Gems & Jewellery

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Tucson 2008

Paraíba tourmalines and their simulants

Market upsurge in coated stones

Colourless gems in old Portuguese jewellery

The Gemmological Association of Great Britain

Editorial

Gems&Jewellery
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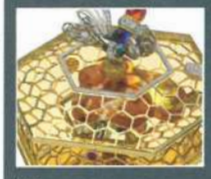

Celebrating the Centenary

I hope you enjoy this issue, the first *Gems & Jewellery* produced by Gem-A alone rather than in partnership with the Society of Jewellery Historians. It is an issue packed with articles covering the wide field of gems and jewellery, from the latest developments to the history. This balance matches our Centenary Conference theme this year (25 and 26 October, see page 36) – one day on the history of gems and gemmology, the second day on the latest gemmological research. Our Centenary Conference forms the 2008 European Gemmological Symposium and so promises to be a great event.

Another major event this year will be our Centenary Dinner to be held in the magnificent Goldsmiths' Hall, London, on Thursday 3 July. Details about our dinner and conference will be mailed to all members in April.

But perhaps the most significant event this year will be the relaunch of our Gemmology Foundation Course in September and, shortly afterwards, our Diploma Course. Our Diamond Course follows in 2009. The courses will have a totally fresh look to them, will be revised to reflect gemmology now, and will combine the printed course notes with the online resources that will form an integral part of our website, now being completely redeveloped.

Redeveloping the courses and the website – and the database that drives them both – has been a considerable drain on our resources, so we do need your continued support to achieve our aims. We are very grateful to all of you who have made donations towards our education fund; without you it would not be economically viable to produce the highest standard, specialized gemmological courses for which we are renowned, and to make them and our exams available in nine languages in some 30 countries.

Jack Ogden
Chief Executive Officer

Cover Picture

Pictured are two stunning pieces of jewellery which featured in the Evening Wear section of the AGTA Spectrum Awards at Tucson. 'The Big Bang' platinum amulet by J.W. Currens features a 424 ct quartz crystal accented with moonstones, opals, and pink, white and yellow diamonds. Jennifer Rabe Morin's 18 ct white and yellow gold ring is set with a 19.53 ct mauve agate cabochon accented with diamonds and amethysts. Photo by Orasa Weldon Designs. Courtesy of the AGTA and 2008 AGTA Spectrum Awards™. (See 'Tucson' pages 3-6.)

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One hundred years of Gemmological Education

This year Gem-A will be celebrating One Hundred Years of Gemmological Education. To ensure that we remain the provider of the highest status gem education through our second century, we have ambitious plans for the expansion and increased accessibility of Gem-A courses worldwide.

This can only be achieved with the support of our Fellows and Members. Our target is one hundred donations of a minimum of £1000 (US$2000) by September 2008.

As a member of the 100 Club, you will play an important role in helping us to achieve our charitable aims. As a patron, you will be honoured with:

- a 100 Club certificate
- an invitation to the Gem Centenary Dinner
- your name on a plaque in the London Headquarters of Gem-A, in our Centenary publication and on our website.

Your contribution will help us to:

- Develop our gem courses and make them more widely available
- Upgrade our in-house facilities for students
- Establish our website as a primary focus for gemmological education and gem information
- Establish a scholarship fund
- Encourage the study of gemmology worldwide through articles and the media
- Make gem education more accessible in developing countries
- Improve ethical and environmental awareness in the gem trade
- Reinstate the Research Diploma for Fellows
- Support for continuous gemmological learning in the gem trade.

Payments may be spread over one year (minimum £83.33 or US$167 per month). Companies and those wishing to make larger contributions or to support specific initiatives, should go to www.gem-a.com/information/noticeBoard.php or contact Olga Gonzalez on +44 (0)20 7404 3334, email olga@gem-a.com.

One hundred years 1908 2008
OF GEMMOLOGICAL EDUCATION

Tucson gem shows are a new high-end market milieu

Olga Gonzalez reports that rare and quality stone supply was meeting consumer demand at Tucson 2008.

1 Josh Hall of Pala International specializes in collector-quality coloured gems. Photo Olga Gonzalez.

2 Bear and Cara Williams, fine-quality rare stone specialists. Photo Olga Gonzalez.

3 Brad Wilson of Kingston, Ontario, a lapidary with Coast-to-Coast Rarestones International, with a 620 ct fluorite from his stock of Canadian gems. Photo Olga Gonzalez.

With signs of recession affecting businesses and individuals in the States, the expectations of those in the trade going into this year's mineral and gem shows in Arizona were less ambitious than in previous years. To the pleasant surprise of all, Tucson was flooded with fewer tourists and more serious buyers.

With a diverse area of show locations including 'The Strip', as the motel room shows along the highway are called, the AGTA show at the Tucson Convention Centre, JOGS International Exhibits, Tucson Electric Park RV Gem Show, GJX Gem & Jewelry Show, as well as dozens of other shows, it proved essential to plan one's 'show-hopping' before the arrival.

The current exchange rates certainly encouraged foreigners to travel to Arizona to spend money on the market, and the city prepared to encourage it, hiring taxi drivers and hotel staff from surrounding states, just to meet the demands of the Tucson population overflow caused by the events.

Although the assortment of qualities and types of minerals, jewellery and gems was wide-ranging, retailers generally sensed a shift in the trends normally associated with the show. Josh Hall from Pala International **(1)** commented that his expectations were initially medium to low, due to volatility in the stock market, but was surprised by what he called "a lower turnout, but those who came, came to spend money." He also picked up on another trend, "Jewellers are a lot more knowledgeable about what they are talking about. Publications are helping with treatments and are helping jewellers, and people are reading them." Bear Williams from Bear Essentials **(2)** remarked that at his stand, "People from Europe and the UK are passing through, with a particular interest in sapphire, natural and treated stones, as well as high-end star material." Those who dealt in rare stones met with high demand; Brad Wilson of Coast-to-Coast Rarestones International **(3)** enthusiastically remarked: "We sell the rare and the unusual here, and we have had a stellar show – our best opening day ever." ▶

4 The 'American Queen' honeycomb box by James Currens, awarded 'Best in Show' at AGTA's Spectrum Awards Competition. Courtesy of the AGTA and 2008 AGTA Spectrum Awards™.

High-end excellence in design was met at the AGTA Spectrum Awards, which celebrates outstanding use of coloured gemstones and pearls throughout fifteen categories. The Best of Show award went to James Currens for his 'American Queen' honeycomb box **(4)** featuring orange and blue sapphires, citrines, rubies, tsavorite garnets, and yellow and white diamonds. Two particularly stunning pieces of jewellery were 'The Big Bang' platinum amulet, again by J.W Currens, which featured a 424 ct quartz crystal accented with moonstones, opals, and pink, white and yellow diamonds, as well as Jennifer Rabe Morin's 18 ct white and yellow gold ring set with a mauve agate cabochon accented with diamonds and amethysts (see model on cover). The cutting-edge awards were distributed to those exhibiting stones with the most innovative cuts, and cutters like Ben Kho, Jeffrey Bilgore, John Dyer and Allen Kleiman won several categories for their original designs.

Representing The Gemmological Association of Great Britain, Chief Executive Dr Jack Ogden, Doug Garrod, Claire Scragg and Olga Gonzalez were at AGTA's Booth at the Tucson Convention Centre, getting acquainted with members, prospective students and gem trade enthusiasts.

With a substantial turnout of rare and quality stone supply meeting consumer demand, many who left Tucson are positively anticipating next year's success.

5 The Gem-A booth at the AGTA Show. From left, Olga Gonzalez, Claire Scragg and Doug Garrod.

Zultanite

One of the rare gems attracting interest at Tucson was Zultanite, a variety of diaspore. Exhibited by Zultanite Gems LLC, these attractive chatoyant gems showed a unique colour change.

Zultanite originates from only one location, a mine at an altitude of 4000 feet in a remote mountainous region in Anatolia, Turkey, and was named in honour of 36 sultans who founded the Ottoman Empire in Anatolia in the late thirteenth century.

Zultanite Gems LLC kindly donated a collection of Zultanites to Gem-A for research and education. The donation comprised 20 cut stones ranging from 0.30 ct to 2.70 ct and a piece of rough weighing 258 ct. All the material demonstrates a colour change between daylight and tungsten light, the colour varying from a yellowish-green to a pinkish shade. The material is strongly pleochroic; the colours are reminiscent of andalusite, a reddish colour that varies with intensity as the material is rotated through 90°, and a yellowish-green colour.

The refractive indices are 1.702 to 1.750 with a birefringence of 0.048, biaxial positive. Because of the high birefringence, the stones show doubling of the back facets when viewed through the stone with a 10x lens.

Gem-A is most grateful to Zultanite Gems LLC for the donation.

Doug Garrod, Gem-A London

Yoshi Kirsch of Zultanite Gems LLC (right) presenting the collection of Zultanites to Claire Scragg and Doug Garrod at the AGTA show.

Shows

Gem-A and the Accredited Gemologists Association kick-off the Gem Centenary celebrations

Tuesday 6 February marked the launch of our one hundred year celebrations with a joint AGA/Gem-A dinner. Held at the Marriott University Park Hotel in Tucson, Arizona, the gala was centenary themed and gemmological institutes from around the world were in attendance, including the American Gem Society (AGS), the Gemmological Institute of America (GIA), the Canadian Gemmological Association (CGA) and the International Colored Stone Association (ICA). The dinner was followed by the awarding of the 2008 Antonio C. Bonnano Award for Excellence in Gemmology to Dr James Shigley, Director of Research of the GIA in Carlsbad, California.

Presentations paid tribute to one hundred years of gem history, with our chief executive Dr Jack Ogden, GIA President Donna Baker and CGA's Brad Wilson setting up an encouraging timeline, honouring past accomplishments in the fields of gemmological research and education. In her presentation, Donna Baker acknowledged the strong links between Gem-A and the GIA, saying, "I am proud to pay homage tonight to the Gem-A and its outstanding accomplishments all the way through to this milestone year – the Hundredth Year of Gemmological Education. GIA's success and growth – not to mention its very existence - would have not been possible without the support of the NAG and Gem-A. And it all started with a conversation back in July 1908, when Samuel Barnett, a retailer from the city of Peterborough in central England, suggested that teaching and examinations be organized."

After the presentations, Antoinette Matlins and Donna Hawrelko presented Dr Jack Ogden with a donation of $10,000.00 towards the continuous development of education and research for Gem-A. With the support of the American Gem Society as ruby sponsors and the continuous support of our members, the AGA/Gem-A gala in Tucson has proved to be an exciting beginning to 2008.

Olga Gonzalez, Gem-A London

Organics at Tucson

As always, Tucson is slightly overwhelming, but the more often you go, the easier it gets, and you find many of the same sellers in the same places at the same shows as the last time. That makes it easier to single out specifics – in my case, organics.

A mammoth ivory carving.
© Maggie Campbell Pedersen.

My overall impression was of an abundance of South Sea pearls at greatly differing prices in the 'finer' shows and of some very expensive *Corallium* coral (also known as 'precious coral'). In the lower end shows there were masses of dyed coral – some in extraordinary colours. There was also a simulant of red soft coral *(Melithaea ocracea);* testing with a hot point indicated that it was not pure coral as the point easily entered the material. FTIR spectroscopy proved that it was polyester resin containing chips of coral. The species of coral used is unknown, and it has not been possible to say whether the coral chips have been dyed. The beads were sold simply as 'natural red coral' and did not have a specific name. However, if 'polybern' is the name for polymer resin containing chips of amber, perhaps we should call this new imitation coral 'polycoral'?

Imitation coral – 'polycoral'?
© Maggie Campbell Pedersen.

I came across quite a lot of finely carved mammoth ivory figures, carved and rough Siberian jet, some Baltic amber (natural, treated and pressed), and very small amounts of Dominican and Mexican amber. As feared, there was also the 'green amber' for sale which is now appearing world-wide, and which is treated Colombian or East African copal. One large stall was selling it as such, but in other places it was labelled 'natural green Caribbean amber' or 'rare Baltic amber' (see 'Natural green Caribbean amber?' on p.15).

I was relieved to see that there was less jewellery made from the nautilus – a threatened mollusc species – but there was a surprising amount of inexpensive beads and blanks made from the shell of Queen Conch, which was clearly in contravention of CITES. However one reputable Swiss dealer was selling some lovely conch pearls with the correct documentation – a particularly beautiful one had a price tag of US$50,000.

Maggie Campbell Pedersen, London

Some interesting finds

Because of my involvement with Gem-A education, I tend to look for gems with interesting inclusions, rare stones and those that have been treated. I certainly wasn't disappointed at Tucson 2008. Many stones containing fascinating inclusions caught my eye this year. A beautiful faceted citrine with two perfect quartz crystals inside was a joy to see. Also much to my delight a couple of Chinese dealers had some quartz crystals with three-phase inclusions, not only with really nice abundant liquid with moving bubbles but also free-moving dark organic-looking material (possibly asphalt) inside these as well. Also available from one dealer at the GJX show was a host of faceted quartz with a whole range of delightful inclusions, including molybdenite and stibnite, and also 'sunstone' beryl, delightful little stones of faceted beryl with hematite inclusions displaying a wonderful 'sunstone' effect.

