Gems & Jewellery

Nov/Dec 2014 / Volume 23 / No. 9

Gem-A Conference 2014

Photo Competition Winners

Mischievous emeralds

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Editorial

Gems&Jewellery
Nov/Dec 14

Contents

You know that feeling on Christmas Day — around 4pm after the Queen's speech — when you think to yourself: "Well that's it over for another year"? That's perhaps how we are feeling here in Ely Place right now, coming down off the high of our conference. It takes a great deal of time, hard work and effort from the entire team to make it possible, and those of you who attended will agree that it was a resounding success. If you didn't, you missed out on some fantastic speakers. We are wondering now how to top it next year. See page 6 for Gary Roskin's report on the conference. My thanks go to the Gem-A team and the speakers for a fun (and educational!) weekend.

At the meeting recently at the Foreign Office I was reminded that most people who work in the gem and jewellery industry are part of what was described as the 'silent majority'. They are there, frequently seen but rarely heard. Often they lack representation or, if not, are merely part of a large number who are either swamped by the dollars of the big boys who shout louder or they just go with the flow, often unaware of the changes going on around them. The recent hiatus at the World Diamond Council (WDC) highlights this. It has representation from CIBJO and the World Federation of Diamond Bourses (WFDB), as well as the large mining companies and other industry stakeholders. The silent majority is represented by CIBJO and the WFDB, but the problem is that they have just one vote — the same as a single company who may join the WDC — therefore tens of thousands of little guys are rendered impotent by one individual willing to pay a few thousand dollars for a seat at the table. In the last few weeks CIBJO and the WFDB have spoken out about this and we await developments. Closer to home we implore those merging companies, the BJA and the N.A.G., not to fall into the same trap. There is a lot of noise about all the good reasons for merging but there is much which needs to be made clear. Although 'one member, one vote' prevails, the reality is that this will be decided by less than 100 individuals out of a combined membership of 2,500. The silent majority goes unheard. That is not to say that there is not good intent both here in the UK, and on a global scale with the WDC, but good intent can often be a very dangerous thing.

This is exactly the problem that one comes up against in the ethical debate; the good intentions of those seeking a 'clean' supply chain and only ethically sourced products. Ethics and Corporate Social Responsibility are not black and white topics. Usually there are shades of grey, thus it is more correct to talk not about 'conflict free' — whatever that is — but 'conflict managed'. Enforcing compliance to strict laws and guidelines such as the USA's Dodd-Frank Wall Street Reform and Consumer Act backfires when the reality is that the little guys can never fully comply without jeopardizing their livelihood while form-filling to satisfy a bureaucrat in Washington or Brussels. The UK government's position is one of pushing compliance with standards through voluntary procedures rather than mandatory, but do not for one minute think that things won't change — for the better I hope.

Lastly, may I take this opportunity to wish you the compliments of the season and a busy time over the next few weeks.

James Riley
Chief Executive Officer

Cover Picture
Microphotograph of an inclusion in natural pale beryl ('Rainy day' appearance) by Dayananda Dillimuni FGA. Joint 1st prize winner in this year's Gem-A photography competition (see p14).

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Gem news

Gem-A conference speaker wins gemmology award

Dr Thomas Hainschwang FGA, one of the speakers at the Gem-A Conference earlier this month, is the recipient of the 2015 Antonio C. Bonanno Award for Excellence in Gemology. This prestigious award recognizes those who have made significant contributions to the gemmological field. Recipients are selected by a majority vote of members of the Accredited Gemologists Association (AGA).

Dr Hainschwang, who is the director of GGTL Laboratories in Liechtenstein, earned his PhD at Nantes University. He is recognized for his significant contributions to the field of gemmology, among which his research on Type Ib diamonds had international impact. His contributions to gemmological literature include more than 100 articles on various aspects of gemmology and analytical instrumentation. AGA president Stuart Robertson noted: "At a rather young age, Dr Hainschwang has already distinguished himself and made an enduring mark on the field of gemmology. Take any one of his numerous studies concerning various aspects of natural, treated and laboratory grown diamonds, their features and phenomena, and it would stand alone as worthy of distinction. Yet with Thomas, we see a pattern of diligent investigation and desire to address the critical issues."

Gem-A and GAA sign co-op agreement

The Gemmological Association of Great Britain (Gem-A) and the Gemmological Association of Australia (GAA) have come together to sign an agreement allowing Fellows from either organization to take Fellowship with each other's Association from the start of 2015. This cross-association agreement comes as the two associations vow to begin a new era of advanced co-operation.

The agreement, signed by GAA patron Terry Coldham FGAA FGA and GAA president Katrina Marchioni FGAA at Gem-A's annual graduation ceremony on 3 November, recognizes the equivalent status of the Association's two diplomas and allows fully paid-up members of either Association to become Fellows of their sister Association. The agreement was co-signed by Gem-A president Harry Levy FGA, chairman Jason Williams FGA DGA, and witnessed by CIBJO president Dr Gaetano Cavalieri FGA.

Gem-A CEO James Riley FGA DGA expressed the importance and practicality of this agreement for Gem-A, saying: "For many years, the GAA and Gem-A have been working alongside one another in our education practices, but these connections have not extended into membership services. As there is both a historical and practical connection between the two Associations, it only seems sensible for an agreement to exist whereby the membership services of each Association can be provided to members of the other Association. We're very pleased to have come to this agreement with our friends at GAA and hope to continue a long and healthy relationship between the two Associations in the future."

World's largest Csarite® revealed

Milenyum Mining Ltd has announced the discovery and cutting of the world's largest known faceted Csarite gemstone. The 121.65 ct pear shape stone was cut from a recently recovered rough of approximately 430 grams from the world's only Csarite mine, which is in the Anatolian Mountains, Turkey. Previously, the largest known faceted Csarite was an 88.49 ct pear shape that took home a 2014 AGTA Cutting Edge Award. The only other large Csarite gemstones of a similar size have been cabochon gems that exhibit the cat's-eye and colour-change effect.

"It was an exciting challenge to cut this stone," said Rudi Wobito, master cutter of Wobito that did the actual faceting. "The rough [of this stone] very rarely produces a fine gem of this size and calibre. And it's a very slow process to shape the rough and finally arrive at the finished gem. We studied the material from all angles for weeks before deciding on the final shape."

Murat Akgun, president of Milenyum Mining explained: "Typical loss from rough Csarite is 98%. We have recovered rough pieces three times the size of this one, and ended up with no faceted stones. We lost only 95% of the large specimen in cutting this gem, again setting it apart as a truly unique gem! This fine quality Csarite is certainly the world's largest at this time, and we expect the retail price to be close to US$1,000,000."

Gaetano Cavalieri and Terry Coldham accept Gem-A Honorary Fellowships

Gaetano Cavalieri, CIBJO president, and Terry Coldham FGAA, Patron of the Gemmological Association of Australia (GAA), have been named Honorary Fellows of Gem-A in recognition of their outstanding contribution to the field of gemmology. The awards were made by Gem-A president Harry Levy FGA during the Association's graduation ceremony at Goldsmiths' Hall in London on 3 November.

Speaking on Terry and Gaetano's awards, James Riley FGA DGA added: "Gem-A is delighted to be able to award Gaetano and Terry Honorary Fellowships in light of their efforts on behalf of both the Association and the wider industry. Gaetano's work on issues of ethics and social responsibility is unparalleled and we're sure that his continued work will only strengthen the industry and leave a lasting legacy we can all be proud of. Terry has made a massive contribution to our industry over the last 50 years. He has worked across all levels of the trade as a miner, cutter, wholesaler and retailer, and has written numerous papers and articles for journals worldwide, whilst also working as the editor of one of the most respected gemmological publications in the world. Without the vision and hard work of Gaetano and Terry the gemmological world would be a much poorer place, and it has been a truly great honour to recognize them today."

