bourses (WFDB) and the United States Federal Trade Commission, but contrary to CIBJO's insistence that only 'synthetic' should be used. The CIBJO position was retained at the CIBJO Congress in Istanbul in 2009. The aim of the recent London meeting was to decide whether the 2009 CEN Workshop agreement should be progressed to become a European Standard, and to sound out whether the CIBJO position might change at their 2010 Congress in Munich thus leading to a harmonized position right across the industry.

CIBJO did indeed change its position in Munich in February this year (see on pages 19 and 20). It might well be asked why CIBJO should have proposed the harmonization talks through CEN as early as 2008, but only agreed to go along with the agreed nomenclature in 2010. The answer is that in May 2008 the International Diamond Council (a joint committee of International Diamond Manufacturers Association and the WFDB) had agreed the use of the terms 'laboratory-grown', 'laboratory-created' in addition to 'synthetic' and a joint statement was issued by the WFDB, IDMA and the CIBJO in which CIBJO President Gaetano Cavalieri stated that CIBJO accepted the IDC's regulations. Cavalieri had been over-optimistic predicting the outccme of the CIBJO Diamond Commission meeting at the CIBJO Dubai Congress in 2008.

CIBJO

The 2010 CIBJO Congress was held in Munich from 20 to 22 February. Harry Levy discusses some aspects on pages 19 and 20, but here is a brief summary of some of the decisions:

The CIBJO Board of Directors approved the Diamond Commission resolution that: "In the best interest of consumer protection and industry harmonization, CIBJO accepts the terms 'laboratory-grown' diamond, 'laboratory-created' diamond and 'synthetic' diamond to describe non-natural diamond. CIBJO recognizes that its standards are subject to government regulations in the respective jurisdiction of CIBJO members. In the event that the national jewellery association, which is a member of CIBJO, deems that there is no acceptable local direct translation of the English terms 'laboratory-grown' or 'laboratory-created,' then only the translation of the term 'synthetic' should be used."

CIBJO's Coloured Stone Commission endorsed the set of 'modification codes' that are intended to be used by members of the trade to disclose treatments on both national and international levels. The codes were developed in coordination with the International Coloured Gemstone Association (ICA) and the American Gem Trade Association (AGTA), and are based on a set of codes originally developed by AGTA. These modification codes are not intended for describing treatments to the final consumer, who should be provided with a full explanation of modifications. These codes and their use will be covered in a future issue of *Gems & Jewellery.*

CIBJO also introduced its *Gemmological Laboratory Book*, a guide for the management and technical operations of gemmological laboratories, providing information about best practices and general requirements for the competence of laboratories to carry out tests, grading and/or internal calibrations, on instruments, coloured gemstones, diamonds and pearls.

Collection news

Books and instruments — Gem-A's extensive archives

As many of our members will be aware, as well as an extensive collection of gemstones, Gem-A holds archive collections of both books and instruments. As part of the ongoing services we provide to both members and students, Gem-A has been looking at ways to improve access to these facilities, but with the limited space at the Gem-A headquarters it is not a challenge with any easy solutions.

The library and student books

The library facilities offered at Gem-A were unfortunately limited to a research library until very recently. In 2009 one of our smaller teaching rooms was transformed into a student study room, which now provides both computer facilities and access to study books. The room has proved to be a popular resource with pre-booked time slots available to students attending specific classes, and dedicated access for members on Tuesday evenings between 5:30 and 8:00 pm. (There is also limited access to the study room for members and students outside their allocated times but we do advise that they phone in advance to check availability.) We are actively looking for recent publications suitable for students for the study room and there are still some gaps in the archive research collection in the library which we would like to fill. We have had many very helpful donations of books and magazines over the years and this has supplied a large core of the books for the student room. As both facilities are limited on space we occasionally offer duplicate copies for sale to provide funds to purchase new books.

Michael O'Donoghue has been instrumental in putting together a catalogue for the research library which now needs transferring to a more modern database. As part of Gem-A's on-going commitment to these collections, we are looking for one or two volunteers to help oversee the library and student books, and to take an active role in both encouraging donations and making recommendations for new books, as well as updating our current library catalogue.

The archive instrument collection

Gem-A's collection of archive instruments represents the major developments in gem testing over the last hundred years. Included in the collection are some fascinating examples such as a refractometer with a diamond prism, various Tully and Herbert Smith refractometers and B.W. Anderson's handheld prism spectroscope.

Because any suitable storage space for the instruments is rapidly disappearing, to enable us to house new donations it has been necessary to review the collections we have. This has been carefully carried out over the last year and many duplicate items have been identified. After careful consideration it has been decided to offer these items for sale at auction, with the proceeds being used to fund new teaching equipment for Gem-A's classrooms.

A small selection of items from Gem-A's archive instrument collection that can be seen on display at Gem-A's London headquarters. Pictured from the left: a Herbert Smith Refractometer donated by Roy Huddlestone, an Ultraviolet Spectroscope donated by Mrs K Findlay in memory of Kenneth Findlay, a Beck Prism Spectroscope originally owned by B W Anderson and a Tully Refractometer donated by Christopher Tarratt. Photo by Jack Ogden, © Gem-A.

Gem-A News and Views

The auction has now been arranged and will be a once-in-a-lifetime opportunity to acquire some very collectable and rarely available historic items seldom seen outside museums. We believe strongly that these items should be admired and appreciated rather than hidden away in a storage room at Gem-A. Although some of these are older models many of them are still in good working order. Included in the auction will be some of Gem-A's teaching equipment which is no longer in use. In total this has produced over a hundred lots including some very sought-after sodium lamps, diamond lamps and refractometers, which we believe will be of particular interest to our members and students.

Auction

The sale is to be held at Fellows & Sons, Birmingham, on Tuesday 13 April, and we would like to extend our thanks to Fellows & Sons for all their help with the preparation for the auction and for kindly waiving their vendor commission on the items being sold. The items to be included in the sale may be viewed in the auction catalogue on online at www.fellows.co.uk/gem-a

Although the sorting of the collection has been a long and a very dirty job as some of this equipment has been in storage for some time, it has been very rewarding as it has brought to light some fascinating instruments, some of which are unique. We hope that over the next couple of years we can put together a database of these items including, where applicable, their historic significance, arrange for any necessary restoration work to be carried out and build a working collection of archive equipment along with user instructions. We are looking for two volunteers to undertake this task, so if you have the time to spare why not consider taking on this fascinating project.

We are hoping to continue to build the collection which can only be done through the generous donations of members and others in the gem and jewellery industry.

If you are interested in becoming an archive instrument curator or a library volunteer please contact Jack Ogden jack.ogden@gem-a.com to find out more.

The Journal of Gemmology

Summaries of articles published in *The Journal of Gemmology*.

The full articles may be viewed by Gem-A members only at www.gem-a.com/publications/journal-of-gemmology/the-journal-online.aspx.

The textures of jade*

Current gemmological opinion in China defines jade as a natural polycrystalline aggregate with fine compact texture, high toughness, good lustre and a medium to high degree of translucency. Geologically speaking, jadeitite, composed mainly of jadeite, is a high pressure metamorphic rock. Not all jadeitites have the qualities required of precious jade, which the Chinese call feitsui or fei cui, because they may have coarse-grained textures which are porous and therefore lack the coherence desirable for carving materials.