I was fortunate to see one dealer who had in his possession a beautiful large tanzanite crystal which contained a large two-phase inclusion (liquid with a moving bubble). A truly amazing piece. Some of the most unusual stones I came across were 'satin-flash' opals from Milford, Utah. Although this material has been known for approximately 30 years, this was the first time I had encountered the material. The pieces ranged from brown and translucent, to transparent white.

On the synthetics front, I found a dealer selling 'Mexifire', a created non-opalescent fire opal. The promotional material states that it is a silica gel with only small amounts of water. The process of manufacture was disclosed neither in the leaflet nor by the dealer. Lead glass filled rubies where certainly available in abundance this year. Prices were based on the amount of treatment that the stones had undergone. Some were very heavily filled and appeared to have a higher percentage of filler than ruby. The majority of dealers were fully disclosing the treatment.

Finally one dealer I visited had a box full of 'Forderite', labelled as being from Detroit, Michigan, which had a similar appearance to multi-banded agate. After a quick look at this material I laughed out loud – much to the dealer's amusement. This was actually car paint from the Ford factory in Detroit, which had layered up when it dripped from the paint spray gun and was then collected and fashioned into a cabochon. Which just goes to prove that you can find anything and everything at Tucson!

Claire Scragg, Gem-A London

'Forderite' from Detroit. Photo Claire Scragg.

A 'satin-flash' opal. Photo Claire Scragg.

First time in Tucson

Two members of the Gem-A group visiting Tucson give their impressions.

I didn't really know what to expect of Tucson before I went there. I had been told that it was Big! But that didn't really convey a great deal. In fact, Tucson is not actually one big show, as I had been expecting; it is over forty different shows all held during a similar period and almost all of the shows are Big!

And there's a lot of walking. Around shows, between shows – some are literally miles from others. Comfortable shoes, and plenty of time, are a must.

And so many misrepresentations! So many people trying to sell you things that are falsely described – I was even sold natural chrome diopside as synthetic garnet! I suggested to the vendor that just maybe this was chrome diopside since it looked just like those in the nearby box, and I could easily see the doubling with my 10x. But he was adamant that it was synthetic flux garnet. So I bought it out of interest, wondering if it were chrome diopside. My HND students later enjoyed proving it was!

And it was so much fun – again, I hadn't expected it to be so interesting and enjoyable. I did think that one could only stand so many gems in a fortnight, especially with an only half interested hubby in tow, but it wasn't like that at all. Neither of us could tear ourselves away from the shows. All pre-plans of alternating show days with leisure, sight-seeing days went out of the window. Instead, we thoroughly enjoyed planning what shows we would attend on which dates; to make the most of Tucson, planning is essential, as shows only run for a limited length of time, with some closing before others, sometimes with new shows taking their place at a venue.

And so here we are back from sunny Tucson and saving up our money for another trip next year.

Kate Hopley, Coventry, West Midlands

The scale of the shows at Tucson exceeded all my expectations. There is so much variety. You see things you have never heard of – things from all over the world manage to find themselves in one place. Madagascar is next to Chile, which is next to Argentina.

I wouldn't have seen what I had seen without Gem-A. I found it better to go with people who know about gemmology, and with those who have been before who can guide me through the city. After visiting Tucson, I have an even higher motivation than before to finish my Gem-A course, so that when I return next year I will know what I am looking at!

Marina Lisurenko, Aberdeen

Gem Alert

Bear Williams reports on star stones that are not what they seemed

Lead glass filling seen in star ruby

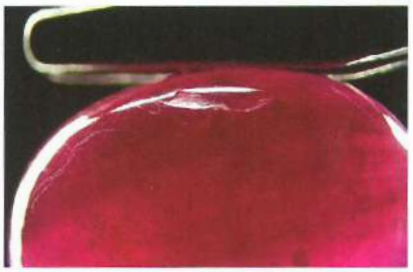
A 2.59 ct red star stone, one of a parcel of stones purchased in one of the 'outer shows' in Tucson 2008, was sent to me for identification **(1)**. At first glance it had the appearance of an Indian star ruby, but with a bit more translucency. Closer observation revealed that it was in fact a star ruby with a lead glass filling, the glass no doubt creating the clearer, less opaque look, albeit a somewhat included view.

In the 20x photo **(2)**, in the region from 9 o'clock to noon, several fissures and a larger cavity, probably where the material was introduced, are visible. In the interior of the stone were rutile, normal colour zoning and inclusions, without any indications of extreme heat. Air bubbles could be seen deep within the stone. Despite the heat involved in the glass filling, enough rutile remained intact to create the star.

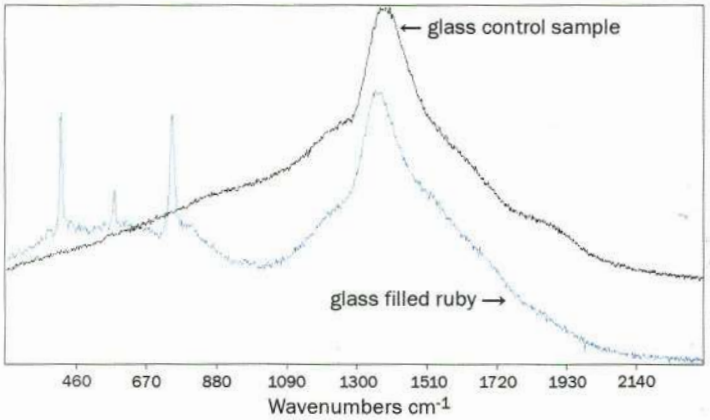
The Raman reading on the ruby **(3)** clearly showed peaks due to glass accompanied by the usual corundum peaks. These were compared against the glass control readings (black). Weak UV chromium emission reactions were also noted.

Such stones had been reported as being seen as early as 2004 by the Gemmological Association of All Japan (GAAJ) and 2005 at the American Gem Trade Association (AGTA), but this alert comes as a reminder that these are no longer the rare visitor to a laboratory, but general products now sold in the open market.

ruby. 8.9 x 6.7mm.



2 The filled section of the ruby. Magnification 20x.

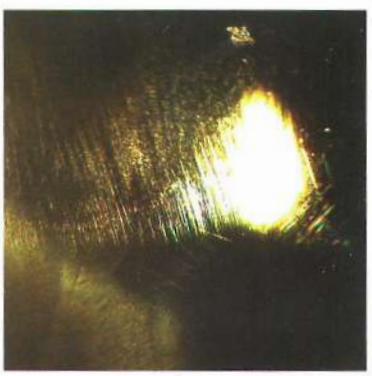


3 The Raman spectrum of the glass filled ruby (blue) showing the peak at 1377 cm^{-1} indicating the presence of glass, compared with the standard glass spectrum (black).

Etching on blue stone to create a star

Another interesting star corundum treatment was seen in a ring **(4)** submitted for evaluation, set with a 12.4 x 11 mm blue star stone estimated at 11.65 ct. As can be seen in the photo **(5)**, tiny etched grooves have been applied over the top surface of a synthetic sapphire cabochon giving the appearance of a star which looks surprisingly authentic, especially when set in a ring with diamonds. The work had been very artfully carried out in that slight variations had been made to give the appearance of the natural-looking crookedness on some of the 'rays' of the star. When the stone was immersed and examined under a microscope, curved striae were observed in the interior indicating its Verneuil growth origin. This star stone is the product of a skilled worker with a good eye.

4 The blue star stone mounted in a ring.



5 The etched lines in the blue star stone showing how they converge at 60° angles to give the asterism. Magnification 25x.

Warning

While not commonly seen treatments, these fakes can pop up anytime and anywhere, and the practising gemmologist should consider all potential frauds when examining materials.

A coat of many colours

Jack Ogden reviews the types of coatings used on gems on the market today

1 Two coated CZs by Azotic. The pavilions show interference colours due to the thin surface layer. © Gem-A.

The use of coatings to change or enhance the apparent colour of gem materials is nothing new, but the recent upsurge in popularity results from new coating technology in part that developed by the early 1990s in the electronics and optical industries. The first wave of new coated gems to hit the market in quantity was 'Mystic topaz' in its myriad iridescent hues (see *Gems & Jewellery*, September 2005, p.58), but now several thousands of shades and effects are available, produced in various ways and with a bewildering range of registered and trade mark names. Amongst these shades are the vivid blues more usually associated with irradiated topaz. These blue coated gems have been given a marketing boost recently because of trade and consumer concerns about the safety status of irradiated stones (a treatment we will look at in our next issue of *Gems & Jewellery*).

The nature and durability of coated stones was a key topic at the AGA Conference in Tucson this year and some of this information was passed on to Gem-A members in London when Gem Discovery Club members had the opportunity to examine a large number of coated gems, including coated topaz, cubic zirconia (CZ) and quartz, at their meeting on 13 February. For those interested in the technology, references to the relevant patents were recently provided by Karl Schmetzer in *The Journal of Gemmology* and an update is in press (see below).

Coated gem materials

Although the best-known coated stones are topaz, a variety of other gem materials are now coated. For example, one of the market leaders, Azotic Coating Technology Inc., also coat quartz and CZ – as seen by Gem Discovery Club members – and, less commonly, beryl (goshenite), kunzite, sapphire, glass and silicon carbide. Azotic can also coat diamond, but they have not released any of this material onto the market. So-called 'diamond coated' CZ is also seen on the market (technically speaking this is coated with 'diamond-like carbon', not a true diamond layer) and diamonds that appear of pink colour because of coating on their pavilion are also now quite commonly encountered (see *Gems & Jewellery* December 2007, p.4).

The nature of the coatings

There are various types of coatings and various producers, but three important processes are those used by Azotic (founded in 1993) and Swarovsky (Signity) and Leslie & Co. (until its take over by Swarovsky in early 2007).

The process used by Azotic for their 'Surface Enhanced Designer Gemstones™' **(1)** derived from the technologies first developed in the optical and electronics industries for coating lenses and depositing thin layers on CDs and DVDs. This uses

Gems and Minerals

A coat of many colours (contd)

physical vapour deposition to deposit thin layers of various oxides or nitrides of such elements as silicon, magnesium, aluminium, zirconium, niobium and titanium. The surface layer or layers created provide the desired interference and reflection effects. The coating is on the pavilion (back) of the stone only and there is no diffusion of the coating material into the underlying gem material.

Signity (a wholly owned subsidiary of D. Swarovski & Co.) produces gems coated by what they term Thermal Color Fusion (TCF). The surface layer is produced by a variety of processes, including vapour deposition and heating in contact with the relevant powdered colorant. The resulting coating has been described as a 'ceramic-like' surface layer. It is well bonded to the underlying material, but seemingly does not diffuse into it. The coating colorants used include gold (producing pink), gold + bismuth (crimson), bismuth + chromium (yellow) and cobalt (blue), and the stones thus treated most typically present a single colour.

2 Stones coated by the Leslie & Co. diffusion process. © Gem-A.

Again the coating is only applied to the pavilion.

Leslie & Co. of San Diego (acquired by Signity in 2007) produced topaz treated by the patented heat diffusion process **(2)**. This process uses greater heat – which limits the size and type of gems that can be coated – but the coating does diffuse into the gem which the producers claim provides greater durability.

Durability and other special care considerations

Generalizations cannot be made about the durability of coated gemstones because different processes result in different properties. The problem for a consumer or retailer is to know what process has been used on the stone they are buying – does that 'pink' topaz simply have a dye on the back that will wash off with solvents or is it a stone from Signity using the former Leslie & Co. diffusion process that they claim "creates a hard, scratch-resistant ceramic layer" that can withstand ultrasonic and acid-bath cleaning methods, and also holds up under cast-in-place techniques. The best producers do explain their processes and special care requirements (usually on their websites) and have stringent quality controls in place. Other producers are less open about the processes they use and some sell less durable products. You usually get what you pay for. It is also true, as Azotic point out, that "durability is more a function of the materials used to achieve certain colours rather than the process used to apply the enhancement".

For their coated stones, Azotic recommend that they are handled and cared for in much the same way as pearls or opals, and this is probably a good general guide for any coated stone unless the manufacturers specifically state otherwise. This means that heat, chemicals, abrasives and other harsh environments should be avoided. So strong pickles should not be used in manufacture and care should be taken with choice of cleaning solutions when using ultrasonic cleaning equipment (use balanced pH cleaning solution). Steam cleaners may also harm coatings.

Coated stones can be particularly problematic when purchased jewellery later requires alteration, repair or even just cleaning. However well the seller explained the nature of the stone and how it should be cared for, such information may well have been forgotten by the wearer or, if the jewellery was a gift, never known to them. Sales and workshop staff and appraisers need to be familiar with what they are likely to encounter.

Detection

Coated gems are by no means always easy to detect. The coatings are now almost always confined to the back of the stone – the pavilion – which is usually hard to examine with set jewellery. Even unset, coatings can be difficult to see at usual 'gemmological' magnification ranges. If the coating produces iridescent or interference effects, its presence is obvious. Even

single colour coated stones will sometimes betray their coatings by slight interference effects seen when the stone is observed at different angles under a microscope.

With unset stones, some of the coatings can be picked up using a standard refractometer, but many are above the usual refractometer range. Thus the silicon dioxide and magnesium oxide layers used by Azotic can be picked up with a standard refractometer (they have RIs of 1.45 and 1.75 respectively) but examples of other Azotic coatings range from silicon oxide (RI 1.97) to titanium dioxide (RI 2.6). Nevertheless, even if the RI of the coating is above usual refractometer range, the inability to get a reading from a pavilion facet but a clear reading for the uncoated table facet may suggest that a coating is present.