New Gem-A team member

This month we welcome a new addition to the team at Ely Place. Richard Lake FGA DGA joins Gem-A as Chair of Examiners, a new role that will support the chief examiner and the lead senior examiners in each of the subject areas. Richard will also check the exam question papers, consider special needs and any issues with exam centres and oversee the moderation of new examiners.

As the Association grows and expands its examinations, Gem-A feels that now is the ideal opportunity to take this important step so that it can ensure standards are maintained and that the independence of the examination board is upheld, whilst providing a professional service to our members and students. The position will remain independent of Gem-A's other educational services, but will be answerable to the CEO as the responsible officer for Gem-A under our accreditation regulations.

Richard Lake has been a diamond practical examiner for many years and has both a geological background and trade experience, having worked for Robert Holt and then for Marcus McCallum FGA in Hatton Garden. Commenting on his new role Richard said: "I am now looking forward to working with Gem-A, as they continue to grow and develop in the face of challenges thrown up by this ever-changing, fascinating industry."

Gem-A Events

Shows

International Jewellery Tokyo (IJT) 2015
21–24 January, Tokyo Big Sight, Japan
The largest jewellery trade show in Japan, IJT is the gateway to expanding your business in Japan and Asia. Come and visit the team in one of the most beautiful countries in the world. Booth number TBC.

AGTA Tucson GemFair 2015
3–8 February, Tucson Convention Center, Tucson, USA
Gem-A is once again headed stateside to the AGTA Tucson GemFair. The highlight of the gem and jewellery calendar, Tucson is renowned for being one of the best jewellery shows around. Booth number TBC.

Gem-A Workshops

Understanding diamond grading
Wednesday 26 November 2014
Birmingham City University, Birmingham B42 2SU
This specialist workshop focuses on the key aspects of diamond grading, giving a unique insight into the 4Cs and their impact on value. Led by experienced Gem-A diamond tutor Andrew Fellows FGA DGA CDG, participants will be guided through the underlying theory before seeing the practical side of cut, colour, clarity and carat weight on both loose and mounted diamonds.

Understanding diamond simulants
Friday 28 November 2014
Birmingham City University, Birmingham B42 2SU
This workshop is for those working, or considering working, in the diamond market. Gem-A tutor Andrew Fellows explains the key differences between diamond and its simulants, and how to recognize them both as loose stones, and in set or mounted jewellery. Using basic observation techniques and readily available instruments, such as diamond and combination testers, participants will be taught to quickly and effectively separate diamonds from all other imitations, thus preventing costly purchasing errors, and allowing informed buying decisions to be made.

Other events

Colour and sparkle: A colour group meeting
Wednesday 3 December 2014
City University London, Northampton Square, London EC1V 0HB
Gem-A tutors join The Colour Group of Great Britain to take a deeper look at the colours that exist within gemstones. In the first collaboration between Gem-A and The Colour Group, Claire Mitchell FGA DGA and Andrew Fellows from Gem-A will join Alan Collins and Lynne Bartlett for an afternoon event at the City University London. During the afternoon these four experts will take attendees on a journey through the cause of colour in gemstones such as ruby, emerald and sapphire, the latest theories about colour in diamonds and discuss how the trade assesses the quality of diamonds.

This is a free event for anyone wishing to attend. To print a ticket visit the colour group website at: www.colour.org.uk/meetingDecember14.html.

Recent Events

Gem-A Conference 2014

Gary Roskin FGA reports on the Gem-A Conference, held over the weekend of 1–2 November.

The two-day event, held at the Business Design Centre, Islington, was a feast for the gemmological palate; hosting 13 international experts in the field, and covering a diverse selection of topics on gems and minerals.

Bruce Bridges — The history of tsavorite and legacy of Campbell Bridges

Leading the Saturday programme was Bruce Bridges, son of the late Campbell Bridges, the renowned discoverer of tsavorite. Bruce delivered a heartfelt family history of how his father first discovered the green grossularite garnet.

It was in 1961, while working as a consulting mineralogist in what was then Rhodesia (now Zimbabwe), that Campbell first caught a glimpse of the green gem. Avoiding confrontation with a rogue cape buffalo by diving into a ravine, Campbell spotted beautiful green euhedral crystals glistening in the sun. Unable to get back to this find, and moving up the Mozambique gem belt on business, he rediscovered the green gem in Tanzania.

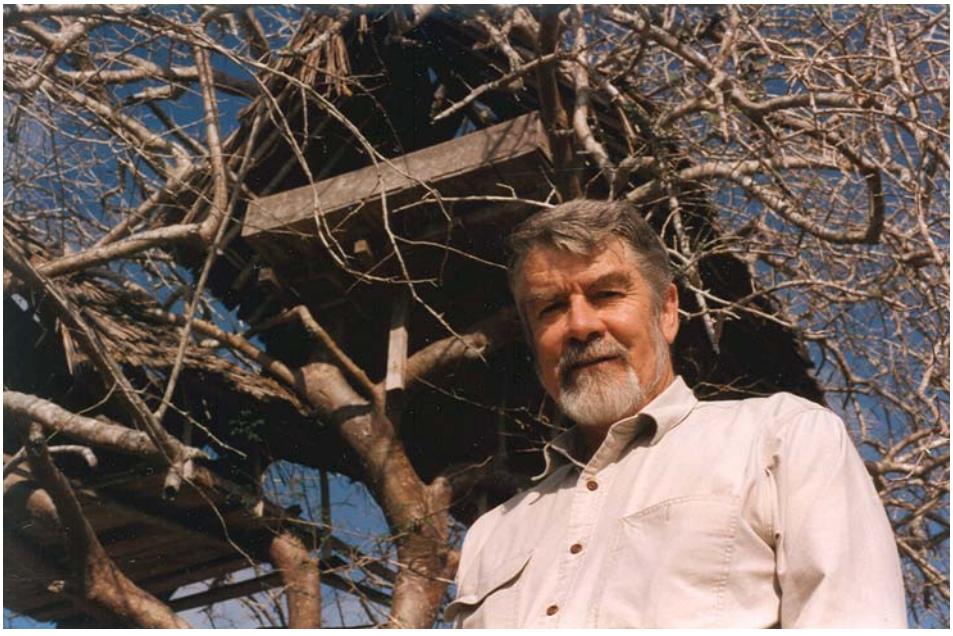
Years passed, with Campbell prospecting around Komolo, Tanzania, but government nationalization of the mines in 1970 sent Campbell into Kenya. It was 1971 when he filed his first mining claims at the edge of Tsavo Park, Kenya, and thus began the jewellery industry's love affair with tsavorite. Working alongside Henry Platt, then vice president of Tiffany & Co., Campbell not only helped Tiffany to name tsavorite, but was also instrumental in working with the company to name tanzanite.

Bruce presented images and video of the tsavorite mining area, showing us the 'local inhabitants', in particular lions, 'red' elephants and scorpions, as well as images of the original Scorpion Mine (and yes, you do need to check under the covers and inside your shoes for scorpions).

Bruce also noted that there are other grossularite garnets in the area, including

Tsavorite rough production from pocketing. Photograph courtesy of Bruce Bridges, Bridges Tsavorite.

'Merelani mint' and 'green grossular'. Similar to the comparison of green beryl vs emerald, the differences between these three garnet colour varieties is described by the tone, saturation and chemistry. Tsavorite has considerably more chromium — described by Bruce as being at least five times greater than the other green grossulars, whilst the amount of vanadium found in tsavorite is reportedly at least two times greater. This difference in chemistry can be seen in the actual colour hue, tone and saturation.



Left: The late Campbell Bridges.
Above: 12.46 ct antique cushion-cut tsavorite.

Photographs courtesy of Bruce Bridges, Bridges Tsavorite.