Mineralogical and gemmological studies on jadeite have in the past mainly dealt with its mineral and chemical compositions, its fluid inclusions, and the causes of its colour. The purpose of the present study was to establish correlations between textural features and jade qualities. The appearance and the transparency of jadeite jades are closely related to texture and if such correlations can be established, we could then predict the texture of a jade based on its appearance. The nature of the aggregate and its relative toughness could then be estimated easily and comparable data from jadeite jades around the world may reveal features unique for each locality. In addition, an understanding of the textures of feitsui can also help a jade manufacturer decide on the best way to design and carve a particular piece of jadeite jade.

Primary textures

Jadeitites that have undergone minimal deformation and which thus retain an undeformed massive structure are described as having primary texture. Such jadeitite has a texture that is coarse-grained, with crystals up to 20 mm or more in length and is porous to variable degrees. The individual crystals are mostly prism-shaped with flat contacts and random orientation, sometimes in radial clusters. They often have zones with slightly different extinction directions under cross-polarized light indicating some chemical variation — variation that also causes zones with variable refractive indices producing optical interfaces or distortion, and reducing transparency. Crystals in primary textured jadeitites may also have distinct cleavages and fluid inclusions further decreasing their transparency.

Primary textured jadeitite it is not considered precious, but it can be used as B-jade material and subject to acid-bleaching and resin-filling.

Deformed, recrystallized textures

Most jadeitites have some deformation and recrystallization of their jadeite grains and are finer-grained. Myanma jadeitites are composed dominantly of elongate jadeite crystals with preferred orientation and with

Journal Files

length/width ratios ranging from 2.0 to 20; some are even fibrous. The grain sizes vary greatly, and the grain sizes, shapes, crystallographic orientations and boundary features are closely correlated to transparency. The finer and more preferred the orientation (with a homogeneous extinction direction), and the more indistinct the grain boundaries are, the better the transparency.

When buying rough jadeite jade with an opaque weathered crust ('skin'), a small 'window' polished through the weathered allows evaluation. In such a case a preferred orientation shown by the visible crystal grain structure can be a positive indication that the whole stone is of good quality.

Some translucent to transparent jadeitites consist of crystals with intergrown crystal boundaries ('sutured grain boundaries'). Such jadeites have excellent toughness, even with larger grain-sizes - and the tougher a jadeite is, the better its quality. Other sub-types of deformed and recrystallized textures can also be recognized.

Icy jade

Some jadeite has an icy or glassy transparency nearly as clear as rock crystal and may appear like a single crystal. However, jadeite cannot easily grow as large transparent crystals in nature and there have been no reports of a single jadeite crystal being cut or otherwise used as a gemstone. With the icy or glassy jadeite, transparency is maximized because the individual crystals are too small to develop cleavage, they have no gaps between their boundaries and they have their crystal and optic axes consistently aligned.

The transformation of coarse jadeitite into the transparent gem-quality icy to glassy feitsui is the result of recrystallization that occurs at high pressure and low temperatures, exacting conditions which make this feitsui extraordinarily rare and, to date, only known from Myanmar. **J.O.**

* A summary of 'Jadeite jade from Myanmar: its texture and gemmological implications' by Guanghai Shi, Xia Wang, Bingbing Chu and Wenyuan Cui. *The Journal of Gemmology,* 2009, **31**(5-8), 185–195

A necklace of 15 exceptionally bright emerald-green glassy feitsui (jadeite jade) cabochons. Photo by G.H. Shi.

Myanma jadeite jade showing abrupt changes in appearance. This is usually accompanied by changes in texture which are as important in understanding jades as inclusions are in other gemstones. Note that the appearance of jade in the centre resembles 'cooked sticky rice', but in the left of the picture looks like 'porcelain'. Length of carving 10 cm. Photo by G.H. Shi.

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Geographic typing of corundum*

The determination of the geographic origin of corundum on the basis of trace element analysis has been of growing importance in recent years. In this present study the trace element compositions of sapphires attributed to simply 'New South Wales' in Australia were compared with those of sapphires from known Australian sapphire fields.

The analytical technique

The sapphires were analysed using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) at GAAJ-Zenhokyo Laboratory in Tokyo. In this process a pulsed laser beam is directed at the gem to remove ('ablate') a minuscule amount of the material which is transported in a high temperature argon plasma into a mass spectrometer where the different ions present are separated and counted. The technique can detect the presence and amount of elements down to parts per million (ppm) or even parts per billion (ppb). Only a minute area of the gem surface is affected and the technique is considered to be essentially non-destructive. Gem corundum is ideal for this type of analysis because its colours are the result of trace element substitutions in the Al_2O_3 structure. Graphical plots of the relative amounts of some of these trace elements can now usually distinguish corundum from magmatic or metamorphic sources.

The study

In 2006 Abduriyim and Kitawaki published a study on a group of blue sapphires reported to have come from New South Wales, Australia. These stones had been presented to the GAAJ-Zenhokyo Laboratory in Tokyo in the early 1990s by the late Professor A. Chikayama (to whom the present paper was dedicated), so unfortunately there was no record of the more precise sources of these stones. There are various basaltic sapphire fields in New South Wales, and in addition sapphire from the Anakie-Rubyvale gem fields in central Queensland had been sold via gem merchants in New South Wales.

Blue sapphire typical of Inverell area, New England, New South Wales. Australian Museum Collection (D48268) Photo Stuart Humphreys.

For the present study the trace element contents of the 'New South Wales' (NSW) sapphires were compared with those of sapphires from known sapphire fields, involving both new analysis of samples from various collections and analytical data previously published. The trace elements detected included magnesium (Mg), titanium (Ti), chromium (Cr), iron (Fe), nickel (Ni), gallium (Ga), tin (Sn) and tantalum (Ta). Sapphires from different mining areas showed some variations in trace element concentrations and their relative amounts can be graphically plotted. In particular Fe against Ga/Mg ratios provided particularly good separation of different groups.

A plot of Cr/Ga content against Fe/Ti content showed only partial separation of the analysed groups and did not link the unsourced NSW stones to a specific field. However, a plot of Fe/Mg against Ga/Mg showed a better separation of the analysed groups and demonstrated that the unsourced NSW group almost certainly were from Inverell, New England, NSW. The long established Inverell field has well-known sapphire placer deposits, renowned for their dark blue sapphires.

The study also highlighted the unusual geochemistry of a group of purple corundums from New England, which came from a zoned sapphire-ruby association. Unlike most known ruby, which has metamorphic associations, the New England ruby shows the high Ga levels usually associated with magmatic sources. They thus resemble zoned sapphire-ruby from Rio Mayo, Colombia, South America, which is attributed to a transitional magmatic/metamorphic origin.

In addition to describing the geology of the Inverell fields, the authors also describe the geology of the Vulcan State Forest and Barrington Tops fields, both in New South Wales, and the Anakie field, Queensland.

J.O.

* A summary of 'Geographic typing of gem corundum: a test case from Australia' by F. Lin Sutherland and Ahmadjan Abduriyim. *The Journal of Gemmology,* 2009, **31**(5-8), 203–210.