Some coatings – especially those containing chrome or cobalt – can be detectable with a spectroscope or Chelsea colour filter.

Disclosure and terminology

The artificial nature of coatings, their effect on appearance and their special care requirements mean that disclosure of coated stones is of paramount importance. The difficulty is that 'coating' can range from a smear of dye to a hard, 'ceramic-like' surface layer. It would be idealistic, but probably unrealistic, to expect disclosure to be specific about the nature of the coating. If a coated stone is a proprietary branded product sold by a known manufacturer under a registered or trademarked name, then that could be used as part of the description as long as it is also clear that the stone is treated – too many consumers over the last decade have assumed that 'Mystic Topaz' was a natural gem. Also registered or trademarked names cannot be used generically – the name 'Mystic Topaz', for example, is registered by Azotic and should only be applied to the stones supplied by that company.

The author is grateful to Dr Michael Schlamadinger (D.Swarovski & Co.), Kevin Bennet (Azotic Coating Technology) and Doug Jeffery (Signity), who provided much information at the AGA Conference at Tucson (7 February 2008) and in subsequent conversations. Both companies kindly provided samples for the author, which were also used at the Gem Discovery Club meeting on 13 February. More information can be found at www.azotic.us and www.signity.com. For the patents, see Schmetzer, K., 2006: Surface coating of gemstones, especially topaz – a review of recent patent literature. *The Journal of Gemmology*, 30(1/2), 83–90 and in press.

Gems and Minerals

Gemstones of the USA
Part 3: the Western States

Nicola Ainsworth BSc, FGA, concludes her examination of the state gemstones of America, illustrated with some rare and unusual examples from her own collection

Petrified wood beads, the state rock of Arizona.
Necklace designed by the author.

The Western side of the North American continent comprises a series of deeply folded mountains and valleys where frequent seismic events and volcanic activity have concentrated the rarer metals and in some cases led to the formation of pockets of fine gemstones, so much so that every state in the region nominated its own State Gemstone. Much of the region was sparsely populated until the gold rush of the nineteenth century and many of the gemstones there were found as a result of the search for precious metals. Examples are the spectacular tourmaline crystals of the Pala district of southern California, without an example of which no great mineral collection would be complete, or the pinkish-violet kunzite which takes its name from the celebrated American gemmologist George Frederick Kunz. These Western states also yield the very rare gemstones such as red beryl of the remote Wah Wah mountains in Utah or benitoite, the state gemstone of California, which contains the rare element barium and has a dispersion to rival that of diamond.

Volcanic activity in the recent geological past has covered huge forests with ash, petrifying them in microscopic detail. In other places the fossilization process has taken place in bogs or oil deposits, such as those which trapped the dinosaurs. Mineral salts have gradually replaced the organic material, often in a wonderful array of colours. Petrified wood is collected by rock hounds and amateur lapidaries from Washington to Arizona and many beautiful beads and cabochons have been cut. Although collecting is not permitted in National Parks there is still enough high quality petrified wood, jasper, agate and obsidian throughout the rest of these states to allow for commercial production as well as a thriving hobbyist community. The state of Oregon has

The rare red beryl from Utah.

Gems and Minerals

Native American jewellery featuring turquoise, the state gem of Arizona.

Benitoite, the state gem of California.

Montana sapphires.

so many varieties of picture stones, for example, that they take their names not just from individual counties but from individual ranches. And, yes, there are people who claim to be able to recognize each and every one.

In the upper reaches of the Missouri river a series of gravel bars contains high concentrations of small, rounded corundum and garnet crystals. Spinel and zircon and tiny diamonds are also to be found but it is the sapphire in its many shades that has been marketed for the gem trade. The expression 'Montana sapphire' is generally understood to describe a greenish-blue stone of no great value. This is an unfortunate oversimplification since they are available in a complete rainbow of colours and fine, untreated Montana sapphires of more than a carat in size are highly sought after. The state gem has even been named after a Montana mine called Yogo, a place with a Wild West history almost as colourful as its deep violet-blue sapphires.

The South Western States of America are known throughout the world for turquoise and the distinctive Native American style of silver jewellery. Copper deposits in the desert region which stretches from California to New Mexico are so extensive that many different varieties of the finest blue/green minerals such as azurite and malachite have been smelted for copper production. Rarer copper minerals abound and the many turquoise deposits such as the beautifully named Sleeping Beauty mine of Arizona or the Little Blue Bird of Nevada are famous for the distinctive shades and patterns of their gemstones. Aficionados claim to be able to tell exactly which mine a turquoise gemstone comes from but, in reality, there is an awful lot of stabilized and Far Eastern material about. One of the best ways of obtaining an absolutely authentic piece is to choose a hand-made, signed piece of turquoise and silver jewellery. Often several decades old, items such as a genuine squash blossom necklace may run into thousands of dollars as they are so highly prized by collectors or as family heirlooms. Western style jewellery often contains a variety of different coloured 'semi-precious' materials from around the world such as coral and sugilite. This can be confusing until one realizes that silversmithing came late to the American Indian and that many native artists place greater emphasis on the use

State	State Gem	State Mineral	State Rock	Other significant occurrences
Alaska (AK)	jade	gold		garnet
Washington (WA)	petrified wood			carnelian, agate
Oregon (OR)	sunstone		thunder egg	agate, jasper, opal
Idaho (ID)	star garnet			aquamarine, jasper, opal
Montana (MT)	Yogo sapphire		agate	garnet, zircon, spinel
Wyoming (WY)	jade			corundum, iolite, agate
California (CA)	benitoite	gold	serpentine	kunzite, tourmaline, beryl
Nevada (NV)	black opal	silver	sandstone	turquoise, agate
Utah (UT)	topaz			red beryl, variscite
Colorado (CO)	aquamarine	rhodochrosite		peridot, topaz, diamond
Arizona (AZ)	turquoise	fire agate	petrified wood	peridot, garnet, amethyst
New Mexico (NM)	turquoise			obsidian, agate, peridot
Hawaii (HI)	black coral			peridot, shell

Gems and Minerals

Gems of USA (contd)

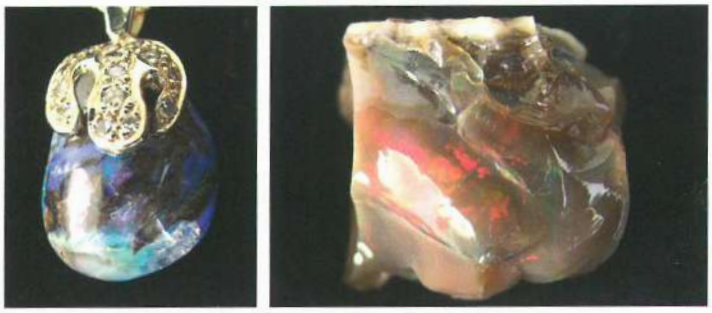
The author in the back yard of a Colorado Rock Shop.

of bright colours than on local materials. Pre-Conquest American jewellery, which can be seen in ethnological museums such as the Heard in Phoenix, often features turquoise, bone and shell with the spiney oyster being a favourite. This bright red/orange seashell from Baja California is making a comeback, providing a handsome contrast in turquoise jewellery and reducing the demand for European coral.

Alaska is the largest state in the Union; however one third of it lies within the Arctic Circle and the Alaskan Mountain Range is host to the sixteen highest peaks in North America. A wild, beautiful and sparsely populated place it has nevertheless been extensively prospected for both gold in the nineteenth century and oil in the twentieth. No gemstone deposits to rival the Ekati diamond deposits of the Canadian North West Territories have so far been discovered and any gem production undertaken is on a small scale, mainly for the benefit of tourists. Even so, this vast wilderness does not give up its treasures easily and many of the jade goods being marketed as Alaskan may have been made by genuine Alaskans but are composed of nephrite jade that has been cut in China, quite possibly having originated in the neighbouring state of British Columbia. 'Alaska black diamond' is neither black nor is it diamond; it is simply hematite and most of the material that is marketed under the name is unlikely to be from Alaska either.

Guide books to Alaska tell of agates waiting to be picked up during summer walks along picturesque beaches. The landscape will certainly not disappoint but, as for the agates, a mineralogist who had been collecting rocks in the Arctic for more than twenty years claimed to have found less than a dozen good agate specimens in that time. Souvenirs showing the obligatory eagles, wolves and sperm whales are sometimes painted onto Brazilian agate slices but the more dedicated collector can find carved local fossil walrus ivory, beautifully formed garnet crystals and fine chrome-green epidote. There is also some lovely rhodonite to be had and attractive fossil corals but very few of the more valuable gemstones have been found in Alaska and even good quality amethyst is almost unheard of.

Far to the West of the North American continent, a chain of young volcanic islands makes up the state of Hawaii and few people with an interest in gemstones have not heard of the legend of Pele's tears – drop-shaped pieces of frozen basalt, and named after the Hawaiian goddess of volcanoes. Peridot, a transparent green variety of the igneous mineral forsterite, occurs in quantity in the basalts on the islands but normally only as tiny crystals. These eventually break down to form the characteristic sand grains found in places such as the aptly named Papakolea Green Sand Beach. Gemstone-sized pieces of peridot from Hawaii are incredibly rare although this does not stop plenty of Arizona peridot being used in jewellery that is made up to be sold to tourists.



Virgin Valley opal, state gem of Nevada.

Also of interest to visitors to Hawaii is the legend of bad luck associated with the removal of rocks from the Islands. Stories have been circulating since the advent of the Internet with people from all over the world recounting tales of poor health and family disaster before sending their souvenir pieces of rock back to the Islands with apologies to Madame Pele. Many native Hawaiians are far more concerned about the damage caused to their flora and fauna by tourism and other environmental issues and are not worried about the removal of small mineral specimens. Some have kindly assisted the author in obtaining specimens of Hawaiian peridot, obsidian and the crumbled, pollution damaged pieces of oyster shell that are all that is left of the pearls which once gave the name to Pearl Harbour. Given this concern for the environment, it is perhaps surprising that the state gem for Hawaii is an organic material, a rare black coral from the lower parts of the reefs. It can now only be obtained by licenced divers and the genuine article is, thankfully, available only in tiny quantities.

Minerals of Oregon: petrified wood, amethystine quartz, carrisite and Rocky Butte jasper and Oregon opal beads, with an Owyhee jasper brooch.

Natural green Caribbean amber?

Maggie Campbell Pedersen argues that green amber does not exist naturally: amber can only look green as the result of treatment or of fluorescence.

1 Treated Colombian copal. The green samples have received more treatments in an autoclave than the golden material. Photo © Maggie Campbell Pedersen.

Baltic amber can be treated to give the illusion of a green colour. This is done by heat and subsequent polishing of part of the surface. Mexican and Dominican ambers can have a beautiful green fluorescence, best seen when the material has a dark backing (either natural or artificial).

Lately we have seen 'green amber' appearing on the market that is described variously as 'Natural green Caribbean amber' or as 'Very rare Baltic amber'. Neither term is correct. This material is copal from Colombia or East Africa that has been treated several times in an autoclave.

At the Tucson gem fairs, one company from Hong Kong had a stand concentrating entirely on 'Golden green amber', but anyone looking at the material was immediately told that it was treated to turn it green. Further explanation was given willingly, though the owners tended to refer to the Colombian copal that they use as 'Colombian amber' and were happy to back up this claim with test reports from various gem labs, all calling the material amber.

It is usually considered by gemmologists that Colombian resin has not matured to the extent where it can be called amber but should, more properly, be called copal. Dr Andrew Ross, entomologist and amber expert at the Natural History Museum in London, is of the opinion that the material is copal. Gary Jones of the Department of Mineralogy at the same museum, concedes that, when testing lesser known resins, one can get into definition problems of 'old copal' grading into 'young amber' and that this is how confusion may arise. While it is possible to give clear results from IR spectroscopy readings of synthetics or Baltic amber, the definitions of retinites (ambers that lack the succinic acid which typifies Baltic amber) and old copals are less clear as the effects of burial, time, oxidation, heat and so forth blur the boundaries of the materials, whose compositions are already variable and gradational. The 'green amber' dealers inform us that the treatment also matures and stabilizes the resin, which in itself suggests that the basic material is copal.

We can argue that the material is probably being called amber purely to make it sound more attractive when selling, but one thing is certain: even though some of the producers are being honest about the fact that the product is treated, this green material is in some instances being sold on as naturally coloured amber. Indeed, even in Tucson there were companies selling the material and giving absolute assurance that it was natural green amber. One of these was also selling polybern (a plastic resin containing small chips of Baltic amber) as natural amber, while on another stand the green material was sold alongside good quality Baltic material as a natural product.

The price of the green material varied. When sold as treated Colombian resin, polished pieces sold for about US$2 per gram, while faceted pieces were considerably more (**1** and **2**). When mounted and sold as a very rare commodity, the price is usually inflated.

It was noteworthy that, although a few people were put off by being told that the material was treated, most were not. If they liked

2 Faceted 'green amber'. Photo © Maggie Campbell Pedersen.

the product, they bought it anyhow. This can only lead us to the conclusion that the subterfuge regarding its origins is to enable the dealer to raise the price. And more 'green amber' is going to appear on the market. There are already reports of 'Ukrainian amber' responding in the same way as the Colombian copal. But whatever the material and whatever the treatment, we must ensure that the public is informed that the material is not 'natural green amber'.