Recent Events

Typically, fine quality tsavorite will be graded as having at the very least a medium tone and moderate saturation. It is also interesting to note that the more chromium, the more bluish the gem appears.

The Bridges' Kenyan tsavorite mines have been closed for the past five years since the death of Campbell Bridges. However, Bruce announced during his talk that the mines will be re-opening in January 2015. With regard to the availability of the green gem, the current tsavorite mines are approximately 175 metres deep. The theoretical producing depth has been estimated at 2 km, and, if correct, we should have tsavorite for many years to come.

Edward Boehm GG CG FGA — Analysing gems on the go: tips from the field

Edward Boehm is a coloured stone dealer and consultant from Chattanooga, Tennessee, USA. His company Rare Source Gems specializes in fine and collectible gemstones, collection sales and acquisitions, and museum consulting.

Edward took delegates into the field with pocket instruments, reminding us just how important it is to be able to make identifications away from the desk, and how easy it can be with practice — a technique he learned from his grandfather, Dr Eduard Gübelin.

Using the dichroscope and loupe we can tell if a gem is doubly refractive or showing natural features. As with the larger desk gem equipment, eliminating possibilities and narrowing our choices is the goal.

Edward also discussed the advantages of the darkfield loupe. Better than a standard loupe, it lights up the interior of the gem, as would a gemmological microscope. Such an inexpensive attachment to a small flashlight, this is a tool the wandering gemmologist should not be without.

Whilst having the right equipment is certainly important, it can be just as important to have a great reference library, including journals. (Vol. 34 Issue 1 of *The Journal of Gemmology* is available to view online for free, perfect for the travelling gemmologist!)

Edward Boehm addressing delegates.

Edward also advocates developing relationships out in the field, acknowledging that it is more challenging to purchase gems from someone you have never met. Show them that you know what you are doing by identifying and quality-grading what they have shown you and then sharing your knowledge with them — they will appreciate your expertise and remember you.

Edward noted that another pocket instrument you should always carry is a small gram scale. A head loupe of 3× magnification also comes in very handy as it leaves you hands-free and able to pick through a large parcel of stones at once.

Edward's last words of advice were to go to museums any time you can to familiarize yourself with natural gem forms and colours, and, most importantly, to pass on the tips you have learnt to colleagues and friends — as Edward reminded us, you learn more when you teach.

Dr Thomas Hainschwang FGA — The challenges faced by green to greenish blue diamonds coloured by natural or artificial irradiation

Dr Thomas Hainschwang is managing director and researcher at the Liechtenstein branch of GGTL laboratories in Balzers/Liechtenstein. He founded the GEMLAB Liechtenstein laboratory in 1996.

Like most gem identifications, there are some that are relatively easy, some that are more challenging, and others that are seemingly impossible — and so it is with fancy green diamonds. The question is simple: is it natural or treated colour? As both are created by irradiation, the identification is anything but simple.

Thomas discussed the treatment of diamonds with radium, stating that radium-treated greens are still potentially dangerous. Even though radium treatment of diamonds has not been seen since the early 1900s, the colour and radioactivity of these stones is shallow because the radium does not penetrate very far. It was also suggested that anyone dealing with these stones have a Geiger counter handy to test for radioactivity.

Thomas noted that it was in the 1930s when we started to see electron (relatively no danger) and neutron (potentially lingering radioactivity) irradiation of diamonds. Visual identification of an electron-irradiated diamond could show what is described as an 'umbrella effect', but these diamonds, and therefore their identification features, are rare.

Some diamonds, typically treated with irradiation along with high temperature annealing, seem to show very strong H2 centres, which give the gem a noticeable


A naturally coloured green diamond mounted as a three-stone ring dated 1821 with blue and orange brown diamonds, also naturally coloured. Photo copyright Thomas Hainschwang.

Recent Events

Gem-A Conference 2014 (cont.)

brownish olive colour, described by Thomas "as if someone tried to change an ugly colour to something better".

With other greens, the question becomes whether the diamond has been HPHT treated, or whether it is natural. Diamonds that are considered a 'green emitter' (what used to be termed 'green transmitter') typically have strong blue fluorescence with yellow body colour. When we look at spectra from these gems, we are no longer simply looking for a spectral peak, but measuring the width of the peaks.

The real challenge comes however with some diamonds of green and green-blue body colour. Whether produced from natural or artificial irradiation, they both show the same GR1 spectral line (741 nm).

Thomas stated: "In order to have a reliable database for natural green coloured diamonds, we need to find those diamonds that have strong provenance prior to the 1930s." There's a great deal of insecurity with green diamonds having provenance only after 1930, because, as Thomas noted, you do not know what has happened to the diamond.

Alan Hart FGA DGA — Gems at the Natural History Museum, a review and forward look

Alan Hart is head of Earth Sciences Collections and curator of Minerals and Gemstones at The Natural History Museum, London, which houses one of the world's finest gem and mineral collections in the world, and he is considered by many to have the best job in the world!

The Hope Chrysoberyl, a 45 ct chrysoberyl gemstone from Brazil, housed in the Natural History Museum, London. © The Trustees of the Natural History Museum, London.

Alan took delegates on a historical tour of this incredible museum, with its beginnings rooted in the purchase of the famous Sloane Collection by the British Government in 1753. Some decades later, in 1881, the collection was given a new home at the Natural History Museum, and is still on display over 250 years later. When the Geological Survey merged with the Natural History Museum in 1985 it transformed the museum; the collection grew to over 5,500 specimens, which Alan called "a superb collection of unheated, untreated gems".

The Natural History Museum is also home to special exhibits and has displayed several important diamonds: the Moussaieff Red, a 5.11 ct fancy red cushion triangular brilliant cut, the De Beers Millennium Star, a 203.04 ct flawless gem, as well as the Aurora Collection, a triangular pyramid display of 296 natural fancy coloured diamonds — 267.45 ct in total, now on permanent loan.

The Natural History Museum may not have the Hope Diamond, but it does have the Hope Collection, an incredible collection consisting of diamonds and other gems and displayed to maximum effect under different light sources, and which includes the Hope Chrysoberyl (pictured).

With free public access, the Natural History Museum has over 5.6 million visitors per year and is a much-loved cornerstone of English heritage. Alan discussed the museum's plans for continuation, stating that in order to keep the gem and mineral collection alive for future generations the museum needs to keep up to date with market values, needs to attend gem and mineral shows with the collection (they are now regularly attending the Tucson AGTA GemFair, to which they took the Hope Chrysoberyl), and they need to make educated decisions on the purchase of new material, not only for research but also for the museum's legacy.

Lastly, Alan gave delegates a sneak preview of the museum's exciting plans for expansion; a project which will no doubt mark the museum as one of the finest in the world and securing its history for the next generation of geologists and gemmologists. Watch this space.

The Minerals Gallery at the Natural History Museum, London. © The Trustees of the Natural History Museum, London.

Dr Ulrich Henn FGA — The different types of moonstone

Dr Ulrich Henn is managing director of the German Gemmological Association and head of the German Gemmological Training Center.

Ulrich began by discussing the chemistry of feldspar that allows the optical phenomenon to exist. The adularescence is caused by the interference of multiple reflections of light coming from the combination of orthoclase and albite layers.

Ulrich noted several useful articles by Lehman and Fritsch and Rossman, available in gemmological journals, which discuss adularescence and the iridescence of reflected light, or 'Rayleigh' scattering. While some texts confine moonstone to being an orthoclase feldspar, adularescence is actually not limited to any one specific feldspar.

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Above: Tanzania moonstone — colourless to white with blue schiller and antiperthitic texture. Left: Ceylon moonstone — colourless to muddy white with a blue to white or yellowish schiller and cryptoperthitic texture.
Photos DGemG – German Gemmological Association.