Journal Files

Quantifying colour change in gemstones*

Colour change, one of the celebrated optical effects encountered with gemstones, was first described for alexandrite in the early 1840s. Over the next century and a half, various other gems demonstrating colour change were described, including sapphire, spinel, garnet, fluorite, monazite, kyanite, and diaspore. Gem-quality garnets with an alexandrite-like colour change are known from Tanzania, Sri Lanka, Madagascar and Nigeria. Those from Madagascar can show various types of colour change, e.g. blue green in daylight to purple in incandescent light or; yellow to greenish yellow in daylight to red orange or orange in incandescent light.

The present study was based on 52 garnet samples from Madagascar which demonstrated a colour-change effect. These stones were chemically analysed and their spectra measured. The observed colours of these colour-change garnets were dependent not only on a major change in illuminants (from daylight to incandescent light), but also on more subtly different types of natural light such as direct sunlight, diffuse light from cloudy skies, or morning, noon or evening light. Consistent examination conditions and lighting were thus essential. Colorimetric parameters for different colour spaces were calculated from absorption spectra for standard light D_{65} (representing daylight) and standard light A (representing incandescent light). To describe the colours, simple hue names were used to avoid confusion or ambiguity.

A striking example of colour-change in a garnet from Bekily, Madagascar; in daylight it is blue green and in incandescent light purple; diameter of sample 7.4 mm, weight 1.78 ct. Photos © Thomas Hainschwang.

Composition and colour

The 52 garnets were divided into seven main groups based on their colour in daylight. Chemical analysis showed that all were members of the pyrope-spessartine solid solution series with minor to major contents of iron (almandine) and minor contents of vanadium (representing goldmanite garnet) and chromium (uvarovite). In addition, a range of percentages of grossular was present. It was found that garnets with a daylight colour of green, bluish green or greenish blue tended to have higher goldmanite (vanadium) and uvarovite (chromium) contents than garnets with a daylight colour from yellow to reddish orange. The few samples with violet, purple and purplish red coloration in daylight have relatively high goldmanite and uvarovite contents, but also contain high amounts of the almandine (iron) molecule. The two samples with red coloration in daylight have the smallest vanadium and chromium contents, but have high or extremely high iron (almandine) values. From these considerations, it could be concluded that the ratio spessartine : (goldmanite + uvarovite) is the key feature to understand the colour and colour changes of these samples.

Plotting colour change

It is important to be able to describe the colours in gems and how they may change precisely. The two systems selected for this research were the now widely used CIE 1931 and CIELAB 1976 systems (CIE stands for Commission Internationale de l'Éclairage). These are 'three dimensional colour spaces' — however, one dimension represents 'lightness' and the present research showed that this could be largely ignored, allowing the colour changes in gemstones to be plotted in just two dimensions — representing hue and saturation (or 'chroma'). The resulting chart is a circular one, with hue represented by an angle — from 1 to 360 degrees — and

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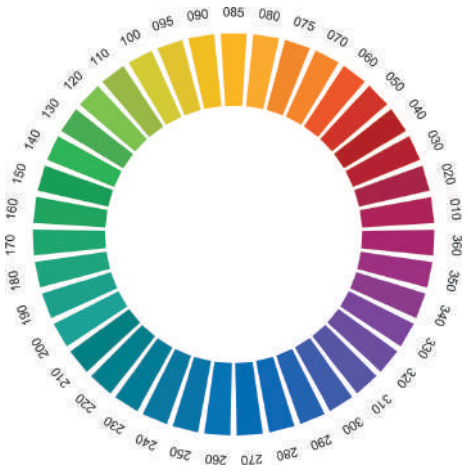


Hue circle (colour wheel) of CIELAB colour space representing examples of colours at different hue angles of the three-dimensional colour solid at high chroma and lightness 50. Copyright dtp studio Oldenburg and RAL gGmbH, Sankt Augustin, Germany (reproduced by permission).

saturation represented by distance from the centre of the circle. The two colours observed for each stone could thus be plotted as two points on this chart and the length and direction of the line joining these two points provided a good graphic representation of colour change. Furthermore, the degree of colour change could be categorized as faint, moderate, strong and very strong. This simple terminology would be useful for communication in the gem trade and use in gemmological laboratories.

Four alexandrites with 'good' colour change were also examined for comparison and it was found that the classification worked well for these — the samples examined could be defined as having 'very strong' colour change. Although the system needs testing further, it appears to be an adequate solution for describing the extent of colour change of gemstones.

Limiting the use of the 'colour change' designation

In the gem trade, the designation 'colour-change' is frequently used as an attribute of quality and with the implication of rarity. The authors suggest that the use of the attribute 'colour-change' should be reserved for gemstones with 'moderate', 'strong' or 'very strong' colour-change. Furthermore, they suggest that stones falling in the 'faint' category of colour change, which is common in some gem materials (e.g. malaya garnet or amethyst), should be described as having 'colour variation' and not be labelled 'colour-change' stones. This would lead to a clear separation between alexandrite and the far commoner pale green or yellowish green chrysoberyl on the market which shows minimal variation of colour upon change of illuminants.

In the absence of analytical equipment such as a colour spectrometers or spectrophotometers, values like colour difference or hue angle difference are not directly obtainable. Nevertheless, colorimetric parameters in daylight and incandescent light as well as the type and extent of colour change of gemstones can be determined by visual comparison with colorimetric standards. **J.O.**

* A summary of the paper 'Colour-change garnets from Madagascar: variation of chemical, spectroscopic and colorimetric properties' by K. Schmetzer, H.-J. Bernhardt, G. Bosshart and T. Hainschwang. *The Journal of Gemmology,* 2009, **31**(5-8), 235-82.

Recent Events

Gem-A Conference 2009

Brief reports on the lectures presented at the Gem-A Annual Conference held at the Hilton London Kensington on Sunday 18 October 2009.

Filter tips

After a brief welcome, the first speaker was the well known author and gemmologist **Antoinette Matlins**, who described the uses of Gem-A's Chelsea Colour Filter (CCF) (**1**). The CCF — developed at Chelsea Polytechnic, London, where Gem-A courses were taught in the early days — was celebrating its 75th anniversary in 2009. Antoinette demonstrated with panache how the CCF, along with a small bag of other basic gemmological equipment (loupe, calcite dichroscope and Maglites), could be used to identify some 85% of the stones commonly encountered on the market. Add a UV light and the percentage rose to around 90%.

With the CCF there were a variety of simple guidelines. One of the most useful applications Antoinette demonstrated was using the CCF to scan quickly parcels of any coloured gemstone; with virtually no experience, one can spot less expensive look-alikes or fakes that are mixed in because their reaction — whatever it is — will be distinctly different. This was demonstrated with a row of 'paraíba-coloured' stones that were very close in colour, in which two were Paraíba tourmaline, one was a YAG and one apatite. The delegates had no difficulty immediately seeing differences in the three materials, quickly and easily.

Antoinette Matlins (left) and Kerry Gregory enjoy an impromptu CCF session following the conference dinner.

The value of the CCF becomes even greater with experience, and knowing how a particular gemstone is supposed to react. If a supposed aquamarine, for example, showed red through the CCF it would not be aquamarine. Indeed, with most blue gems red equals fake. Exceptions included natural cobalt spinels and most tanzanite. With green stones, however, the gemmologist might hope to see red; tsavorite garnets, chrome tourmalines and many emeralds showed red. With the red stones, ruby, of course, showed red, with synthetic ruby showing 'super red'.