More impressions of the various organics found at the Tucson fairs – including the 'green amber' – appear in 'Organic Gems' at www.maggiecp.com.

Hands-on Gemmology

'Paraíba' tourmaline and similar looking materials

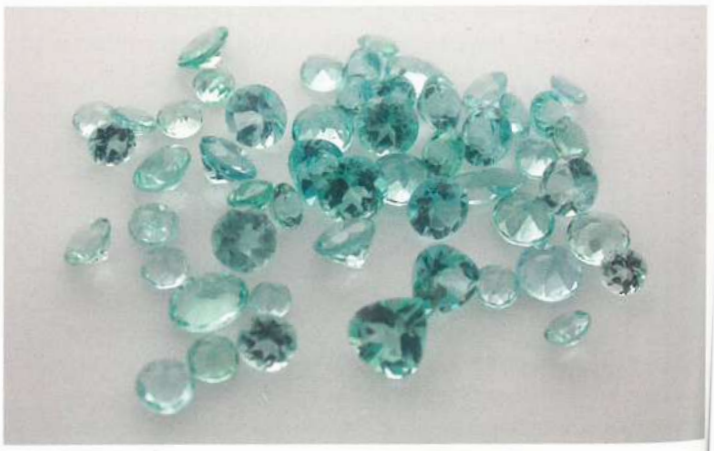
Gagan Choudhary FGA and Chaman Golecha FGA of the Gem Testing Laboratory of Jaipur, India, look at current imitations of this popular blue stone

1a, b and c: Rough and cut apatite.

The tourmalines from Paraíba, Brazil, display a distinctive bright electric blue-green colour that has led to their increasing popularity over the last two decades. More recently, tourmalines of similar colour have been found in other countries, and the term 'Paraíba tourmaline' has slowly evolved to indicate a particular shade of copper-bearing elbaite tourmaline regardless of the source of the gemstone, a fact that is also reflected in identification reports of various laboratories.

The popularity of Paraíba tourmaline is now encouraging the jewellers, miners and manufacturers to provide a cheaper alternative.

At the Gem Testing Laboratory of Jaipur we have encountered a number of gem materials which simulate the appearance of Paraíba tourmalines. Some of these include apatite, glass, cubic zirconia and synthetic beryl. Materials like apatite and glasses have been known as 'Paraíba' simulants for several years, but cubic zirconia and synthetic beryls have been launched recently on commercial scale. In view of the importance of and the demand for Paraíba tourmaline, we compiled details of simulants we have encountered and how they may be identified. The properties of Paraíba tourmaline and its simulants are given in the Table.



Hands-on Gemmology

Apatite

Apatite occurs in various colours, including the 'Paraíba' shade. Rough as well as cut specimens have been encountered in packet lots as well as single specimens **(1a, b and c)**. The life, fire and colour of apatite make it a very close simulant of Paraíba tourmaline, although the rather duller lustre noticeable by an experienced eye is sufficient to distinguish it. Apatite tends to be generally abraded and scratched due to its low hardness although this alone is not conclusive.

Apatite may however be easily separated from tourmaline and other simulants by its properties (see Table). The most characteristic features include the strong didymium spectrum, the low birefringence and near-absence of doubling of back facets or inclusions. Inclusions comprise 'black canals' or fine tubes oriented in one direction (along the *c*-axis), disc-like inclusions, and fingerprints and cleavage planes, all of which may be seen under magnification.

Glasses

Several Paraíba-shade rough and cut glass specimens have been encountered **(2a and b)**. Glasses can easily be identified by the standard optical properties listed in the Table, and the presence of gas bubbles, swirl marks or devitrification features.

However, out of many glass samples observed, one specimen is particularly interesting and deserves a special mention. A blue-green rough **(2c)** appeared to be dichroic, closely resembling Paraíba tourmaline. Tourmalines are characterized by their strong pleochroism; when viewed in different directions perpendicular to each other they exhibit variable colours. A very similar effect was seen in the glass sample which appeared yellowish green when viewed from the top, but greenish blue from the side. On further examination, we noticed that a yellow/brown swirl-like plane running along the top surface was causing the yellow component in the blue **(2d)**. This gave the stone the yellowish-green appearance when viewed from the top, not observed from the side, giving it an apparent pleochroism. However, careful examination indicated the presence of a thick swirl-like pattern forming a conical zone and on magnification scattered gas bubbles were also observed, all features typical of glass.

Synthetic beryl 'Paraíba' shade

At the September Bangkok Gems & Jewelry Fair, one author (CG) visited the booth of Tairus Co. Ltd which, among various 'created' products, was selling synthetic 'Paraíba'. Upon enquiry, the representative of Tairus informed us that it was "Paraíba shade synthetic beryl" which has recently been commercially launched. Both rough and cut stones were on display, ranging in size approximately from 0.20 to 3.00 carats. Two purchased specimens, one cut **(3a)** and one rough **(3b)**, displayed a bright 'electric' greenish-blue colour. Visually, the rough sample suggested its manufactured hydrothermal origin by the presence of typical wavy features on its surface, similar to features shown by Tairus hydrothermal emerald (Schmetzer *et al.*, 2006); the wavy features continued inside the stone as chevrons. The cut

2a and b: Rough and cut blue glass.

2c and d: A rough glass specimen with a misleading appearance of displaying pleochroism.

3a and b: Synthetic blue beryl.

Hands-on Gemmology

'Paraíba' tourmaline and similar looking materials (contd)

Gemmological properties of 'Paraíba' tourmaline and its simulants

	Tourmaline	Apatite	Glass	Synthetic beryl (hydrothermal)	Synthetic cubic zirconia
Pleochroism	strong dichroic	moderate dichroic	none	moderate dichroic	none
Refraction	Double	Double	Single, anomalous double	Double	Single, Anomalous double
RI range	1.61 to 1.65	1.64 to 1.65	1.45 to >1.80	1.57 to 1.60	>1.80
Birefringence	0.020	0.002 – 0.006	-	0.004 to 0.008	-
Optic character	Uniaxial negative	Uniaxial negative	Amorphous	Uniaxial negative	Isotropic
SG	3.03-3.12	3.17-3.23	variable 2.30-4.50	2.70-2.75	5.80-6.20
Magnification features	Highly reflective fine liquid inclusions 'trichites'; double refraction easily visible	Black canals, fine parallel needle-like inclusions along optic axes, fingerprints at 90° to black canals, cleavage cracks	Swirl marks, gas bubbles, devitrification effects	Undulating growth patterns 'chevrons'; hound's-tooth. Other possible inclusions are nailhead spicules, seed plate, liquid fingerprints, and small crystals	Generally clean; gas bubbles or unmelted zirconium powder may be present
Other distinctive features		Typical rare-earth spectrum - series of lines in yellow/ green region	Rounded facet edges in some glasses	Floats in liquid of SG 2.88	Sub-adamantine lustre, very high heft, life and dispersion.

4a and b: Synthetic blue cubic zirconia.

specimen also exhibited strong chevron growth patterns even to the naked eye.

Measured gemmological properties were consistent with beryl. The tested specimen gave RI values of 1.594 – 1.600 and SG 2.75, which were much higher than those reported previously for synthetic beryl (aquamarine) (Schmetzer, 1990). Hounds-tooth features were also visible under magnification. Synthetic beryls have been encountered for over a decade, but not in this colour.

Synthetic cubic zirconia

Paraíba-blue synthetic cubic zirconia was available at the Hong Kong Jewellery Fair, also in September 2007, a rough column of which we purchased for our collection **(4a)**. A part of the rough was sawn and two stones were cut **(4b)**. Though the rough appeared very dark, the cut stones showed the true 'Paraíba shade'. Other measured properties were consistent with synthetic cubic zirconia. This simulant may easily be identified visually by the high sub-adamantine lustre, high heft, the life and high dispersion (which may be masked by darker shades).

Conclusion

The prices of 'Paraíba' tourmalines are rising rapidly and while certain laboratories continue to include the term 'Paraíba' to indicate appearance rather than source on identification reports, the gem trade has won the confidence of customers in marketing this 'special product'. Identification of the tourmaline simulants may be made by simple testing, but origin opinions of Paraíba tourmaline can only be given by well equipped laboratories.

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About the Authors

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

Chaman Golecha MDGI FGA was awarded the Anderson-Bank Prize in the Gemmology Diploma Examination in 2005. He worked as the Executive (Technical and Training) at the Gem Testing Laboratory, Jaipur, till December 2007 and is currently involved in his personal gemstone business.

Gem Discovery Club

The Baroda Pearls, two-strand natural pearl necklace with sixty-eight graduated pearls, sold at Christie's New York, 25 April 2007, for US$7.1 million. Photograph courtesy of Christie's

La Perle Napoléon - La Régente, 302.68 g oval drop-shaped natural pearl sold by Christie's at the Hotel Richemond Geneva, in 2005 for US$3.2 million. Photograph courtesy of Christie's.

On 22 January Gem Discovery Club members were able to learn about the modern natural pearl market from one of its foremost dealers – Mohammed. I. Jabir.

In his talk entitled 'Pearls, A Natural History', Mohammed Jabir explained briefly the origin and history of pearls before describing the recent growing interest in natural pearls and the resulting increase in demand and prices.

At the beginning of the twentieth century there was one diamond dealer for every three pearl dealers; today there are a thousand diamond dealers for every pearl dealer. The introduction of relatively inexpensive Japanese cultured pearls in the early twentieth century was a setback to the natural pearl business and the financial crash in the Western world around 1930 compounded this. The discovery of oil in Persian Gulf had also provided alternative safer employment for pearl divers and pollution from the oil production greatly reduced the yield of the pearl oyster beds. Today the only known active natural pearl fishery in the world is a minor one off the coast of Kuwait.

The recent revival in the natural pearl market has been partly fuelled by the great fall in the price of cultured pearls following the Chinese entry into that market – leading discerning customers to seek a finer, differentiated product. Increasing spending power in India and China has also provided new customers for natural pearls. Since there is minimal natural pearl production today, most pearls on the market are those returning onto the market from private ownership; some pearls coming onto the market have been known for many centuries. Most fine natural pearls now end up at the major international auction houses such as Christie's, Sotheby's, Bonhams and Phillips. La Perle Napoléon (also known as La Régente), a 302.68 g oval drop-shaped natural pearl originally purchased by Napoléon I and worn by Marie-Louise in a tiara, was sold in 2005 for US$3.2 million. In April 2007, the famous Baroda necklace sold for US$7.1 million and later last year the natural pearl necklace from the estate of the Duchess of Windsor sold for US$ 3.2 million. Christie's is devoting a whole section to natural pearls at its auction in Dubai in April 2008.

Now, exactly one hundred years after the publication of the standard work on pearls – *The Book of the Pearl* by Frederick Kunz and George Stevenson – the natural pearl industry seems set to grow, and it is hoped that new pearl fishery locations will be discovered and a new generation of pearl divers, threaders and dealers encouraged.

Hands-on Gemmology

Gem Discovery Club (contd)

Examples of silver jewellery produced using precious metal clay.

Feats Of Clay

Gem Discovery Club participants on 19 February were given an insight into a different aspect of gems and jewellery when Helen O'Neill of The PMC Studio Ltd gave a talk and demonstration on precious metal clay (PMC) with particular reference to the *in situ* firing of natural gemstones.

PMC is composed of precious metal particles suspended in a water-based, organic binder. This putty-like material can be modelled, impressed, rolled and otherwise manipulated. Once dried, it is heated to (600 – 900°C), the particles sinter together, and the binder and water burn off to leave solid metal. The metal can be pure silver (that can be hallmarked/sold as sterling, or in the UK 'Britannia Standard'), gold, gold + silver (22 ct) or pure platinum. The heating can be carried out with a simple furnace, or for smaller more two-dimensional items, the firing can be by torch.

PMC was first introduced onto the market in the late 1990s by Mitsubishi of Japan. Helen explained that this first generation material required two hours firing and shrank by some 30%. The next generation, PMC+, could be torch fired but still shrank by 15%. The latest PMC product, PMC3, has a shrinkage of just 10% and has improved strength, durability and lustre. It is available in lump, paste and syringe form.

Many workers in PMC have experimented with gem materials, but mainly inexpensive synthetics such as cubic zirconia, to minimize economic risks. Some natural gems can be fired in situ, but the gems must obviously be capable of withstanding a constant temperature of 600°C for 45 minutes without fracture, colour change or other deterioration. The risk to gems is minimized by using PMC3, ramping up the heat in the kiln slowly and by designing the piece to best allow the clay to move around the stone.

To date the testing of firing PMC with natural gems in situ has been limited in the UK, but it is clear that stones from a single source or batch can vary in their susceptibility to heat. It is seldom possible to predict the behaviour of the gem during firing from its hardness or colour.

In-house tests by the PMC Studio have indicated that the following gems can give good results: peridot, diamond, moonstone, pyrope garnet, sunstone and blue sapphire. However, there can be differences between the long firing times of a kiln and the shorter torch firing. The results of more exhaustive tests on a variety of natural and synthetic gem materials in 2007 by Mary Ellin D'Agostino can be found on the PMC Studio website under the heading 'About PMC – Gemstone firing'.