Ulrich then then described moonstone from Sri Lanka, India (including a 'rainbow' variety) and Tanzania. The colour of the adularescence exhibited depends on the width of the layers as well as the particular feldspar itself.

Ulrich then gave identification techniques for the different varieties of moonstone; for example, low-quality white adularescence with labradorescence is termed ‘white labradorite’. If, on the other hand, we should have higher quality moonstone (adularescence) with a little labradorescence, giving spectral colours to the adularescence, this is termed ‘rainbow moonstone’.

Brian Cook — Paraíba tourmaline: an update and Bahia golden rutilated quartz: the introduction

Brian Cook, geologist and purveyor of minerals, took us on a geological tour of the mining areas and discoveries of cuprian tourmalines in the northern Brazilian states of Paraíba and Rio Grande de Norte. He also gave us a brief look at a second gem from the region: rutilated quartz.

Paraíba tourmaline is a copper-bearing cuprian elbaite. The primary discovery of Paraíba tourmaline at the Batalha Mine in 1987 was through the determined search of Heitor Barbosa, who believed that there were tourmalines in the area. The discovery had everyone digging in the region to find more. Two other localities have produced similar goods: Mulungu and Quintos de Baixo (owned by Paul Wild) in 1991. Spessartite and spinel have also been found in the area. While current production is not commercial, Barbosa continues to dig deeper, hoping to find more of this incredible gem.

A lover of unique gems, Brian has been collecting rutilated quartz for years. He mines for the material in Formação Rio dos Remédios, Bahia, Brazil. Rutilated quartz can be described as a crystalline quartz containing golden coloured fibres of rutile. The bundles of needles and the patterns or designs in which they appear give the gem an infinite and unique beauty.

Business in rutilated quartz is currently good, with 95% of the material being sold to China. For Brian, sustainability (a resounding theme throughout the Gem-A Conference) is first and foremost. Brian realizes that gem mining can be a finite venture, and so he is assisting with the development of other businesses, including growing food crops — a commodity that the community needs, and can sell. “The lives of close to 15,000 people are directly impacted by this one

Bahia golden rutilated quartz gem specimen. Photo © Brian Cook.

Recent Events

Gem-A Conference 2014 (cont.)

gem material," said Brian. When all the material has been exhausted, he wants the community to be able to stay in the area and continue to thrive. Aware of the impact the gem industry can have on a community, Brian continued, "What we do now is going to affect their future."

Vincent Pardieu GG — From Jedi to Windex: a quest to the origins of the ultimate red and blue spinels

Senior manager of field gemmologist for the GIA Bangkok laboratory, during the past five years Vincent Pardieu has led successful field expeditions to gemstone-producing areas in Southeast Asia, Central Asia and East Africa. Another gemmologist with a dream job, in 2008 Vincent was asked to visit the actual gem deposits and collect on-site gems. Since then he has made 57 trips, visited 15 different countries and has collected over 120,000 samples. He noted that two thirds of his time is actually spent in the lab examining and documenting the stones collected. Some of these gems are cut into wafers so that the laboratory can perform chemical analysis, gaining a complete data set for the reference collection. As we learned earlier from Dr Thomas Hainschwang, having a reliable database is essential for any important laboratory and teaching centre.

Natural (left) and synthetic (right) highly saturated blue ('Windex') spinels displayed on a lavender spinel matrix specimen seen in Luc Yen, Vietnam. Photo V. Pardieu © GIA.

Stunning red ('Jedi') spinels crystals from the Man Sin spinel mining area, presented in a gem market in Mogok, Burma (Myanmar). Photo V. Pardieu © GIA.

With enthusiasm Vincent shared his love of spinel with us. He started by offering a robust argument for ruby getting the image and popularity it has based on misidentified spinels such as the 'Black Prince's Ruby', and many others in European collections from centuries past. Many or all of those wonderful stones were spinels, with ruby the imposter!

The oldest records of spinel deposits come from the Tajikistan/Afghanistan area, which was near the original overland trade route called the 'Silk Road'. It is likely that the historically important spinels in Europe and Asia, including the Black Prince's Ruby, are spinels of this origin. Vincent believes there is still great potential for vast deposits of spinels from this area.

The second historical site for spinel is Burma. When the Silk Road collapsed, the oceanic 'Spice Route', sailing around India, became the area from which stones were collected. The gems that were found were traded all along the coastlines of the Indian Ocean. Early in his career Vincent, who studied gemmology in Burma, had the opportunity to see spinels form two major deposits: Mogok and Namya. The colours are similar, but the rough crystals are different. Mogok, a primary deposit, shows sharp crystal faces, whereas Namya, a secondary alluvial deposit, shows round crystals — naturally tumbled.

Specific localities will also show you specific inclusions or chemistry — all of which Vincent examines in an effort to maintain a complete and reliable database.

Craig Lynch GG — The Recovered Jewellery

Kicking off the Sunday sessions was Craig Lynch, an independent jewellery appraiser from Phoenix, Arizona, USA, who was asked to examine and document all of the jewellery and watches recovered from the ship-wrecked *RMS Titanic*, which has been at the bottom of the North Atlantic Ocean since April 1912. So how does an appraiser from a land-locked state like Arizona get an assignment like that? Craig is well-known in the trade, from his involvement with the Accredited Gemmologists Association to his book on glass-filled rubies, as well as his work with the 'Somewhere in the Rainbow' collection. However, what many of us did not know about Craig was that before his jewellery career he was training to be a professional commercial diver, so it was only fitting that he should get the call that applied his accumulated knowledge and put his two careers together, to examine the jewellery from the wreck of the *Titanic*.

The wreckage of the *Titanic* was discovered on 1 September 1985. Located 2½ miles deep in the Atlantic Ocean, at 6,000 pounds of pressure per square inch, the wreckage is scattered over 15 square miles. Due to the location of the wreck, there are only six weeks out of the year in which you can safely dive to it.

Craig explained that there were approximately 80 jewellery artefacts recovered from the Titanic, most of which

Cufflinks recovered from the HMS Titanic. Photo Craig Lynch.

were found in the scattered wreckage and not from exploration inside the ocean liner.

Craig's task was to identify and document the artefacts, but he first needed to determine the use of some of the pieces — some had been eroded by seawater or damaged and so were only partially present — and, as they were all dated from 1912 or before, some of their uses were a mystery. One such item was a box full of identical unknown objects. Craig then introduced Peter Mitchell, who was dressed in gentleman's attire of a similar fashion to what would have been worn on board the *Titanic* in 1912. With full theatrical flair, Craig explained that what they had found were buttons. Men's fashion at the time required the buttoning up of many items — collars to shirts, cuffs to sleeves, breast fronts to shirts, etc.

Most of the jewellery recovered was found in two Gladstone bags and a suitcase. The items were, as one might expect, Victorian, Art Deco, Art Nouveau and Belle Époque. There were wrist-watches and pocket-watches of 9 ct gold, Russian silver and men's jewellery, including cufflinks, buttons and tie clips. Craig also showed an image of a beautiful 18 ct yellow gold fine mesh purse and a match safe — a little container for matches, with a ridged bottom to be used as a strike plate. He also noted that most of the women's costume jewellery had degraded — pearls were wholly or partially destroyed, but it was inconclusive as to why, raising many intriguing questions.

Dr Laurent Cartier FGA — An update on worldwide cultured pearl production

Laurent Cartier holds a PhD in Geosciences, focusing on sustainability and traceability issues in the marine cultured pearl industry, and has a Master's degree in Earth Sciences from Basel University, Switzerland. He works for the Swiss Gemmological Institute (SSEF), and lectures on gemmology at the University of Lausanne.

Laurent gave an update on the global pearl production, looking at pearl farming, including the natural pearl fishing industry.