With experience, the CCF can also alert the gemmmologist to the possibility of colour treatment and even doublets.

Antoinette reminded participants that it was also essential to stay up to date through publications, the web and such forums as Gem-A's MailTalk, and that through ignorance as much as malice, suppliers' descriptions could not always be trusted. She also pointed out that it was wrong to talk about stones being 'inert' under the CCF because all stones have a reaction, even though it may not be 'red'; developing an eye for subtle differences in shades of red or green is also valuable. During the lunch break Antoinette signed copies of her book *Jewelry and Gems: The Buying Guide*.

Flash Photography

To the novice gemmologist, gemstone spectra can be hard to see at first using a small, hand-held spectroscope. Even experts have considerable difficulty photographing what they see. **John Harris**, a Gem-A tutor since 1986, is a true maestro in the art of photographing spectra — indeed his photos are used in the new Gem-A Gemmology Foundation and Diploma course notes.

After introducing the background, from Newton to Anderson and Payne's research, John talked about his passion and experiences in 'Chasing Rainbows', his work with the gemmological spectroscope. He explained that so-called reflected light really meant internally reflected light and he recommended diffused light for best results, such as that produced by passing light through a tissue. Poor spectra could be due to glare, multiple reflections, extraneous light or dirt.

Good results could be obtained by placing the spectroscope in the tube of a microscope instead of the eyepiece. A piece of polaroid sheet could be used to separate the ω and ε rays. With some materials there can be a dramatic difference between the ω spectrum and the ε — for example with pezzottaite.

Recent Events

Modern digital photography works well for photographing spectra and indeed, when a triphosphor-coated tube is used as a lighting source, its characteristic emission spectrum (**2**) allowed a spectroscope to be calibrated by counting pixels in a digital photograph and then working out a nanometre to pixel conversion. Gems and minerals with rare earth spectra can be used in a similar way. Details of this type of calibration and John's database of spectra can be found on his website www.gemlab.co.uk.

Changing before your eyes

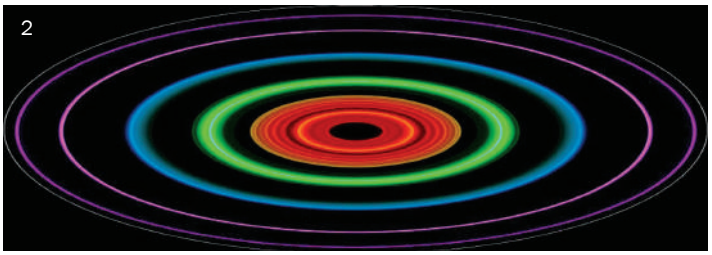
In the next presentation, another aspect of colour in gemstones was described in detail when **Dr Karl Schmetzer** discussed 'Colour change garnets — causes of colour, colorimetry and extent of colour change'. His main focus was on colour-change garnets from Madagascar (**3a** and **b**), the first stones from this country that had been known since the end of the 1990s. The challenges were to find a way to describe the colours and the colour change, what caused the colour changes and how the extent of colour change might be best communicated.

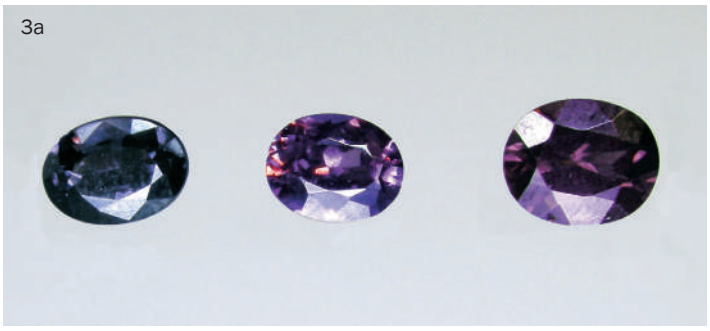
The garnets in question fitted into the pyrope-spessartine series with vanadium, chromium and manganese as the main colouring agents. However, different colour-change effects did not clearly relate to simple trace element contents, e.g. not simply to the amounts of vanadium and chromium present. The garnets could have similar absorption bands, but although the spectrum patterns remain similar, the V-Cr-maxima were slightly shifted. This was seemingly due to lattice expansion with increase in vanadium and chromium contents, and also due to some replacement of magnesium by calcium. The best correlation for predicting colour on the basis of composition was Mn: (V+Cr), the best correlation for predicting the extent of colour change was the sum (V+Cr).

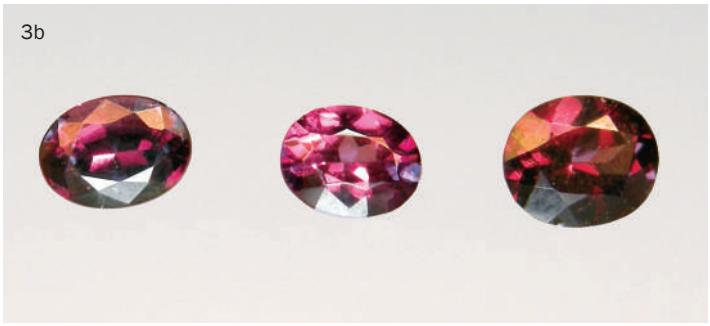
As noted in the summary of Karl's work on these colour-change garnets from Madagascar (see pages 38 and 39), he found that the colour changes could be plotted clearly and usefully on a two-dimensional chart. On the basis of the degree of colour change, the phenomenon could be described as 'faint', 'moderate', 'strong' and 'very strong'. In effect, 'faint' meant only a slightly noticeable colour change and Karl proposed that a specific type of chrysoberyl found in the trade with a colour change from green to grey was perhaps more fairly called 'colour change chrysoberyl' than alexandrite.

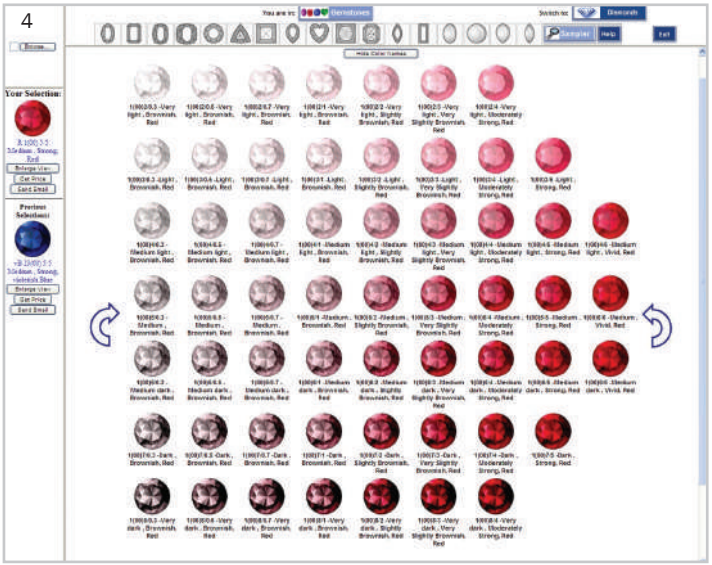
Gem wiz

The colour theme continued after lunch when **Dr Menahem Sevdermish**, the inventor of GemeWizard®, presented 'Digital gem colour communication and analysis'. The growth in internet commerce has made it essential to have some way of accurately and consistently communicating colour. This computer-based method of describing colour has representations of 31 hues, each in 36–40 saturations. In the more sophisticated GemePro™ version (**4**), each hue is further divided into 5 — thus providing some 72,000 colours in total. The system includes the GemeSampler™ component, which









2. Emission spectrum of triphosphor fluorescent lamp. Photo courtesy of John Harris. 3a and b: Colour -change garnets in daylight (a) and incandescent light (b). Photos © Karl Schmetzer. *3. Sample tone and saturation combination grid of red colour of the GemeWizard®.* © *GemeWizard.*

Recent Events

Gem-A Conference 2009 (cont.)

analyses the digital images of a gem, defining the specific hue and corresponding red/green/blue (RGB) proportions.