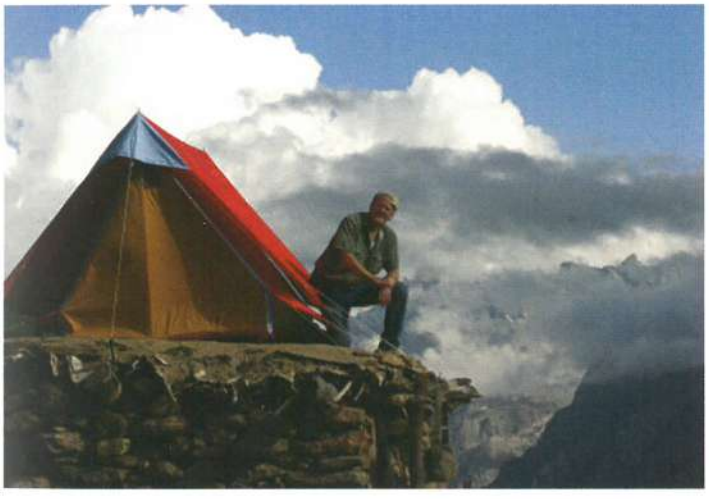
For more information on PMC and for details of supplies and courses see www.thepmstudio.com

Helen O'Neil (right) of PMC Studio explains to members of the Gem Discovery Club how precious metal clay is used.

See Gem-A Meeting and Events on p.36 for details of forthcoming Gem Discovery Club specialist evenings.

A voyage around the world of gem publications

Our *Journal of Gemmology* provides abstracts of articles in gemmological publications around the world; here we provide a brief look at gem-related articles in the world's jewellery trade press, and some other relevant publications.



Cap Beesley at the Kashmir sapphire mines. Photo courtesy of Cap Beesley.

In the *Rapaport Diamond Report* for December 2007, AGL president 'Cap' Beesley recounted his trek to the sapphire mines of Kashmir. He described it as "A gemologist's dream come true" – even though he walked 60 miles (100 km) and lost 15 pounds (6.8 kg). One of his intentions was to determine the status of the so-called 'New Kashmir' sapphires; were these from the original mine area, or from a secondary site? In fact, the few Kashmir sapphires now coming onto the market are from the original mine area, including the local mining debris. The article includes a table showing the visual characteristics of sapphires from what Beesley terms the 'Classic' sources – Kashmir, Burma and Ceylon – and Madagascar. (An article on Kashmir sapphires will appear in the next issue of *Gems & Jewellery* following a talk by Haji Abdul Majid Butt, Consultant to the Indian Government on the Kashmir mines, to the Gem-A Gem Discovery Club members.)

Stuart Robinson's report on the coloured stone market in *Gem Market News* (supplement to the *GemGuide*, January-February 2008) described the 'stampede' of miners at the new Tanzanian spinel source at Ipango near Mah–enge which provides some large and spectacular stones – including magnificent red spinels that are selling around $2500 per carat. The report also talks about the Madagascan government's attempts to best allow the exploitation of the newly discovered tourmaline deposits – after unregistered foreign buyers were encountered, along with unfairly low prices being offered to miners.

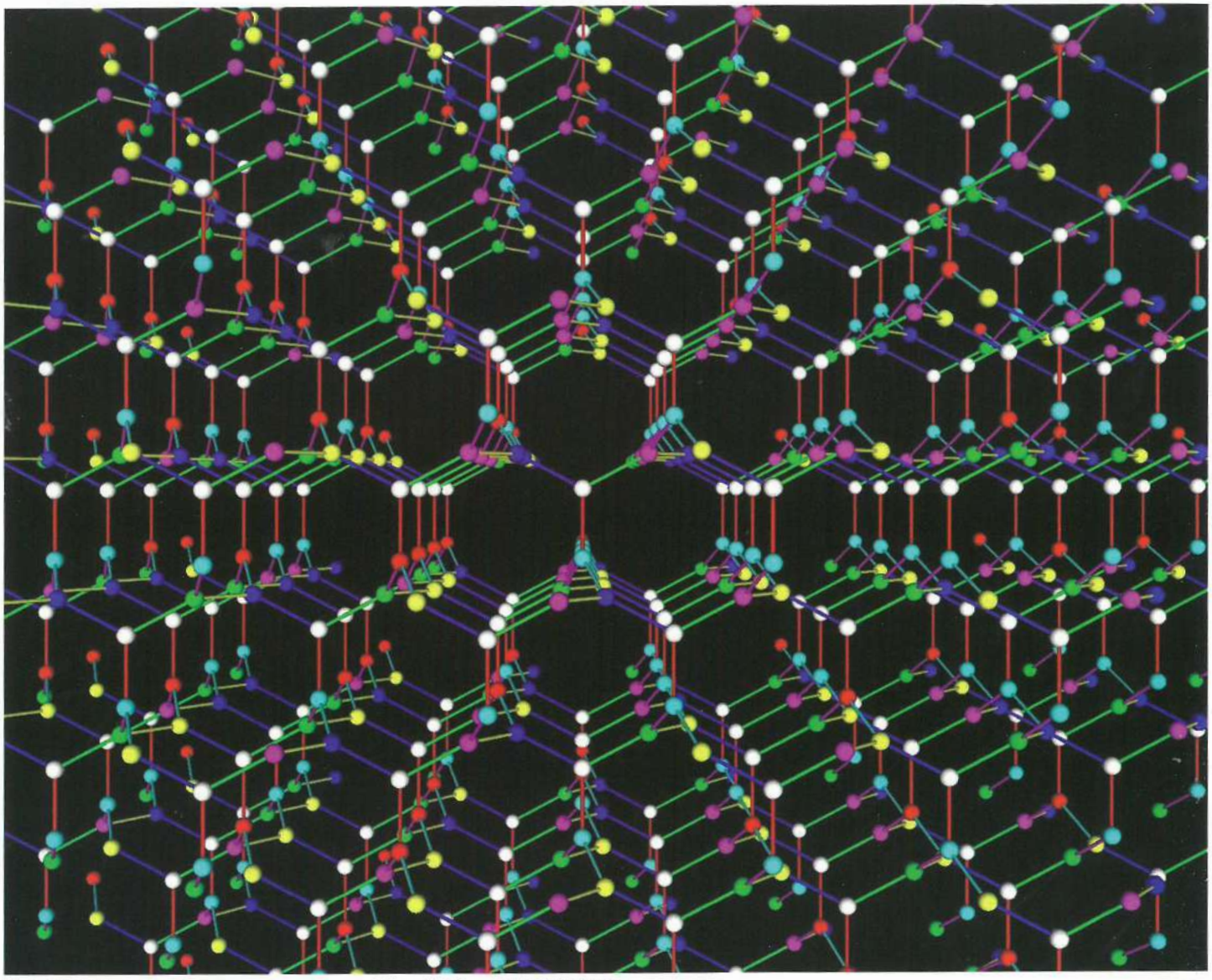
I realize we said this column would leave articles in gemmological journals for the official 'Abstracts', but it is worth mentioning Don Hoover's article entitled 'Fact or Fiction: Lessons from the History of Gems' that appeared in *The Australian Gemmologist*, 23(3), 2007. This article looked at areas where fabrications or misunderstandings relating to gem history are liable to confuse people. One example was a magnificent pink topaz necklace that had featured in a major gem publication. It was described as having been commissioned by King George III in 1795 and the topaz was "presumed to have originated in Russia". As Don Hoover pointed out, the Russian (Ural) pink topaz deposit was only discovered in 1853.

And from fifty years ago ...

Looking back 50 years, in 1958 *The Journal of Gemmology* carried an article entitled 'The Design and Construction of a Gemmological Spectroscope' by L.C. Trumper (1958, (6)5, 271-89). The article described a spectroscope made by the author "to meet the growing demands of those engaged in this interesting branch of gemmology". After describing the construction of his device, the author notes: "The constructional details of the gem spectroscope have been given to encourage any gemmologist who is handy with a few simple tools, to build one for himself. Starting from scratch, it took five months of almost every available moment of spare time to build it."

Press Package

A Voyage Around the World (contd)



K_4 crystal created by Hisashi Naito. Picture courtesy of Hisashi Naito, used by permission.

In an American Mathematical Society (February 2008) online article, the mathematician Toshikazu Sunada (of Meiji University, Japan) described a 'theoretical' crystal form. The article, entitled 'Crystals that Nature Might Miss Creating', dealt with a mathematical structure similar to that of a diamond structure, which he termed the K4 crystal. After describing the symmetry of a diamond crystal, Sunada presented his mathematical model for K4 which "looks no less beautiful than the diamond crystal". I must admit that the mathematics was way beyond me, but the 3D depiction of the K4 crystal created by Hisashi Naito is undoubtedly beautiful. Sunada poses the questions as to whether K4 crystal exists in nature, or whether it might be possible to synthesize. If you recognize the structure, you are not alone; the author has told us that several correspondents have advised that the structure is known – an addendum appeared in *Notices of the American Mathematical Society* in March and online at www.ams.org.

An article that doesn't concern gemmology, but which will be of interest to some 'traditional' family-owned jewellery retailers, appeared in the February 2008 issue of the UK publication *Real Business*. This was a profile of Michael Wainwright and 'Boodles', the UK-based luxury jewellery business of which he is a director. How did what the article describes as a 'dowdy' jewellery store 'treading water' in the early 'nineties reinvent itself to become the prime jewellery brand it is now – and still remain in the same family? First came a change of look, making the premises and their advertisement and brochures appear far more stylish. They now design all their own jewellery, creating a recognizable and marketable brand, and are meticulously careful when choosing and training staff.

Jack Ogden

New Examination Centre launched in Las Vegas

In recognition of the increasing need to respond to the continuous growth of gemmology courses, further support for US students is being undertaken with the launch of our new American examination centre in Las Vegas in partnership with the American Gem Society (AGS). Gem-A Foundation, Diploma and correspondence students will now be able to take their examinations within the USA.

The centre will host a highly informative two-day Diploma practical examination workshop on 10 and 11 June, which will help students prepare for upcoming examinations. Doug Garrod, Gem-A London's Senior Lecturer, will be the guest lecturer for this first workshop, which will provide guidance for the Diploma practical examination. Topics that will be covered include the use of the 10x lens and microscope in the observation of rough crystals and cut stones, practical use of the refractometer and spectroscope, UV fluorescence, a review of the polariscope, dichroscope, Chelsea colour filter and a 'practical' examination.

Spaces for the workshop are limited, so prompt booking is advised. For further information, or to book a place on the workshop, please contact Doug Garrod on +44 (0)20 7404 3334, email doug@gem-a.com.

Gem-A Spring Workshops

Three-Day Advanced Diamond Grading Course

This concentrated certificated course will cover key areas of advanced diamond grading including:

- Use of the microscope to clarity grade and plot
- Colour grading and master stones
- Fluorescence grading
- Cut (measurements, proportions, symmetry and polish)

Applicants for this course must hold either the Gem-A Diamond Diploma or Diamond Grading Certificate. Students will be assessed through practical work during the course.

Start Date: Wednesday 23 April
Price: £695

Introduction to Practical Gemmology

A practical day to help you understand the principles required for effective gemstone identification. After a demonstration of the use of different types of gem-testing equipment, you will have the opportunity to try gem testing for yourself with the guidance of a Gem-A tutor. No previous experience required.

Date: Monday 28 April
Price: £138

Bead Stringing

Bead stringing is one of the most popular forms of jewellery making. This one-day course is an excellent introduction, whether you are wondering where to begin or want to refresh existing skills. Join our guest expert Beatrice Gimpel in a friendly and practical atmosphere to learn the techniques required for successful stringing. All materials needed for the day will be provided.

Date: Wednesday 30 April
Price: £160

One-Day Rough Diamond Course

This course is designed to give a basic understanding of rough diamonds and the diamond pipeline, as well as a practical grounding in the handling and recognition of the various diamond qualities, shapes and colours. The course is run in conjunction with Dennis Terry of Dianet Ltd, who has an extensive background in the handling, sorting and valuing of rough diamonds. Key areas will include: global diamond trading; diamond pricing system; diamond sorting equipment; diamond shapes, qualities and colours; theory of market valuations; conflict diamonds and an update on the Kimberley process.

Date: Friday 16 May. Course times 9:45 a.m. – 5:00 p.m.
Price: £242

All workshops are held at the Gem-A Headquarters at 27 Greville Street (Saffron Hill entrance), London EC1N 8TN.
Unless otherwise stated, course times are 10:00 a.m. to 4:30 p.m.
For further information or to book for a workshop, contact Claire Scragg on 0207 404 3334 email claire@gem-a.com

Book Shelf

New Books

The Comb Its History and Development

Jen Cruse
Published by Robert Hale 2007
Pages 272
Price £45.00

Combs are so commonplace that one tends to ignore them. It can come as something of a surprise to realize that they have a very long and interesting history. An added interest for a gemmologist is that many combs have been made of, or adorned with, gem materials. Examples include organics such as horn, tortoiseshell, ivory, coral and mother-of-pearl, and countless inorganic materials, from diamonds to 'paste'.

The Comb is a beautifully presented, well written, large format book containing over 500 photographs, most of which are in colour. It is divided into nine chapters, each covering a different aspect of combs. Starting with their history from prehistoric times to the modern day, the book continues with chapters on different types of combs (for grooming or ornament), combs in other cultures worldwide, combs for special occasions or purposes, and their manufacture and sales. The final two chapters cover the materials from which combs have been made and how to identify them.