Up until 1910, the pearl industry was solely concerned with natural pearls — pearls were harvested from oysters through natural means; oysters were opened, and if there was a pearl inside it was harvested. Natural pearls are, by definition, formed accidentally in wild oysters, with one natural pearl being found in approximately every 4,000 oysters. On the other hand, cultured pearls are formed via human intervention, a process which came about mainly due to the experiments of Mikimoto Kōkichi.

Pearl grafting in French Polynesia. Image Laurent Cartier.

While natural pearls are certainly worth mentioning these days, cultured pearls make up the bulk of the pearl industry. Laurent went over the process of culturing pearls; discussing the insertion of a mother-of-pearl bead nucleus with a small piece of mantle tissue into the oyster, which then produces calcium carbonate and aragonite layers (nacre) onto the inserted bead.

Beadless cultured pearls, typically grown in China, currently overwhelms the production of bead-nucleated pearls. Laurent noted that Chinese freshwater cultured pearl production topped 800 tons last year. In comparison, Japanese and Chinese Akoya (bead-nucleated) cultured pearls production was listed at a diminutive 25 tons. Even smaller in production figures are South Sea bead-nucleated white and golden cultured pearls at 12 tons.

Japan has turned its stalling production numbers around, and is producing more Akoya pearls each year. Laurent also briefly mentioned that the original definition of 'keshi' is small accidental pearls caused during the Akoya culturing process versus what may or may not be accidental larger South Seas and Freshwater cultured pearls.

He also noted that mother of pearl is no longer the only nucleus being used to grow cultured pearls, with Galatea using coral, turquoise, citrine, amethyst and opal beads to create cultured pearls. We were treated to a summary of Laurent's PhD work, and learnt how sufficient DNA could be collected by minimally destructive means to give us a DNA profile and therefore provenance of a pearl. He also spoke of experiments with the use of RFID chips as the seed nucleus, which would revolutionize identification and tracking of pearls.

Always of concern in pearl cultivation is climate change and the affect this has on ocean nutrients. A campaigner for a sustainable pearl industry, Laurent is focused on sustainable goals, and for more and better natural and cultured pearls. Because pearl production is so dependent on a global response, perfecting the biosphere is the goal. For more information regarding what can and what is being done on regional as well as global levels, visit www.sustainablepearls.org.

Recent Events

Gem-A Conference 2014 (cont.)

Chris Smith FGA GG — Ruby and sapphire source-type classification: an objective approach to help make country of origin determinations more consistent

Chris Smith is president and CEO of the American Gemological Laboratories (AGL) located in New York, USA.

Chris began by discussing why gemmologists and labs issue origin reports and why these reports differ from other reports. He noted that a surprisingly vast majority of the gemmological data collected for the origin reports is exactly the same as a normal lab report. Maybe not so surprisingly there is a high degree of consistency amongst the professional identification labs in this regard.

While origin determination is often easy when concerned with unique gem sources and therefore distinct deposits, it can be a challenge when the sources are not unique and not so distinct. Therefore, instead of looking at geographical boundaries such as whether the gem is from Burma or Kashmir, it is more important to examine the gem deposit's geological boundaries.

Chris discussed the three major geological structures which are significant to gemmologists. We were taken back to Godwana some 550 million years ago where three major structures formed. First, there is the Mozambique Belt: a line of geologically important deposits that include portions of what we now know as East Africa, Madagascar and Sri Lanka. It is interesting to note that from these areas we see similar gems with very similar appearances. The second major structure occurred when the Indian continent (which was an island at the time) 'slammed' into the southern Asian continent. This gemmological-geological region includes India, Afghanistan, Pakistan, Tajikistan, Cambodia and Vietnam. The third major structure occurs near the subduction zone, where the Pacific Plate is moving underneath the Indo-Australian Plate. Chris noted that the geology of these three areas of gem deposits are distinctly unique, and it therefore makes more sense to note gems in geological classifications than geographic classifications.

Geological deposits include those that are metamorphic, magmatic or a combination of the two. Chris noted that within these geological classifications we have two different deposits: primary and secondary. If the labs were handed rough crystals, their identification, whether identifying for geological or geographical purposes, would be easier. However, most of the material the labs see are fashioned (and potentially also treated) gem materials.

The beauty of source-type classifications is that it's objective, it's repeatable, and it's relatively easy. For example, if we see a sapphire that shows metamorphic origin, it could be from Burma, Ceylon, Kashmir or Madagascar. We can eliminate all of the magmatic basaltic deposits like Australia, and metamorphic-magmatic deposits like Colombia, Tanzania and Montana. After eliminating other deposits, we can then look at chemistry. Metamorphic sapphires contain iron and titanium, while magmatic sapphires contain Fe^{2+} and Fe^{3+}. These are markers that can be easily identified using UV-VIS-NIR.

Chris reminded us that after all of this science and detective work about where on earth these gems originated, it's not really the locality that matters so much as how the gem shows itself. We all need to step back and simply look at the stone.

Dr Menahem Sevdermish FGA — Further developments into digital colour analysis, grading, pricing and trading of gems

Menahem Sevdermish is an educator, inventor, leading gemmologist and a successful gem trader. He and his team have developed the revolutionary GemeWizard; a unique colour communication, grading, trading and pricing system for gems and diamonds.

GemeWizard's GemePrice software. Image GemeWizard.

Menahem took delegates on his journey to develop the colour grading and pricing program he calls GemeWizard, a computer aided colour tree, based upon the traditional 31 hues, but multiplied by five, and divided up by tone and saturation — leaving us with a comparison chart of over a 500,000 images.

However, matching just one colour was not good enough, so his team developed an expanded software update, the GemePro. New this year, it's a colour converter, which changes the 500,000 images into Munsell colour nomenclature, CMYK notations for publishing, and RGB, a standard for most social media and blogging needs. GemePro also converts colours into trade names and GIA fancy colour diamond labels.

Also new is the ability to search the internet for comparables. Do you need a blue sapphire of a particular colour? Just ask GemePro and it will do a global search of suppliers, show you the possible matches, along with the price of the stone. This can also be used to collect pricing data for diamonds and coloured stones. Menahem was enthusiastic about the software as it can collect so much information.

GemeWizard and Gem-A have recently launched a new Colour Grading Course. For further information please email education@gem-a.com.

Terry Coldham FGAA — Australian sapphire: a forgotten foundation stone of Thailand's gemstone industry

Terry Coldham has been in the Australian jewellery business since 1965 and has a degree in Mineralogy and Petrology. A man of many hats, he has been a member and officer of several gemmological organizations, including his current position as ambassador for the International Coloured Gemstone Association (ICA). Terry is a patron of the Gemmological Association of Australia (GAA), and is chair of the editorial committee of *The Australian Gemmologist*.

Recent Events

Parcel of fine Australian sapphire. Photo Terry Coldham.

Terry gave delegates a first-hand account of what was happening in the relatively small Thai gem cutting business in the 1960s, and its relationship to the Australian sapphire market — with Australian sapphire playing a major role in the evolution of the Thai gem industry.

Sapphires were discovered in Australia in the late 1800s, first in New South Wales, then later in Central Queensland, with numerous deposits being found up and down the east coast. Approximately 98% of the gem material was and still is blue, with colours ranging from blue-black to black- and inky blue-black. A small percentage of the material consists of large yellows and golden sapphires, along with some star sapphire material.

Whilst the Australian sapphire was not the best quality, there were substantial amounts of it which could be calibrated for use in manufactured jewellery. However, with the sapphires showing strong pleochroism of greenish blue, it was a challenge to orient.