The suite of products developed by GemeWizard® was designed to meet specific needs of particular segments and professionals of the trade with an emphasis on internet activities, pricing systems and trading platforms.

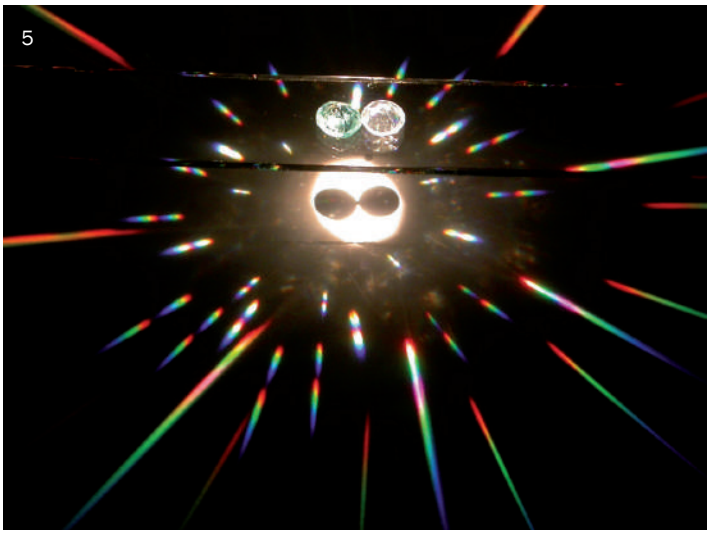
The software allows rapid and accurate comparison of colours. It is ideal for communicating colour and for teaching gemmologists or stone dealers about colour.

Menahem stressed that modern flat-screen monitors have fairly consistent colour reproduction and can be easily calibrated for more stringent colour characterization.

Gee wiz

Alan Hodgkinson next presented a pot-purri of gemmological aspects in 'Putting the *Gee* back in gemmology'. With his inimitable enthusiasm and experience for the subject he explained both the necessity for gemmological knowledge and experimentation, and how basic equipment could be used to provide useful information. For example, zircon could be distinguished from the man-made material lithium niobate (**5**) on the basis of their relative birefringence and dispersion — what Alan referred to as their b:d ratios: zircon ~1.5, lithium niobate 0.7. With top lighting, a refractometer can also show the pleochroic colours of a gem and thus the relationship between RI and the relative dichroic colour of each ray.

The origin of the 'Visual Optics', for which Alan is well known, was traced back to the late nineteenth century, when a large colourless diamond in Paris was in doubt. The stone was denied its diamond identity on the basis of the 'doubling' of a candle flame when held close to the eye, the method was developed to a much higher level by the speaker, who gave the technique the name 'Visual Optics'.



The elongate lithium niobate doubled primaries (b:d 0.7) are instantly separated from the zircon primaries in which the doubled primaries are quite separate at a b:d ratio 1.5. Photograph by Alan Hodgkinson.

A new Comparative Hanneman Reflectivity Meter was shown to have a range of gemmological diagnostic benefits, as reflectivity is closely related to the sequence of refraction. Control stones enable much useful determinative or elimination work to be undertaken. YAG is thus easily separated from GGG.

The new powerful rare earth magnets have gemmological uses in addition to detecting the majority response of synthetic diamonds (apart from Sumitomo). They make a useful contribution to distinguishing between the pyrope, almandine and spessartine garnets (see *The Journal of Gemmology*, 2007, **30**(7/8), 454–55). The powerful response of GGG to such a magnet immediately separates it from YAG. This is the more critical when it was shown how many colours exist of these two synthetic garnets.

Talk of simulants brought Alan to an unusual gem identification puzzle — how do you convert a spinel into a much rarer taaffeite? Cutting the table of a spinel so that it actually had two planar surfaces at an angle of just 1 or 2 degrees to each other, causes a refractometer to give an anomalous indication of double refraction. Spinel is singly refractive with an RI of 1.719 while taaffeite has an RI of 1.717–1.724 with a birefringence 0.004–0.005.

Alan also was a fan of less common gems which are rarely used in jewellery because they are considered too soft. A fine example was provided by a mouth-watering yellow anglesite, Mohs' hardness 5.5–6. A range of exquisite fluorites was also shown, many from England and faceted by Doug Morgan and Jim Finlayson. These have a hardness of 4, which seems to cause the jeweller to have a fit and yet the trade happily make a handsome profit from pearls (cultured) the hardness of which is only 3–3.5! Surely such fine gems can be set in pendants, brooches or earrings?

Coloured diamonds

From unusual gems and some less conventional methods of examining them, the subject moved to diamonds when **Thomas Hainschwang** presented 'Optical and spectral characteristics of exotic natural fancy colour diamonds'.

Thomas explained that diamonds were known in most colours of the rainbow, some extremely rare, others less rare. Absolutely pure diamond is colourless, but intrinsic defects, such as lattice effects, and extrinsic defects such as the presence of boron or nitrogen, affect their colour. For example, when a diamond contains sufficient N3 centres (three nitrogen atoms surrounding a vacancy) with associated N2 centres, it is yellow in colour. A small amount of boron present causes a blue to grey colour. In addition to explaining the various colours encountered in diamonds and their causes, Thomas described the techniques used to characterize diamonds and distinguish natural fancy coloured diamonds from treated and synthetic diamonds.

The main techniques used for characterizing coloured diamonds were UV-Vis and FTIR spectroscopy — which, respectively, look at the ultraviolet plus visible part of the spectrum, and the infrared part of the spectrum. Photoluminescence was also used. The characteristic

Gem-A Conference 2009 (cont.)

spectra of various coloured diamonds were discussed, along with some of their fluorescence and phosphorescence features (**6** and **7**). For example, a strong band at 480 nm is often associated with an orangey fluorescence. X-ray fluorescence analysis could also be useful, especially for synthetics. However, Thomas pointed out that traces of nickel, usually associated with synthetic diamonds, had been encountered in some natural diamonds.

Valuing coloured gemstones

Brian Dunn, a well known and highly respected jewellery valuer, formerly of Asprey and Garrard and chairman of the National Association of Goldsmiths' Valuation Committee from 2002 to 2005, then talked about the challenges encountered valuing coloured gemstones (**8**). One problem was the lack of a common language, partly resolved by the use of price guides such as *The Guide*. Another challenge was many valuers' lack of familiarity with the coloured gemstone market, often leading to valuers over-estimating the quality and thus value of gems. In addition valuers could have problems estimating the weights of set gems.