The author has a collection of combs which she has accumulated over the past thirty years. She has a deep knowledge of the subject, but even so she has clearly carried out much research to produce this book. It is a shame, therefore, that there are some errors in the last two chapters. This is clearly due to having used out-of-date or inaccurate sources of information. However, it is unlikely that gemmologists would use this book as their sole source of information on the materials and the errors are not of any great importance to the text in general.

In spite of the huge amount of information it contains, the book remains very readable. At no time does one become bogged down in the detail. The abundant, good-quality photographs help the reader to understand the text and appreciate the craftsmanship involved in producing many of the combs.

As a reference book, or purely for its entertainment value, this book is a delight.

Maggie Campbell Pedersen

Laboratory-grown Diamonds Information Guide to HPHT-grown and CVD-grown Diamonds

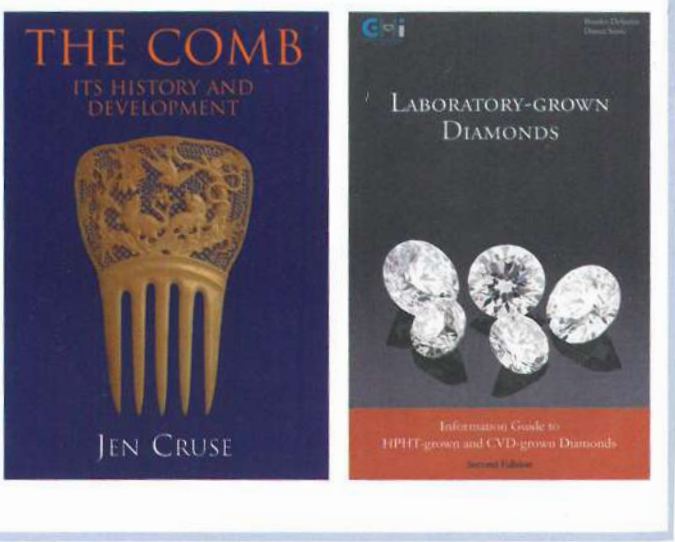
Branko Deljanin and Dusan Simic
Gemology Headquarters International, Mumbai, 2007.
Pages 86
Price £12.50

This small but comprehensive and well-illustrated book is described by the authors as "A unique guide for gemmologists from the pioneers of lab-grown diamond research." The fact that a second edition is required so soon after the first (published in 2004) reflects the rapidly developing world of diamond synthesis and identification techniques.

The book focuses on the two currently known approaches to growing gem-quality diamonds – the high pressure high temperature (HPHT) method and the chemical vapour deposition (CVD) method. The book explains these methods and their history, and how different types of laboratory-grown diamonds may be identified by traditional and advanced gemmological techniques.

Available from Gem-A at £12.50 (plus postage and packing – £2.25 plus VAT UK, £7.00 elsewhere in the world).

Jack Ogden



Colourless gems in Portuguese eighteenth- to nineteenth-century jewellery

Rui Galopim de Carvalho reveals how and why these stones were used

The jewellery production of the late eighteenth and early nineteenth century in Portugal differs greatly from other European jewellery, but not much has been written about it in the international gem and jewellery media, apart from the few pieces that are auctioned, such as those reported in the November 2007 sale at Sotheby's London.

Portuguese jewellery of this period contains a rich and varied assortment of gem materials, particularly those from Brazil, which was a Portuguese colony at that time. The discovery of gold in Brazil in the late seventeenth century led to exploration in the area for the precious metal, which eventually resulted in the discovery of several gem occurrences, the most important of which was diamond in the early 1720s. Local gem varieties of significance in the period's jewellery included diamond, topaz (including the 'imperial' colours), quartz (mostly rock-crystal and amethyst), garnet (almandine), chrysoberyl (yellow-green) and beryl (specially aquamarine and near-colourless goshenite). It is undeniable that these Brazilian gems, so conveniently available in large quantities to Portuguese jewellers played a fundamental role in making Portuguese jewellery unique, quite different from other European jewellery of the same period.

In the present article only the colourless gems will be discussed and contextualized in the jewellery designs used, the types of setting, foiling and other appearance-modification techniques. Although the variety of colourless materials is not as comprehensive as some, such as the collection of colourless gems compiled by the late David Kent, it is interesting to understand how and why these were used.

Brazilian diamonds are truly the most important gems in the jewellery of the eighteenth century, not only in Portugal but also all around Europe as a result of the huge quantities being mined. At a time when Indian production was a few thousand carats a year, the several tens of thousands of carats produced annually by Brazil in some periods of the eighteenth century meant a significant contribution to the industry, with direct impact in jewellery design and fashion. Coincidently at the same time great changes were taking place in diamond cutting, in particular in the development of the brilliant cut.

In Portuguese jewellery in particular this impact is seen in the way jewels were designed. Before the availability of Brazilian diamonds the jewels were mostly precious metal art pieces with a few diamonds scattered about; after, the precious metal (mainly silver) served as a mere mount for the gems and it was often almost impossible to see any metal. Curiously, however, although there was a greater amount of light return from the new

1 Portrait of King Joao VI, sovereign of the United Kingdom of Portugal, Brazil and the Algarves (as it was then known), in full regalia by Domingos A. Sequeira, c. 1820. Courtesy of Palacio Nacional da Ajuda, Lisbon.

Gem and Jewellery History

Colourless gems (contd)

cutting styles when compared with the then traditional rose cuts, the settings were closed concealing the pavilion. Sometimes a reflective foil was used at the back of the stone, a solution that had benefited the shallower stones. It was also common to paint a small black area right below the culet of the diamond, enhancing the popular dark culet effect.

Diamonds were indeed extensively used and this is particularly evident in the Crown Jewels where fine and large stones can be seen decorating the state and military insignia of the period's Portuguese royalty **(1)**.

2 Silver gilt monstrance, c.1750-70, with the frame fully set with colourless topaz. Photo by Carlos Pombo Monteiro, courtesy of Fundação Eugénio de Almeida, Évora.

4 Insignia of the Military Order of Holy Lady of Conceição of Vila Vicosa (early/mid nineteenth century) set with near-colourless beryls. Photo by Carlos Pombo Monteiro, courtesy of Fundação Eugénio de Almeida, Évora.

Although diamond was the most significant colourless gemstone, other gems came into play in mid-eighteenth- to early nineteenth-century jewellery. The abundance of diamonds created a new way of designing jewels with an immense profusion of stones over an almost invisible metal structure and this was captured by jewellers using other gems in this design concept. The following were no exception.

Colourless topaz: Before the discovery of the techniques to change colourless topaz into the vibrant blues so fashionable in today's markets, white topaz was used in its natural state: colourless.

Gem and Jewellery History

Due to its alluvial occurrence and specific gravity, colourless topaz might have been recovered along with diamonds right after the mid 1720s. It was not difficult, however, for the experienced dealer and cutter to distinguish between the two on the basis of their different external shapes and hardness. It was realized that this gem material had jewellery potential by simulating diamonds (but not with the intention to deceive) in silver jewellery **(2)**.

The style of cut of such stones was very close to the so-called double and triple cuts used for diamonds, always with a significant culet size. The stones would be set in closed settings with a reflective back foil and a black dot painted on the culet itself simulating the optical effect mentioned above (rather than on the foil as was the case with some diamonds).

Some regional trade names like 'minas novas' (after Minas Novas, the region in Minas Gerais where white topaz was found in significant quantities in the early nineteenth century) and 'pingo d'água' (drops of water) were used for topaz, especially at the beginning of the nineteenth century. The lack of gemmological knowledge led to the indiscriminate use of this trade name for two other colourless gem varieties, quartz and beryl. This causes some confusion in the interpretation of the actual gem content of nineteenth-century items as well as in some eighteenth-century jewels. Even today some dealers still refer to every non-diamond colourless gem material as 'minas novas'.

Rock crystal: The use of rock crystal was similar to that of topaz, but the quantities were very much larger. It was soon understood that the tips of quartz crystals and their eroded parents were suitable for faceting. It was used extensively in silver jewellery with closed settings, reflective foil backs and sometimes with the black painted culets **(3)**. It is noticeable though that the quality of the pieces set with quartz is not as delicate as those containing topaz, indicating an interesting rarity factor. The lower hardness of quartz and its lower reflective properties do make it less brilliant than topaz, but positive identification cannot be made solely on the appearance of the stone. The different reactions to short-wave ultraviolet light as well as the different thermal properties do aid identification, particularly when the stones are set in complex pieces where refractometer readings are difficult to obtain.

Beryl: The last colourless gemstone dealt in this article is not really colourless, rather a very pale greenish-blue. Beryl rarely occurs in the true colourless goshenite variety and almost all the beryls observed in Portuguese jewellery of this period are in fact very pale aquamarines, which can be easily proved using the Chelsea Colour Filter. As with quartz and topaz, a closed setting is used with a reflective foil in the back, sometimes with the black dot in the culet to create the desired 'diamond culet' effect. An immediate difference between these gems is the face-up brilliant appearance of beryl **(4)** and, as with topaz, these are used in finer pieces than those set with rock crystal.

In conclusion, the exploration of the Brazilian soil in the eighteenth and nineteenth centuries led to the discovery of several gem materials, most importantly diamond, that made a strong impact in developing jewellery concepts. Such concepts included the use of topaz, beryl and quartz, set like diamonds in prestigious royal jewellery as well as in less glamorous pieces by the period's Portuguese jewellers.

3 Rock-crystal and silver earrings (late eighteenth to early nineteenth century) in typical Portuguese style. Photo by Carlos Pombo Monteiro, courtesy of Fundação Eugénio de Almeida, Évora.

Gems of the Highest Water

What has a large ship on a lake some 12,500 feet above sea level got to do with the gem industry? Quite a lot if an 1840s' report is accurate.

Any mention of large ships high in the Andes is likely to bring to mind the 1982 movie Fitzcarraldo. This was written and directed by Werner Herzog and starred Klaus Kinski as Fitzcarraldo who attempted to pull a steamship over a Peruvian mountain to gain access to a region rich in rubber trees to finance his building of an opera house. The movie was loosely based on the true story of a Peruvian rubber grower who did indeed transport a boat overland between two rivers in the 1890s. But there are earlier examples of similar South American feats with overland boat transport. For example, in 1850 several American periodicals noted that a small iron steam-boat with 10-foot-diameter water wheels was being built by Mr George Birkbeck of New York which would be shipped in pieces to Lima and transported on mule to Lake Titicaca. The most famous such enterprise relates to the steam ship Yavari which was commissioned from the foundry of James Watt in Birmingham by Peruvian president Ramon Castilla in 1862. It was transported in pieces across the Atlantic and then taken on mule high into the Andes to Lake Titicaca where it can still be seen – a floating museum. The guides might be correct in asserting that the Yavari is the oldest surviving boat on Lake Titicaca, and the link between James Watt of Birmingham and the rise of the mechanized jewellery industry in that city is well known, but as we have seen, the Yavari wasn't the first large ship on lake Titicaca and there was an earlier one with an even closer link with jewellery.

The Year-book of Facts in Science and Art, published in London in 1845 refers (on page 119) to a report in a Montevideo journal of a British ship sailing on Lake Titicaca 18,000 feet [sic] above sea level. "In 1826", says the account in question, "Messrs Rundell and Bridge, the London jewellers, purchased the gold mines of Tipuani and the emerald mines of Illimani, and sent over Mr Page as their agent. These mines are situate on the banks of the Lake Chiquito [Titicaca], 248 English miles long, 150 in breadth, and hitherto unfathomed in many parts. In the neighbourhood of Tipuani are other productive mines, belonging to General O'Brien and an Englishman of the name of Begg. ... The difficulty of feeding, from their own scanty region, the large body of Indians working in the mines, suggested the idea of building a vessel for the navigation of the lake; and General O'Brien, and Messrs Page and Begg, determined to make the attempt. Mr Page purchased an old brig, in the port of Arica, stripped her of her anchors, sails, and rigging; and succeeded, with extreme difficulty, in conveying the hull to the mouth of the Apolobambo, whose waters fall into the Chiquito Lake [a journey of some 240 miles]. Thither he brought workmen from Arica, built stocks, and after two years of painful and unceasing labour, succeeded in launching his vessel on the Lake, and opening a regular communication with the produce of the valleys of Bolivia. The brig is well found in all things – save for her want of anchors, which it has been impossible to carry to such a height."

Rundell and Bridge, of course, were the famous London jewellers appointed Royal Goldsmiths, Silversmiths, Jewellers and Medallists in 1797. They held the Royal Warrant until 1843. They had an interesting international entrepreneurial streak. In 1824, they were granted exclusive rights to the pearl fishery of Colombia for ten years (to do so, they formed the Colombian Pearl Fishery Association). They even leased coal mines in Nova Scotia in 1825. It would be interesting to learn more about the 'the emerald mines of Illimani'. Writing at the end of the nineteenth century, Max Bauer noted that "Besides the Colombian deposits, there is no other well-authenticated occurrence of emerald in South America."

Jack Ogden

Lithograph of Lake Titicaca ca 1850 (by Lardner Gibbon).

Salesroom News

The emerald-set Jacobite ring. Photo courtesy of Lyon & Turnbull.