Terry pointed out several mining areas, with one of the more important localities in Queensland sapphire mines, producing 'silkies' and 'milkies' — sapphires with lots of inclusions. Sometime between 1967 and 1969 gem merchants in Thailand developed the heat treatment of these gems in order to clarify and to improve their transparency. Thailand already had a processing industry — something Australia was sorely lacking. In 1970 the global gem industry saw a huge rise in sapphire, with the Thai gem processing and cutting industries utilizing Australian sapphire material, eventually growing into the large treatment and cutting industry that it is today.

Richard Hughes FGA, with special guest John Saul — Heretical gemmology

Richard Hughes is widely regarded as one of the world's foremost experts on ruby and sapphire; he has authored several books and over 150 articles on gems and gemmology. Today, he and his family operate Lotus Gemology in Bangkok, the world's first lab exclusively devoted to ruby and sapphire. His latest book *Ruby & Sapphire: A Collector's Guide* was published in 2014.

For those of you who do not know Richard, it was fitting that he closed the Gem-A Conference, as he lived up to his reputation of delivering 'intriguing' talks. He began by defining what he means by 'heretical gemmology'; 'heresy' simply means 'contrary to the doctrine'. Richard states: "There are certain ideas that gemmologists and geologist accept as being unabashedly and unassailably true. But are they really?"

Richard began by answering this question with another question: where did the carbon that created diamond and oil come from? The carbon that made oil — and diamond for that matter — was not from organic material. It was actually elemental carbon trapped below the earth's crust, and not carbon from decaying plant materials. Whilst most (if not all) delegates would have known that for diamond, not all would have known this for oil. As a future reference for all things carbon, Richard pointed delegates to one of his favourite sites, www.deepcarbon.net.

Another gemmological heresy on Dick's list is the idea that "the higher the refractive index (RI), the better". Take, for example, the RI of spessartite garnet at approximately 1.76 and opal at approximately 1.43. Which one will show better colour? You might think that it would be spessartite, but you would be wrong. Because of the higher RI, more light reflects off the surface of the spessartite. This means that less light will actually enter the gem. On the other hand, less reflection and more light enters the opal. And we all know that more light in the stone means more absorption, and that translates into more colour. As Richard says: "Reflected light is the enemy of colour due to first surface reflection."

Richard also spoke of pink sapphire, and how some say that you can identify the subtle 'lower temperature heating' by examining zircon crystals. When zircon crystals are heated, they turn white and expand, causing stress fractures called 'halos'. This is said to be proof of heat treatment. Richard calls this a heresy — in Madagascan pink sapphire we typically find zircon crystals with halos close to the surface. What we have not considered is why we see this with close surface zircons and not deep zircons. If temperature flows evenly through the crystal, then even low temperature heating would penetrate the entire gem. What we may not have

Recent Events

Gem-A Conference 2014 (cont.)

considered is just how these gems are being polished — consider surface disruption cracks, typically seen on synthetics that have been polished too rapidly. Thai cutters are polishing pink Madagascan sapphire using diamond cutting equipment — probably for a better and faster polish. Unlike traditional slow lap polishing, these fast steel diamond wheels generate a lot of heat. That heat causes disruption cracks and disturbs near-surface crystals. Therefore, these so-called 'heat-treated' sapphires are not heat-treated at all, merely polished on a diamond lap.

Richard finished by noting that the science of gemmology allows us to understand the properties of the gem, but that we need to pull back and admire its natural beauty, and feel the emotion and the romance that it brings. "Gemmology is love and emotion for beauty," says Richard. "Our science needs art."

The speakers and seminar leaders of the 2014 Gem-A Conference with Gem-A CEO James Riley, Gem-A President Harry Levy and Chairman of the Gem-A Board of Trustees Jason Williams. From left–right: Bruce Bridges, Dr Franz Herzog, Chris Smith, John Saul, Richard Hughes, Dr Ulrich Henn, Dr Menahem Sevdermish, Terry Coldham, Brian Cook, Harry Levy, Dr Thomas Hainschwang, Jason Williams, Richard Drucker, Vivien Johnston, Dana Schorr, Vincent Pardieu, Edward Boehm, Alan Hart, James Riley, Craig Lynch, Mikko Åström, Laurent Cartier and Alberto Scarani.

Seminars

The Gem-A Conference was complemented by a range of seminars and workshops, including the 'Coloured stone grading and pricing workshop' with Richard Drucker FGA GG, president of GemWorld International; 'Gemmological applications of Raman and photoluminescence spectroscopy' with Mikko Åström FGA and Alberto Scarani GG of GemmoRaman; and, new for this year, 'A portable EDXRF device in gemmology: toy or dream?' with Dr Franz Herzog FGA. On Tuesday morning delegates were given a private visit to the mineral collection at the Natural History Museum — a highly popular event and one which always sells out quickly.

Also new for this year was the 'Global ethical challenges within the industry' seminar — see Michael Hoare's report below.

Global ethical challenges within the industry

Michael Hoare gives a summary of the ethical challenges seminar with Greg Valerio, Vivien Johnston and Dana Schorr, held at Gem-A Headquarters on Tuesday 4 November.

"Is armed conflict always wrong? What is child labour; is it always wrong? Are gemstones taken from indigenous peoples' land without compensation ethical?" These are just a few of the questions posed by Dana Schorr at the Gem-A ethics debate I chaired recently, where three speakers with decades of jewellery experience challenged notions of what is 'ethical' or 'moral'. Dana, of California-based Schorr Marketing, illustrated the worst (and possibly the inevitable) consequences of globalization. He also tested the rights of corporations to determine ethical or moral standards, questioning the work of the Responsible Jewellery Council (RJC) as 'just marketing', and making a case for moral relativism?

Apologizing for an anti-corporate rant, Greg Valerio, human rights and environmental campaigner, made a passionate plea for real solutions by real people; for building a system and process that verifies truth and builds confidence, transparency and traceability; not permitting Corporate Social Responsibility (CSR) to be swallowed up by corporatism, subsumed by profit motive, or abandoned with change of ownership. He wanted to see sustainable economic impact on the ground, rejecting Dana's assertion that consumers balk at the cost of ethical assurance.

Vivien Johnston, Gem-A Ethics Manager and a responsible sourcing consultant, reminded us that the majority of the jewellery supply chain are small businesses, and that the corporations stand on the shoulders of the little guy, concluding there is little sense in dumping the 'good' we already have, because it's hard to define what's 'ethical', or we suspect corporations' motives. She cautioned against CSR becoming a tick box activity, against failing to capture best practice and to educate or develop. Endorsing the work done by Branded Trust, Gem-A and The World Jewellery Confederation Education Foundation (WJCEF), Vivien commended their new online course as a holistic toolkit for success.

Personally, I lament the slow pace of change, but I took comfort from participants' thirst for knowledge, goodwill and energy; believing it should be harnessed in favour of a transparent jewellery sector.

Gem-A, in association with WJCEF and Branded Trust, has recently launched a new online course called 'CSR for the Jewellery Professional'. For more information or to sign up contact education@gem-a.com.

Graduation Ceremony and Presentation of Awards

Gem-A's annual Graduation Ceremony and Presentation of Awards were held at Goldsmiths' Hall on Monday 3 November. The event saw students from over 20 countries around the world join together with fellow students and professionals from the industry to celebrate success in their studies.

As well as awarding students with their Gemmology and Diamond Diplomas (including Gem-A's very own Natalie Harris FGA DGA and Cathryn Hillcoat FGA DGA, who were presented with their Diamond Diplomas), prizes were given to those students who had excelled in a particular area of their studies. The winners and their prizes are as follows: The Anderson Medal, awarded for the best set of papers of the year in the Foundation examination, was presented to Andrew Barrett; the Anderson Bank Prize, awarded to the candidate who submitted the best theory papers of the year for the Gemmology Diploma examination, was presented to Dilyara Khabrieva; the Read Practical Prize, awarded to the candidate who submitted the best practical papers of the year for the Gemmology Diploma examination, was presented to Claire Ito; the Christie's Prize for Gemmology, awarded to the best candidate of the year for the Gemmology Diploma, was presented by Mr Keith Penton, director of Christies, to Elie-Anne Caya; the Deeks Diamond Prize, awarded to the best theory candidate of the year in the Diamond Diploma examinations, was awarded to Ching Man Wong; the Mok Diamond Practical Prize, awarded for excellence in the Diamond Practical Examination and sponsored by Dominic Mok of AGIL, Hong Kong, was awarded to Doerte Herold and the Bruton Medal, a particularly special award given to the overall best candidate of the year in the Diamond Diploma examinations, was awarded to Andrea Von Allmen.