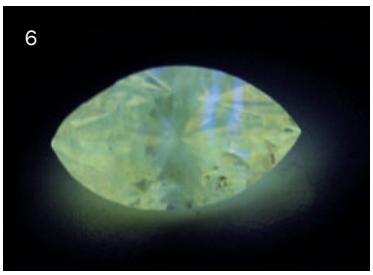
Treatments were also a source of frustration because valuers, even those with good gemmological training, could not identify all treatments and it was usually uneconomic to send a stone to a laboratory for formal testing. Most synthetics could be reasonably easily identified, but not all. Amethysts were a particular problem here as many of those on the market in recent years were synthetic. Individual valuers also had their individual likes and dislikes — Brian admitted to jade being a pet hate.

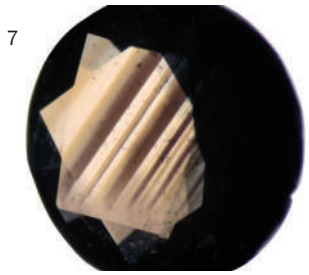
Brian's approach was to gauge the relative 'quality' of a coloured gem on his own scale of 1 to 10 and then use past experience, pricing guides and auction records to assign a suitable value. For much antique jewellery the small coloured gems set in a piece, such as turquoise or coral, had minimal value relative to the value of the piece as a whole.

Musing of a gem dealer

Hatton Garden gem dealer, **Harry Levy**, well known for his regular 'Around the Trade' column in this publication, rounded off the day with his personal and often humorous reminiscences about his time in the trade — which also acted as an introduction for the would-be gem buyer. Harry had some basic rules — such as use your own tongs as well as your own loupe — and some words of wisdom that seem self evident but are often neglected. An example was that you need to know what you can sell before you start to buy.

Different markets, of course, presented different challenges and preferences. For example UK buyers preferred darker blue sapphires, US buyers lighter ones. Lighting is of course important — a ruby can look far more desirable in the Thailand sun than back home in rainy Britain. In some case there was too much light — a star stone might better be examined with a single light even if it ends up under a dealer's sheet-covered table (but make sure the light source is not a cigarette lighter!). It was also important to buy the right type of stone





6. The yellow fluorescence with sharp blue fluorescing zones is characteristic for chameleon diamonds and is always associated with long-lasting yellow phosphorescence after short wave UV excitation. Photo by T. Hainschwang.
7. The most uncommon multi-coloured banding in an oxygen rich 'pseudo CO_2' diamond is unlike any colour zoning known from any other diamond. Photo by T. Hainschwang.
8. Diamonds and other gems can be costed, but just how does a valuer assess the 'worth' of the design input? Photo by B. Dunn.

in the right place — not always are the countries of origin the best places to buy stones. For example, certain stones were best bought in Thailand, others in Hong Kong.

The buyer needs experience and good gemmological skills, but the latter should not be flaunted — a seller may show nothing if the prospective buyer looks too professional. Harry told of a buyer who sat down at a table, produced a microscope, but no seller would show him anything. Buyers should be wary of sellers who, in response to a request, say "I have some with my broker." This meant they didn't have anything to show, but were searching. Harry tells of a gem dealer asking his son, also in the trade, what he was doing. "Sorting gems," came the reply. "Oh no you are not," responded the father. "You are sorting stones. They are only gems when you sell them."

On a more serious note Harry underlined the importance of buying correctly and not inadvertently smuggling. People often buy gems in one country then carry them into another; technically they are 'smuggling' because most countries regard gems as a dutiable and therefore declarable product. Smuggling gems could lead to confiscation of the stones and maybe a fine, and possibly even prison.

J.O.

Recent Events

Valuing the past

The extraordinary treasure of more than 1600 pieces of Anglo Saxon gold and silver work discovered by Terry Herbert, a metal detectorist, in Staffordshire, UK, in 2010 received media attention worldwide. As 'Treasure' its market value had to be assessed so that a reward could be paid to the finder and landowner — this came to over £3 million — but how was this done? Dr Jack Ogden, vice chairman of the government Treasure Valuation Committee, explained the process in his talk 'Valuing the Past' at the Gem-A Gem Discovery Meeting on 1 December 2009.

Cheek piece, fittings and zoomorphic mount. Courtesy of Birmingham Museum and Art Gallery.

The Treasure Valuation Committee

There have been laws relating to who owns discovered treasure since Roman and probably earlier times. In England, so-called Treasure Trove legislation was augmented in 1977 by the establishment of the Treasure Trove Reviewing Committee to provide independent valuations to advise the Government. The procedures were updated after the introduction of the Treasure Act in 1996, the number of treasure finds having increased considerably due to the rising popularity of metal detecting, and the Reviewing Committee was renamed the Treasure Valuation Committee (TVC). The purpose of this committee is to establish the value of the Treasure and to advise the Secretary of State in cases where there may be grounds for paying no reward, or a reduced one, to the finder or where there is a dispute as to the apportionment of the reward.

The process starts when a find which a museum wishes to acquire is declared to be 'Treasure' at an inquest. Finders have a duty to report finds that they believe might be treasure. For the purposes of the Treasure Act, jewellery is 'treasure' if it is at least 300 years old when found and has a metallic content of at least 10 per cent by weight of precious metal. Other categories of 'treasure' include coins over 300 years old if there is in the same find: more than one coin at least two coins with 10 per cent or more precious metal, or at least ten non-precious metal coins.

The values

As Treasure the finds are legally the property of the Crown, so payment made to a finder and landowner is not a purchase of the find, but an *ex gratia* reward equal to the market value of the find. For the purposes of valuing treasure, market value is defined as

Recent Events

the likely hammer price should the object or objects be sold at auction.

The Department for Culture, Media and Sport (DCMS) commission a provisional valuation from one or more expert advisers, typically specialist dealers or auction house experts. The finder, the landowner and the museum wishing to acquire the find are then notified of the provisional valuation and have the opportunity to provide comments and their own valuations before the TVC meets. At the meetings (held about six times a year) the TVC members inspect the finds and consider their value in the light of the provisional valuations and their own expertise and experience. The TVC then recommends a value to the Secretary of State. Once all parties have accepted the valuation, the museum is invoiced for the agreed amount and the *ex gratia* payments made to the finder and the find site owner.

Finders are sometimes disappointed to be told that their find is common or fragmentary and even if hundreds or thousands of years old, may be worth a minimal amount. On the other hand large and rare finds, such as the Staffordshire Hoard, can be worth millions.

The Staffordshire Hoard

The Staffordshire Hoard was valued by the TVC on 26 November 2009. Provisional valuations had been provided by three experts — antiquities dealers Peter Spencer and James Ede, and Christie's antiquities expert Judith Nugée. The three valuations were highly detailed, and although values for individual objects varied, the totals were fairly consistent. The TVC had received these valuations in advance of the meeting and a considerable amount of homework had been done, including collating the three valuations into a single spreadsheet so that variations could be noted and items that might require special discussion highlighted. The day began in the basement of the British Museum where the entire hoard was laid out on a table for examination by the committee. Notes were made, similar items compared, bits that might belong together as parts of one object studied, damage assessed and so on. For the afternoon, the meeting was moved to the TVC's usual venue — the Hartwell room, where the British Museum Trustees hold their meetings. Although the items in the hoard number some 1600, the Pareto principle once again seemed to apply

The Treasure Valuation Committee considering the Hoard in the Hartwell Room in the British Museum. Photo by J. Ogden. (Inset) Jack Ogden examining one of the items.