Scots' Secret Ring

An eighteenth-century ring sold recently at auction in Edinburgh had a fascinating history. The emerald-set ring was used as a 'signature' when travelling with correspondence from Bonnie Prince Charlie. At that time, no document could carry his signature or seal because if the bearer was found in possession of such marked papers by government troops he would almost certainly have been sentenced to death. Therefore this ring would accompany the messenger to show the documents had originated from Charles.

The cipher of CR III 1766 is also important as this is the year that Charles's father James died in France and Charles considered himself the rightful King of Scotland and gave himself the title King Charles III, rather than Prince of Wales which, even in exile, he still used.

The ring sold for £14,640 (US$29,000) at Lyon & Turnbull's Scottish Silver Sale on 13 February in Edinburgh. Colin Fraser, Silver Specialist at Lyon & Turnbull, said: "The ring was bought by an anonymous private collector; however I can confirm that it will stay in Scotland."

Remembrance of an earlier Afghan campaign

A Victorian ring dated 1885, created in memory of Lt Col James Galbraith who was killed in the British Army's Afghan campaign in 1880, sold on 3 March at Fellows & Sons, Birmingham, for £900 (US$ 1800).

The 18 ct gold memorial ring with red and white paste and a black enamel Maltese cross decoration, was engraved with 'Remembrance' on the back of the shank and inside with the words "Writ by a friend and with his blood, James Galbraith Lieut Col Com 66 Reg, obt 27 July 1880."

Lt Col. Galbraith was part of the 66th Regiment and died in battle at Maiwand during the Afghan campaign. He was from County Tyrone in Northern Ireland and served with the regiment from 1851 having trained at Sandhurst. Prior to the Afghan campaign (1878-1880), he served in Canada and East India.

Stephen Whittaker, managing partner at Fellows & Sons, said: "This is a beautiful item and a fine example of a Victorian memorial ring. Given the recent conflict in Afghanistan the story behind this ring has contemporary relevance, although there were significantly different reasons for that campaign and the nature of warfare has changed considerably since then." The Afghan campaign (1878-1880) was part of British attempts to safeguard their Indian empire against invasion from Russia.

Nineteenth-century memorial ring. Photo courtesy of Fellows & Sons

Lt Col. James Galbraith. Photo courtesy of Fellows & Sons.

Salesroom News

Salesroom News (contd)

Pear-shaped diamond, 72.22 ct. Photo courtesy of Sotheby's.

Colourless diamond, 101.27 ct. Photo courtesy of Christie's.

Two large diamonds at Hong Kong auctions

Two colourless diamonds of 72.22 and 101.27 ct are to be offered at Spring auctions in Hong Kong.

The first is a pear-shaped D-colour flawless diamond of 72.22 ct which will appear at the Magnificent Jewels sale of Sotheby's Hong Kong on 10 April. Cut from an original rough diamond weighing 188.11 ct, the stone is estimated at 10–13 million US dollars.

The second diamond, a colourless 101.27 ct near-flawless stone, will be offered at Christie's Spring Hong Kong jewellery sale on 28 May. According to Francois Curiel, chairman of jewellery at Christie's, this is the largest colourless diamond to be offered at auction in 18 years. "Only three colourless diamonds of over 100 carats have ever appeared at auction, all sold in Geneva," said Curiel. The diamond was cut from a 460 ct rough stone found at the Premier diamond mine in South Africa, and is being sold by a Europe-based diamond trading company. The gem is expected to fetch in excess of 6 million US dollars.

Auction Houses

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

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

Stone Scoop

Let Trigons be Trigons

The minute triangular depressions on the crystal faces of a diamond – trigons – are a fascinating feature. Is the earliest mention of them that by Robert Boyle in his *An Essay about the Origine and Virtues of Gems* of 1672? He described a rough diamond crystal in his collection and "perceiv'd that the Surface of it consisteth of several Triangular Planes, which were not exactly flat, but had as it were smallest triangles within them." He examined other diamond crystals and discovered that most of them had similar features so he then consulted "an expert Jeweller, that was also a Traveler". This expert didn't know of a special name for the little triangles, but confirmed that he was well aware of them and that "such a shape was a mark, by which he usually judg'd a Stone to be a right Diamond, if he had not the opportunity to examine it by the hardness."

Blood and Chips

Following on from the note about the production of diamond splinters using lead, blood or goat's horn in the last issue of *Gems & Jewellery*, it is worth remembering that in medieval times diamond splinters, as used for engraving and drilling gems, were an expensive commodity. Albertus Magnus in his *Book of Minerals* (thirteenth century) gives a rather charming allusion to the cost of diamond splinters when he talks about engraved gems and expresses his puzzlement as to how these gems were engraved: "I do not understand how they are made, except that it is by some artificial and not natural method. Those, however, who write about gems say that work on very hard stones is done with fragments of diamond, which are sharp and extremely hard. But I myself do not believe this is true at all. For engraving demands instruments properly adapted; and this cannot be with fragments of diamond, unless they should be softened with goats' bloods. And this would be wasteful and much too costly; for sometimes we see a gem of little worth that has been engraved."

Chewing over History

Gem-A is proud of our centenary celebrations and we are having fun exploring what was happening elsewhere in the gem, jewellery and precious metal world back in 1908. But what about 200 years ago? While researching the early history of platinum jewellery, I came across the introduction of a very important non-jewellery use of platinum metals that can be dated to 1808. Platinum metals were beginning to be better understood by that time and already employed to some extent in the jewellery industry, but a variety of non-jewellery uses were also being explored. In 1808 Giuseppangelo Fonzi (1768-1840) published his method for the manufacture of individual ceramic false teeth with platinum hooks fired into them – an invention that has been described as a major step towards modern dental prosthetics. The use of platinum in dentistry was taken further over the following decades by J.C.F. Maury, a dental surgeon who worked in Parisian military hospitals. The illustration here shows an example of porcelain and platinum dental work made in 1839 by Lemale & Co.

Incidentally, the teeth in Damien Hurst's famous diamond-set platinum scull were real human teeth and we did mischievously suggest to the UK assay offices that the scull did not need to be hallmarked since UK hallmarking legislation exempts platinum supports for dental work.

Porcelain teeth fixed to the base by means of platinum tube, by Lemale & Co, 1839. Hunterian Collection © Copyright 2008 The Royal College of Surgeons of England.

A Ray of Truth

A conversation repeated in various forms at too many booths at Tucson this year:

Me (seeking teaching and research stones): "Are these blue topazes irradiated?"

Booth person: "No. These are all coated. No irradiation."

Me: "Oh. I am actually looking for irradiated stones for teaching."

Booth person: "Ah! No, sorry, made a mistake, the ones on this tray are indeed irradiated."

Quote of the Month

"The age of the blockbuster museum show, where people would kill if they could only see The Ancient Gold of the Impressionists."

(Laurie Fendrich in a review of The Frick Collection's exhibition of a single painting 'Antea' by Parmigianino (1503-1540) in *The Chronicle Review*).

Correspondence

Sustainable jewellery practices

I recently spoke at the Madison Dialogue meeting hosted by the World Bank in Washington, D.C. The conference was sponsored by both industry organizations, such as Jewelers of America (JA), and non-governmental organizations (NGOs), like Earthworks, as well as many other interested government and industry groups. The goal of the conference was to bring together a variety of parties from government, industry and NGOs – all of whom were interested in sustainability in the jewellery industry.

What does 'sustainable' mean in the jewellery industry? We all know that it cannot mean that gem mines or metal mines will produce forever. Sustainability in the context of the jewellery industry means, in the process of mining, gemstone cutting or jewellery manufacturing, we work together to create a flourishing, ongoing community – building sound environmental practices, as well as community structures that support health and ongoing education. This way, if a mine should close or a manufacturing plant should relocate, the community has a plan in place to allow for ongoing employment and development. To do this, we all must understand the full range of hopes and conflicts that can develop along a jewellery supply chain.

The Madison Dialogue meeting brought together small-scale metal miners from South America, jewellery manufacturers from North America, gem cutting facilities, major mining corporations, retailers and a host of other organizations. The goal was to see what was being done and how we might all join together to further this concept within the jewellery industry. It was a start, and after personally working for nearly ten years on this very subject, it was heart warming to see a broader range of the industry taking a serious look at the subject. I believe we will see this area develop rapidly over the next few years, becoming an integral element of the jewellery industry.

We believe luxury products, such as jewellery and gemstones that support the environment and every individual along the supply chain, can truly bring love, hope and beauty to those fortunate enough to wear them.

Eric Braunwart
President, Columbia Gem House Inc., Vancouver, Washington

Hit and Myth

Jack Ogden's interesting article 'Hit and Myth – Breaking Diamonds' (*Gems & Jewellery*, December 2007, 16(5), 18) omits a recent explication of the 'goats' blood' story. This process, which is more than 2000 years old, was described in *Papyrus Holmiensis*, the later Greek copy of the ~200 BC manuscript Baphika (On dyeing) by Bolos of Mendez, an Egyptian chemist; it was inaccurately quoted in Pliny's *Natural History* and others over the centuries. It actually works and is still in use today!

To understand this process one has to apply linguistic analysis to the text and use knowledge of treatment possibilities, which earlier translators did not have. The original intent was not 'softening for breaking' or 'softening for cutting' but 'softening for dyeing'. This terminology was used by analogy with the 'softening' of wool: To accept dyes readily, as also described in this papyrus, 'hard' i.e. raw wool first needs to be 'softened', a process now called mordanting. Also, note that diamond, quartz and other colourless stones were not distinguished from each other at that time.

The process described in detail in *Papyrus Holmiensis* was the heating of quartz and then dropping it into warm goats' blood to produce cracks for the subsequent entry of coloured oil. This is still done in the 'quench-crackling' of rock crystal used in Idar Oberstein and elsewhere. Of course, one does not need warm goats' blood – cold water works just fine for the quenching. My own experiments on this process were reported in the *Lapidary Journal* (May 1985, 39, 254-62).

I gave some details in "Two Types of Traps..." *in The Journal of Gemmology* (1991, 22(7), 339-403) and yet more in my book *Gemstone Enhancement* (Butterworth-Heineman, 2nd edn 1994, pp. 9-13, 68, 181). The new translation and reinterpretation of the gemstone portions of *Papyrus Holmiensis* was done with the help of Dr Ann E. Hanson, then Professor of Classics at Fordham and Princeton Universities. We never did publish the rest except for 'The Pearl in the Chicken ...' (K. Nassau and A. E. Hanson, *Gems & Gemology*, 1985, 21, 224-31).

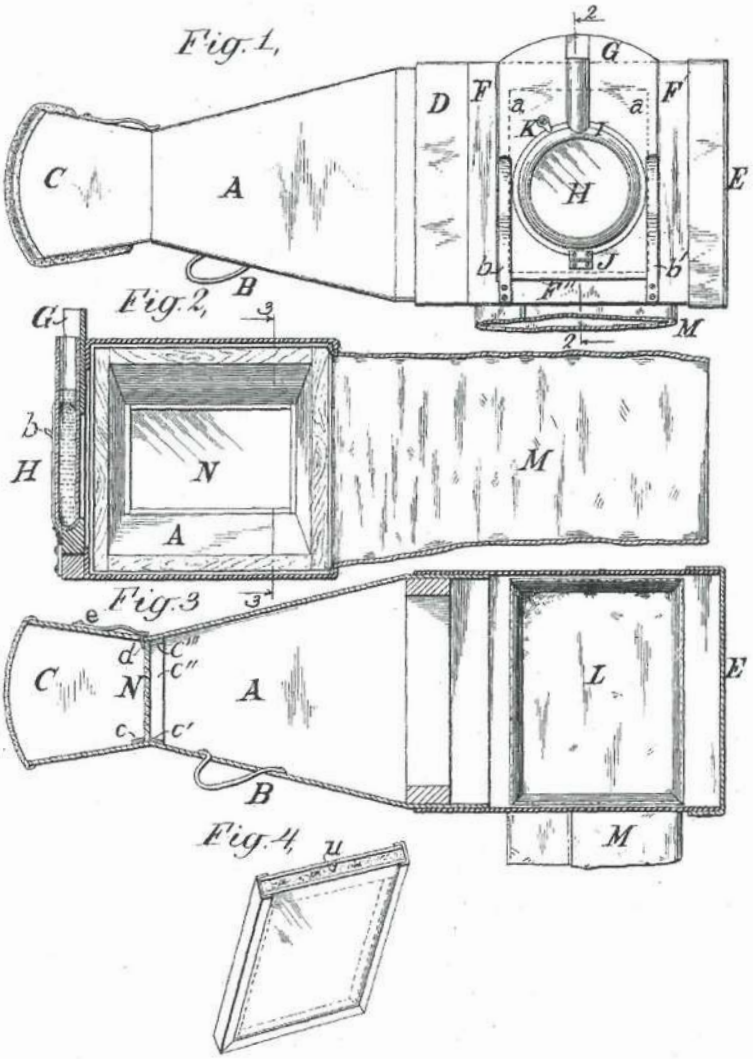
Kurt Nassau, PhD, Hon. FGA
Lebanon, New, Jersey

You can read more about Eric Braunwart's approach to ethics in the gem trade at www.fairtradegems.com

Gem Centenary

As we celebrate One Hundred Years of Gemmological Education it is interesting to consider what else was happening in the gem and jewellery world back in 1908. In this and subsequent 2008 issues of *Gems & Jewellery* we will look at some of these centenaries which range from the cleaving and cutting of the Koh-i-Nur to the first UK patent for the centrifugal casting of precious metals.