Awards were also presented to members and friends of the Association who have made an extra special contribution to the Association or the wider industry. In particular, awards were given to both Dr Jack Ogden FGA and Mary Burland FGA, who each received an Honorary Lifetime Membership of the Association for outstanding contributions to Gem-A over the years. Jack's award was presented in respect of his outstanding commitment to historic research and the reinvigoration of Gem-A's international reach, particularly in regards to North America, whilst Mary Burland, who celebrates 50 years with the Association this year, was awarded for her outstanding work across all areas of the organization, particularly in regards to her contribution to *The Journal of Gemmology* throughout the years.

The Association also gave special Honorary Fellowships to members of the industry who have made outstanding contributions throughout their career. These were granted to Terry Coldham FGAA, patron of The Gemmological Association of Australia (GAA),

and Dr Gaetano Cavalieri, president of The World Jewellery Confederation (CIBJO). In similar fashion, the GAA also presented Honorary Fellowships to Gem-A CEO James Riley FGA DGA and Terry Coldham FGAA, as the first cross-Association Fellows of both the GAA and Gem-A.

In addition, Gem-A granted two Gemmology Diplomas by redemption to those people who have had a significant influence on the world of gemmology over a number of years: Dr Ulrich Henn of the German Gemmological Association and Edward Boehm GG of RareSource Gems.

The presentation of awards and prizes was followed by an address from special guest speaker, Tim Matthews FGA DGA, CEO of Jewelry Television, who encouraged the students to be responsible with their learning, stating: "This is not the end of the student's journey, but the beginning, and I think it's important for students to be responsible with their knowledge and experience, making an important impact on the frontline of the industry."

Following the ceremony, students, their guests and ceremony attendees were invited to a drinks reception.

Gem-A would like to congratulate all our graduates and wish them every success for the future.

Gem-A photo competition winners

The winners of the 2014 Photo Competition were announced at the Gem-A Conference on Saturday 1 November. The photos were judged on the basis of gemmological interest, inspiration and artistic quality.

The joint winners were Grenville Millington FGA with his impressive photo 'Trigons across table facet in diamond' and Dayananda Dillimuni FGA, with his wonderful 'Microphotograph of an inclusion in natural pale beryl ('rainy day' appearance'). Grenville and Dayananda receive a year's free membership with Gem-A. Second and third prize winner was Billie Hughes FGA with her photos 'Inclusion photo of pyrite in quartz' and 'Inclusion photo of petroleum in quartz'. Billie was presented with a copy of *Dictionary of Gemstones & Jewelry* by Akira Chikayama. Richard Hughes FGA and Dayananda Dillimuni also received an Honourable Mention with their photos 'Trapiche sapphire' and 'Sun spangles in amber'. All winners also received a professionally-printed copy of their photos.