Gold scabbard boss with inlaid garnets. Photo by D. Rowan and D. Buxton under the aegis of Birmingham Museums and Art Gallery

— about 80% of the value lay in 20% of the pieces. The more valuable pieces were thus considered first, with photos being projected as an *aide memoire* during discussions. Once values for these had been agreed, the less important pieces were valued and finally the very minor and fragmentary items were given a collective value. The total came to £3,285,000 — remarkably close to the estimates the press had suggested. An unforgetable day in the life of the TVC and one that will stand out even though the committee has been privileged to examine many wonderful objects over the years.

In his talk, Jack also showed photographs of other recent treasure finds, and discussed the function and remit of the TVC. He explained that although the primary function was to advise on valuation, the TVC also advises the Secretary of State where there is sufficient reason to suggest that rewards should be reduced or 'abated'. Such reasons include cases where a finder has negligently damaged a find, for example by attempts at cleaning or repair, delays in reporting a find or when the finder has sold or otherwise disposed of part of the find. Recent changes to the Treasure Act were also mentioned, in particular the widening of the 'duty to report' to anyone who comes into possession of an object which they have reason to believe is an unreported treasure find.

Stone Scoop

*Gem*emory Lane — 1910

As we start the second decade of the twenty-first century, we can look back at what was happening in the gem world a hundred years ago, in 1910. One thing is certain — the frequent complaint by gemmologists and jewellers today that there are too many novel things to cope with, is nothing new.

New blue

In 1910 Isaac H. Levin, a graduate of the University of Pennsylvania and Columbia University, working in Paris under the supervision of Professor A. Verneuil, first produced synthetic blue sapphires. Verneuil himself told the French Academy of Science that the result "... is as much like the beautiful sapphire of the Orient as the synthetic ruby [Verneuil's own invention] is like the beautiful red stone of Burma". Verneuil synthetic rubies, introduced some twenty years earlier, had annual sales of about six million carats by 1910. A stalling point in the production of synthetic blue sapphire had been the uncertainty regarding the cause of sapphire's blue colour — previously considered to be cobalt. Levin had correctly identified the colouring agents as titanium and iron. Some of the new synthetic sapphires were taken to London and shown to "the foremost merchants in precious stones in Hatton Garden". One of these, we are told, "had a bad nervous shock since ... he has in stock 3000 carats of the natural sapphires, and fears he is about to lose a fortune". Professor Herbert Smith of the British Museum, "reported the discovery to that institution, where it has aroused considerable interest".

Morganite — named in 1919. Photo © Gem-A.

New pink

Another new but natural arrival on the gem scene in 1910 was a beautiful rose-coloured beryl that had been found at Mt Bity, Madagascar. At their meeting on 5 December 1910, the New York Academy of Sciences honoured the millionaire financier Mr J. Pierpont Morgan by naming this new gem after him — morganite. This naming of the gem after Pierpoint Morgan had been recommended by George Kunz, then Chairman of the Geological Section of the Academy. Kunz stated: "I have named it after J. Pierpont Morgan, the distinguished financier, art lover and philanthropist, in recognition of the encouragement he has always extended to the arts and sciences and for his presentation to the American Museum of Natural History and the Museum of Natural History, Paris, of collections of precious stones and minerals in 1889, 1900 and 1902." He added that "Morganite is undoubtedly one of the most important gem materials ... from the pegmalite [sic] veins of Madagascar" and noted that "It differs from other beryls in that it fluoresces an intense cherry red when exposed to the x-rays."

Sceptred Isle

We mustn't forget diamonds; 1910 was the year in which the larger Cullinan diamond was set in the Royal Sceptre of England's Crown Jewels and the smaller in the Imperial State Crown beneath the so-called 'Black Prince's ruby'.

On a humbler level, the abundance of diamonds made possible by the nineteenth-century finds in Africa is evidenced in the numerous adverts for diamonds in the popular press, particularly in the United States. J.M. Lyon in New York were one of many companies offering diamond rings on credit — Lyon's diamonds were "guaranteed blue white" in writing. In New York the Lincoln Company was offering diamonds on credit; for $1 a month "you can own and wear a sparkling diamond that will add to your prestige, income and self-respect". People wanted sparkle — and improvements in sparkle were being sought. An unusual Patent in 1910 (US 946939) was for concave facets on diamonds, especially brilliant cuts. This would "secure increased brilliancy in the cut stone".

Diamond simulants

For those unable to afford diamonds for just a dollar a month in 1910, there was a wealth of alternatives. The R. Gregg Manufacturing

Stone Scoop

An advert from Popular Mechanics, *1910.*

and Import Company in Chicago was offering its 'Geisha Diamonds'. A twentieth of the cost of real diamonds, it was claimed: "They equal the genuine, standing all test and puzzle experts." Also from Chicago were the offerings from The Rhodesian Diamond Co. These 'Rhodesian Gems' were "mined, cut and polished like genuine diamonds", had the "same beautiful, hard brilliancy" and would "withstand hardest diamond tests".

In contrast to these presumably natural gems — possibly white sapphire which occurs in Zimbabwe (as Rhodesia is now called) — were the 'Rémoh Gems' out of St Louis. These were described as: "A marvellously reconstructed gem — the greatest triumph of the electric furnace. Looks like a diamond — wears like a diamond — will cut glass like a diamond — stands filing, fire and acid tests like a diamond — guaranteed to contain no glass." These, at one thirtieth of the price of real diamonds, had "no paste, foil or artificial backings" and their "brilliancy is guaranteed forever". Later advertisements from the same company explained that these were synthetic white sapphires. The *Miami News* in September 1910 noted that a genuine white sapphire cost 10–15 shillings a carat (£0.50–£0.75) while a synthetic one just a tenth of that. "The real stones can only be distinguished from the artificial [synthetic] by the use of the microscope." Note that the term 'artificial' was used for synthetics.

'Artificial' diamonds

It is true that the jeweller of 1910 didn't have synthetic diamonds to contend with, but the potential was known. Even a century earlier in 1810, there was talk about the possibility of producing synthetic diamonds. Diamonds had been shown to simply be carbon and thus, as Nicholas Meredith said in his *Rudiments of Chemical Philosophy* that year: "Does it not seem to follow, that Diamonds may be easily produced by art?" However: "To form perfect crystals of many other substances is often, even when we do succeed, a difficult and slow process, and what length of time, even nature herself may require, to form those crystals called diamonds, we are yet ignorant." As with the 1910 reports on synthetic white sapphires, it is perhaps relevant to current discussions about the nomenclature for synthetic diamonds to note that in 1910 synthetic diamonds were described as 'artificial'. No less an authoritative source than the 1910 edition *Encyclopædia Britannica* noted that "Artificial diamonds, so far, have not been larger than microscopic specimens."