But let's start with ultraviolet light and its use in gem testing. In 1908 the US Patent 883653 for 'Exhibiting the Fluorescence of Fluorescent Substances' was granted to Walter Goold Levinson of Brooklyn. Levinson (1846–1924), a Harvard graduate who became the first editor of the *American Mineralogist* in 1916. The apparatus he described would allow the observation of ultraviolet fluorescence, "the presence or absence of which in gems serves admirably to distinguish them from ordinary imitations". As he explained: "A mineral specimen, a gem or any other object may be held in the hand within the box and turned about at pleasure for examination." The equipment required a suitable light source – a mercury vapour lamp was one of Levinson's recommendations – but "The most convenient is ... an acetylene bicycle



The apparatus for 'Exhibiting the Fluorescence of Fluorescent Substances', patented by Levinson in 1908.

lamp the lantern of which is provided with a condensing lens and a blue screen." The screen was needed to filter out as much as possible of the non-ultraviolet light, the lens to focus the light on the specimen. Levinson suggested quartz lenses be used since they filtered out less of the ultraviolet component than glass.

Levinson also explained how fluorescence of small specimens might be observed with a suitably illuminated microscope. He suggested that fluorescent minerals in museum collections might be displayed with UV lighting to "disclose a gorgeous beauty for the permanent exhibition of which no provision had heretofore been available."

The study of UV fluorescence, of course, predates Levinson. The term 'fluorescence' was first coined by Stokes in 1852 after he had noted the effect in the mineral fluorspar. The phenomenon had been noted earlier, but attracted considerable attention from scientists in the 1850s and '60s who often used solutions of quinine in their experiments. Stokes proposed that the fluorescence was caused by rays "more refrangible than the violet" which, "though invisible in themselves, produce the blue superficial light in the quiniferous solution." Remember this the next time you enjoy a gin and tonic in sunlight and see the "ghostlike gleam of pale blue light" that Stokes had noted in his quinine solutions.

By the late 1850s the phenomenon had been observed in various mineral species, including uranium ores (and glass coloured by uranium) and also in "certain specimens of Apatite, Aragonite, Chrysoberyl, Kyanite and Topaz" where it was assumed to be "due to the presence of some substance accidentally present in small quantity". The term 'ultraviolet' in reference to this fluorescence seems to have been coined by W. Eisenlohr in the mid-1850s, who recalled that "the phenomenon described by Stokes under the name fluorescence, led me to the supposition that this was caused by the interference of the shorter system of waves, blue-violet and ultra-violet (for the sake of shortness, the chemically-acting invisible rays of the spectrum may be so designated)."

In 1903 a Harvard physicist, Robert Williams Wood, wrote an article entitled 'On screens transparent only to ultraviolet light and their use in spectrum photography'; this was what we know as 'Woods glass', a filter that has long survived in the gem lab. Levinson's 1908 patent was actually applied for in May 1903, quite possibly before Wood's article had appeared.

Despite what gemmologists might assume, fluorite was not so called because of its fluorescence. It was the other way round. The phenomenon was termed fluorescence because it was seen in the mineral fluorspar, a mineral that had long been used as a fluxing agent in smelting ores – it helped the metal flow = latin fluores. The element fluorine was first isolated in 1886 by Henri Moissan and won him 1906 Nobel Prize in chemistry, although in the gem industry he is better remembered for other reasons.

Namibian Diamonds

A significant 1908 gem discovery was diamond in Namibia (then South West Africa, a German colony since 1884). It has been said that diamonds had been found there as early as 1855 by a German missionary, but he discarded them saying that they would only bring tragedy to the country. In any case the 'official' discovery of diamonds in German South West Africa, supposedly by a railway worker, occurred in 1908 and this led to a large influx of German colonists and, not unique in diamond history, what is termed the 'appropriation' of land from the natives. The latter were also 'appropriated' to work in the mines, a final indignity after several decades of severe colonial indignities. In 1909 the yield was almost half a million carats, the start of an increasing yield that makes the 'Diamond Coast' one of the world's major diamond suppliers to this day (the output for 2008 is expected to reach 2.5 million carats).

The arrival of large quantities of Namibian diamonds in Antwerp in 1908 attracted De Beers' attention, and Sir Ernest Oppenheimer and others went to visit the Namibian mines for themselves in 1914. The First World War brought Namibia under South African control and in 1919 The Consolidated Diamond Mines of South West Africa Limited was incorporated in the Union of South Africa, with Sir Ernest Oppenheimer as Chairman. This company was sold to De Beers in 1929 and reconstituted as Namdeb Diamond Corporation Limited in 1994 with joint Namibian government and De Beers' ownership.

Jack Ogden

Events and meetings

Gem-A Centenary Dinner

Celebrating One Hundred Years of Gemmological Education

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

The Gemmological Association of Great Britain is proud to announce our Centenary Dinner, which will be held from 7:00 to 11:00 p.m. on Thursday 3 July in the magnificent Livery Hall at Goldsmiths' Hall in the City of London. The dinner will be a joint charity fundraiser for our educational aims, as well as a celebration of the past one hundred years of gem education, innovation and trade. The evening will be hosted by Dr Jack Ogden, Chief Executive of Gem-A. Further details of the event are to be announced.

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

Hong Kong Graduation and Awards Dinner

Monday 15 September
Venue to be announced

Gem-A Conference 2008

Saturday and Sunday, 25 and 26 October
The Hilton London Kensington

Gem-A Graduation Ceremony

Monday 27 October
Goldsmiths' Hall, London

Nature's treasure: Minerals and Gems

Saturday 7 December
The Flett Theatre, The Natural History Museum, London

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

Gem Discovery Club Specialist Evening

Tuesday 13 May
Synthetic moissanite
DAVID ALLEN

Gem-A Branch Events

Midlands Branch

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

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

Friday 25 April
DOUG GARROD
Corundum – natural, treated and synthetic

Saturday 16 June
Summer Luncheon Party

North East Branch

Contact:
Mark Houghton 01904 639761
email:
markhoughton@hotmail.co.uk

Meeting to be held at the Pavilion Hotel, Fulford, York.

Thursday 1 May
Colour in Diamonds
DOUG GARROD

North West Branch

Contact:
Deanna Brady 0151 648 4266

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

Thursday 17 April
Diamonds – cut
JAMES RILEY

Thursday 19 June
Gem evening
A hands-on session on natural, treated and synthetic gem

Scottish Branch

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

Website:
www.scotgem.demon.co.uk

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

Scottish Branch Conference

Friday 2 to Monday 5 May – The Queen's Hotel, Perth, Scotland

This popular annual event attracts speakers and participants from many corners of the world. The well-balanced programme of lectures has something for anyone with an interest in gems. In addition social events are held each night, including the Ceilidh (dinner/dance) on the Saturday evening. The event will conclude with a field trip.

Speakers will include George Rossman, David Callaghan, Alan Hodgkinson, Elisabeth Strack and Stephen Whittaker, with short talks by Brian Jackson, Harold Killingback and Anton Vasiliev.

South East Branch

Contact:
Liz Taylor on 07733112849
email: liz@ga-seb.org

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

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

Gem-A Diploma in Gemmology

EIGHT-MONTH LONDON DAYTIME COURSE

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

* Supported study

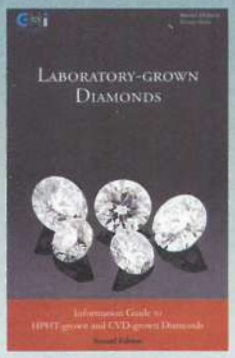
The course fee of £6895 (payable in five monthly instalments of £1379 commencing July) includes tuition and practical classes, access to study stones, course materials, the Foundation and Diploma examination fees, and a one-year subscription to *Gems & Jewellery.*

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

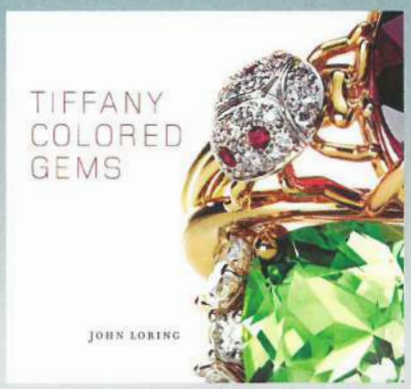
For further information contact Gem-A Education on
+44 (0)20 7404 3334 email education@gem-a.com

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

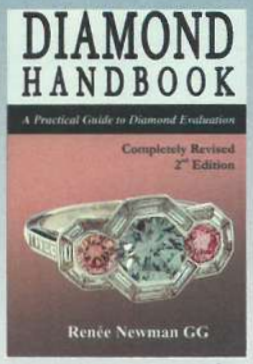
NEW TITLES FROM GEM-A



LABORATORY-GROWN DIAMONDS
Information Guide to HPHT-grown and CVD-grown Diamonds
Branko Deljanin & Dusan Simic
GHI, Mumbai. 2nd edition 2007
£12.50*



TIFFANY COLORED GEMS
John Loring
Abrams, New York. 2007
£25.95*



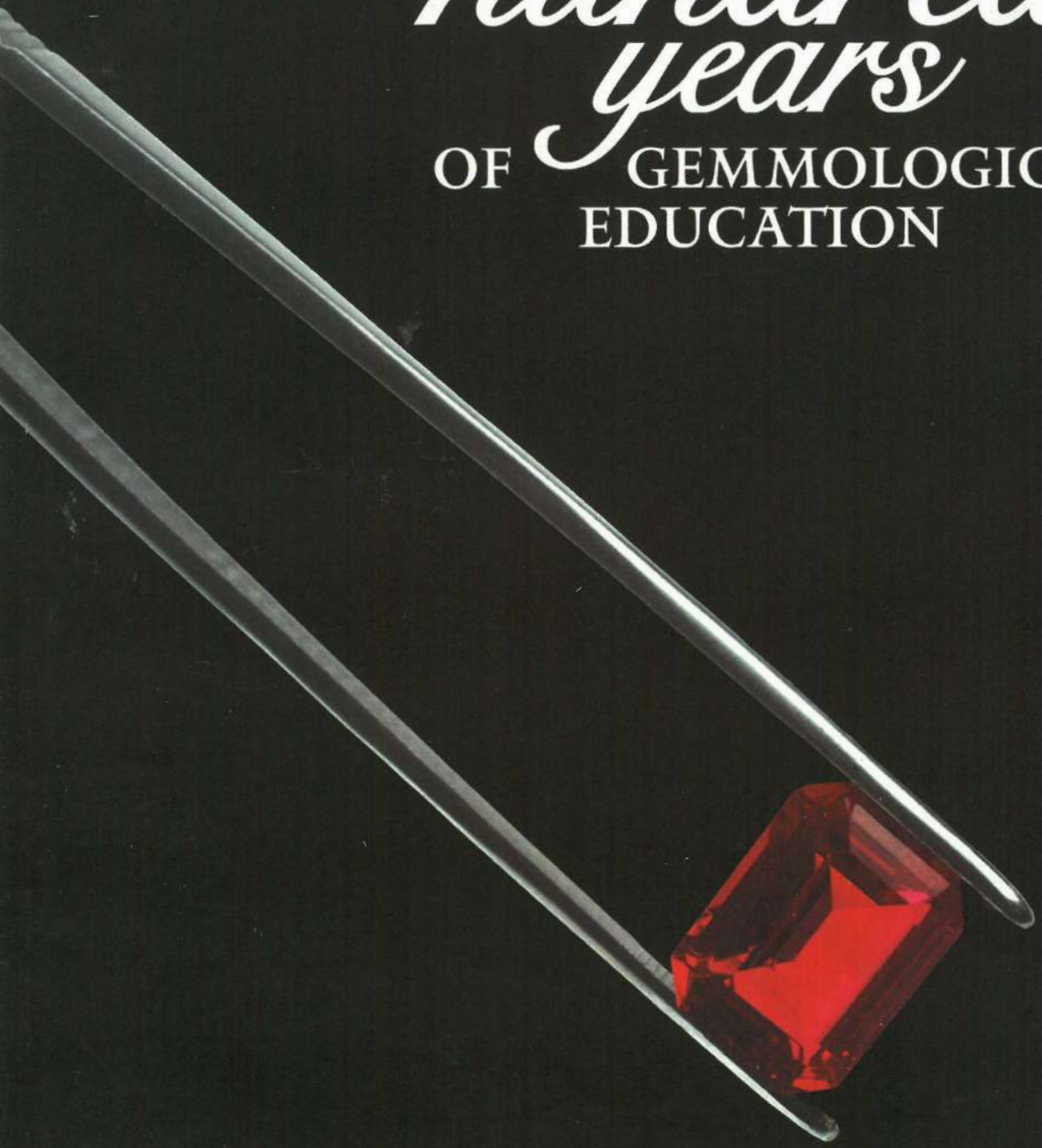
DIAMOND HANDBOOK
A Practical Guide to Diamond Evaluation
Renée Newman
International Jewelry Publications, Los Angeles. 2nd edition 2008
£17.50*

* Plus postage and packing

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

One hundred years 1908 2008

OF GEMMOLOGICAL EDUCATION



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OF GREAT BRITAIN