Treated gems

Treatments were less prevalent in the trade in 1910 than now, but the scientists were not idle. That year radium had been first isolated as a pure metal by Marie Curie and André-Louis Debierne. Sir William Crookes had experimented on treating diamonds with radium salts as early as 1904, but in London in 1910 Dr Armbrecht, who did much to further the use of radium in medicine, conducted various experiments using the radioactivity of radium to change the colour of gems. Armbrecht placed about 200 white sapphires in contact with pure radium. Over two or three weeks "the greater number of them had turned yellow or orange". Some had gone green, pinkish and amethyst colour and a few bluish — although 'not sufficiently blue to take the colour of blue sapphire, the expensive and fashionable colour.' With other gems, radium made very pale emeralds a darker green (but 'not sufficiently dark to equal the true green emerald'), turned amethyst into a smoky quartz or citrine, and 'bleached a brown diamond almost white'. A 'dirty-looking pearl' was changed to a 'clearer white'.

Meanwhile Professor Bordas in Paris had been pursuing similar work and, in the words of the *New York Times*, had discovered a method of "transforming ordinary corundum, or oxid [sic] aluminium crystals, into rubies, emeralds, sapphires and topazes by the use of radium." In one case a mixed gem was produced — blue at one end, yellow at the other. There was huge potential because "The same jeweler who sold Prof. Bordas the original corundums, valued at about 60 cents a carat, has appraised several of the transformed jewels at $100 and even at $150 a carat. Some are exceedingly beautiful in brilliancy and color." The jeweller from whom he had purchased the stones also noted that it was impossible to distinguish the irradiated gems from the natural. As the *New York Times* commented, the trade believed that a revolution was imminent in the trade of precious stones. The stalling point, however, was the extreme scarcity then of radium — barely 0.02 g in the world. The treatment was unlikely to be commercially viable for 'many years'.

The world was then blissfully ignorant of the dangers of radium and radiation. Some things have changed.

Jack Ogden

Events and Meetings

GEM-A ANNUAL GENERAL MEETING

Tuesday 29 June 2010 at 5:45 for 6:00 pm
The National Liberal Club, Whitehall Place, London SW1 2HE

Visit our website from Tuesday 8 June for further information on the meeting and to download the AGM Agenda, annual report and accounts. Hard copies can be mailed to members on request.

Regional Events

Midlands Branch

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

Meetings will be held at the Earth Sciences Building, University of Birmingham.

Friday 30 April
Jewellery of the Great Exhibition of 1851
DAVID LANCASTER

North East Branch

Contact: Mark Houghton
fax: 01904 632870
email: markhoughton1@hotmail.co.uk

Wednesday 26 May

Conference Suite, Innovation Centre, York Science Park, Innovation Way, Heslington, York YO10 5DG
Rubies that can ruin the market
DR JACK OGDEN

Scottish Gemmological Association

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

Tuesday 30 March
BGS, W Mains Road, Edinburgh
Wine and cheese reception and SGA AGM followed by Piteiras emeralds
PADRAIC LAVIN

Friday 30 April to Monday 3 May
SCOTTISH GEMMOLOGICAL CONFERENCE
The Queen's Hotel, Perth
(See page 12 for further details)

The Gem Discovery Club Specialist Evenings

Once a month, the Gem Discovery Club opens its doors to members and non-members to participate in Specialist Evenings. Details of the April specialist evening follows:

Tuesday 20 April

Gem Carving, Inspiration and Skills

HELEN SERRAS-HERMAN MFA FGA

Helen Serras-Herman, an acclaimed gem sculptor, will share, in a very unique presentation, her journey from sculpture to gem sculpture, her influences and sources for inspiration.

The face of Venus is carved in rutilated quartz, 256 ct. Photo by Michale J. Collela, © H. Serras-Herman.

The fee for non-club members for specialist evenings is £5 payable at the door, but if you plan to attend a specialist evening please call 020 7404 3334 or email arianna.maccaferri@gem-a.com, as space is limited.

DATES FOR YOUR DIARY

GEM-A ANNUAL CONFERENCE

Sunday 7 November 2010
The Hilton London Kensington, London

A one-day Conference followed by the Conference Dinner. Speakers will include Richard Drucker, Michael Hügi and Maggie Campbell Pedersen

PRESENTATION OF AWARDS AND GRADUATION CEREMONY

Monday 8 November 2010

Goldsmiths' Hall, Foster Lane, London EC2

NATURE'S TREASURES III: The Wonder of Minerals and Gems

Sunday 12 December 2010
The Flett Theatre, Natural History Museum, London

A one-day seminar organized jointly by Gem-A, The Mineralogical Society, The Russell Society and Rockwatch

Keep up with the latest information on these and other Gem-A events at **www.gem-a.com**

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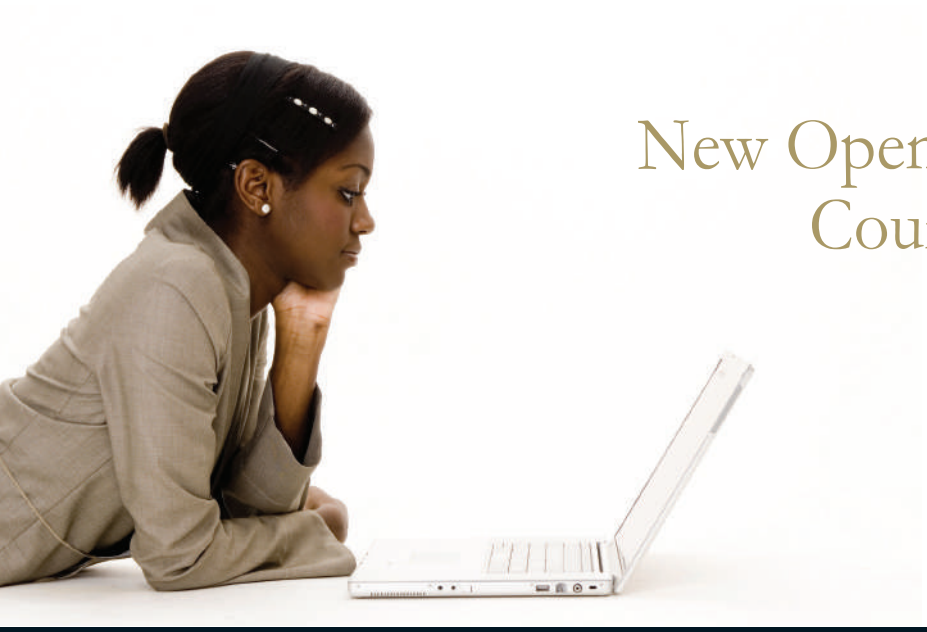

New Open Distance Learning Courses in Gemmology enrolling now

A strong knowledge of gemstones and diamonds will increase customer confidence and boost your sales. Gain that knowledge by studying with the world's longest established educator in gemmology. Graduates may apply for Fellowship of the Association enabling them to use the initials FGA after their name.

Study gemmology from your own home or workplace with comprehensive course notes, and online coursework and study groups*. You will also receive a selection of instruments and stones to help you with your studies. Additional instruments and books can be purchased from Gem-A's extensive range.

* Access to a computer with an internet connection essential.

Foundation Certificate in Gemmology

Start date: 6 September 2010 (nine-month programme)

Course fees: £1595 (or £1800 to include the London practical workshop) payable in instalments

Diploma in Gemmology (open only to Foundation Certificate holders)

Start date: 13 September 2010 (nine-month programme)

Course fees: £1795 (or £2295 to include the London practical workshop) payable in instalments

Full details at **www.gem-a.com/education.aspx** or call 020 7404 3334

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