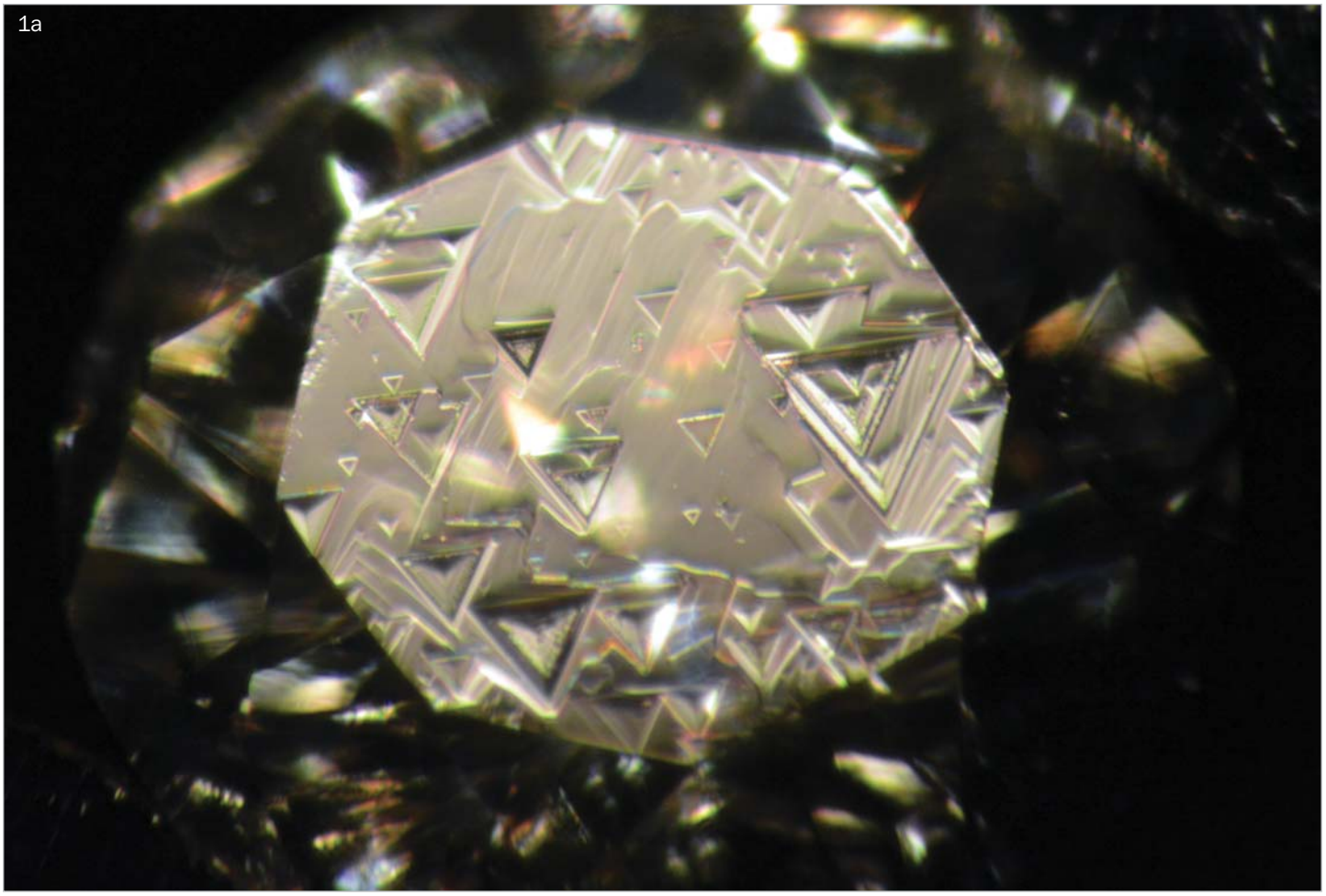
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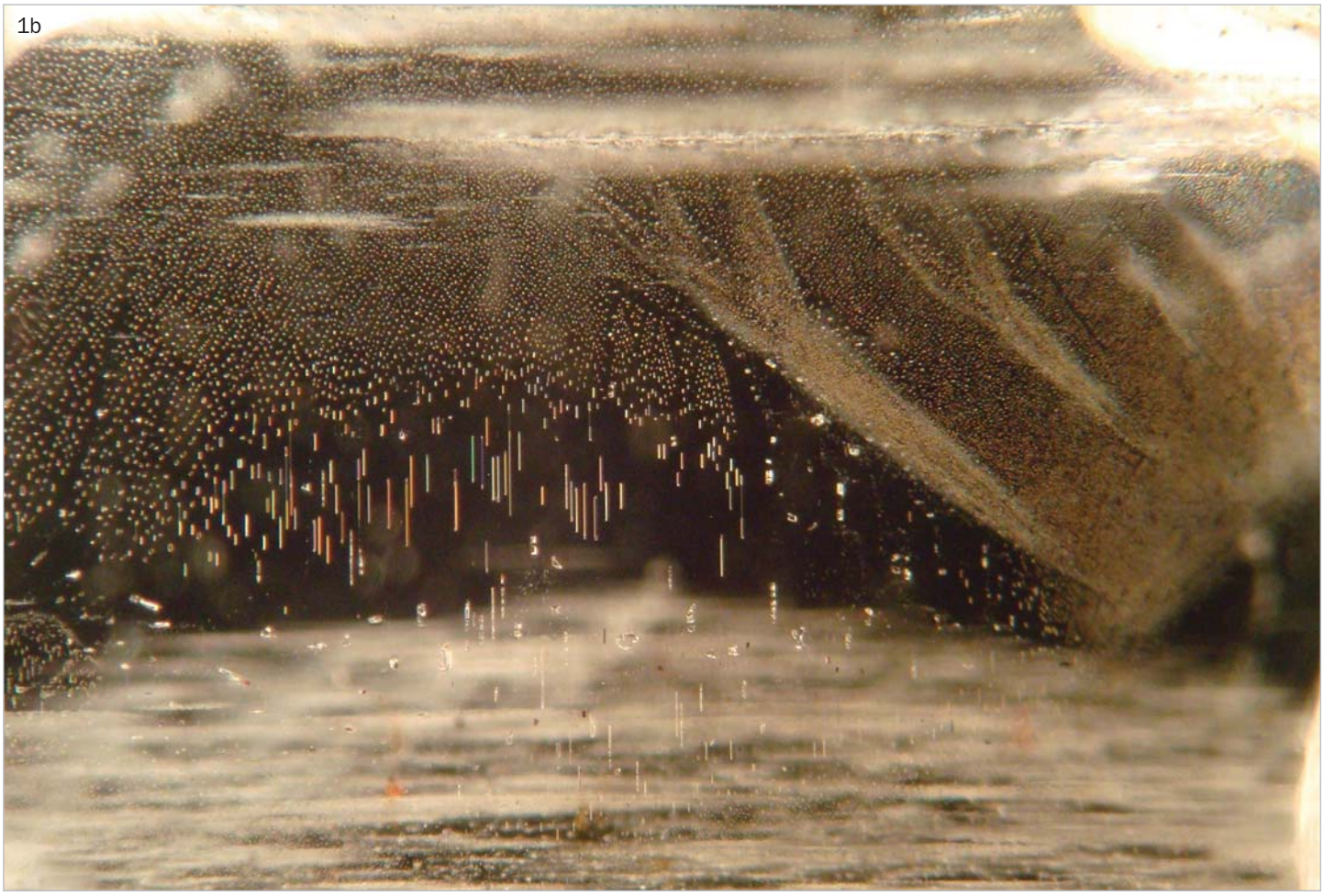
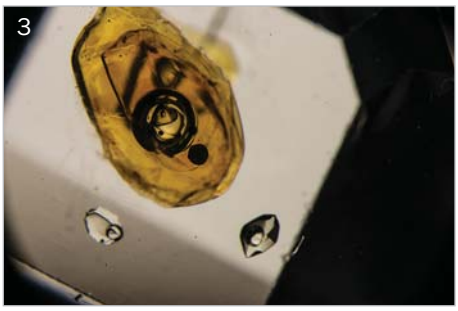
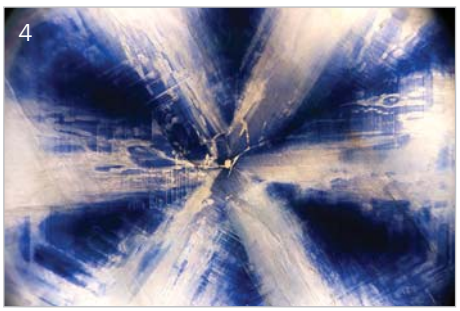
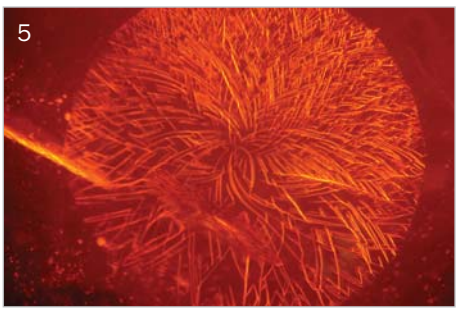
Photo Competition









1a **Joint 1st prize, won by Grenville Millington** FGA — Trigons across table facet in diamond. The diamond is approximately 2 mm across.

1b **Joint 1st prize, won by Dayananda Dillimuni** FGA — Microphotograph of an inclusion in natural pale beryl ('Rainy day' appearance).

2 **2nd prize, won by Billie Hughes** FGA — Inclusion photo of pyrite in quartz.

3 **3rd prize, won by Billie Hughes** FGA — Inclusion photo of petroleum in quartz. This includes a bubble in the negative crystal that forms a 'yin-yang' symbol.

4 **Honourable Mention, Richard Hughes** FGA — Trapiche sapphire from Mogok.

5 **Honourable Mention, Dayananda Dillimuni** FGA — Sun spangles in amber.

Hands-on Gemmology

Tales of the unexpected

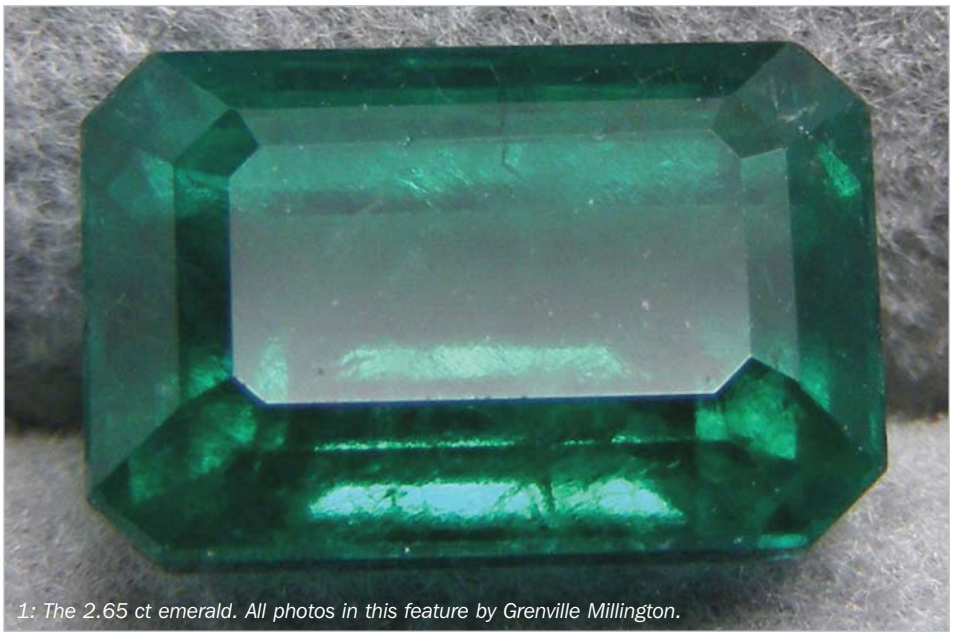
Grenville Millington takes a look at a 'mischievous' emerald.

It looked like an emerald, it was cut like an emerald and the man who brought it to me said it was emerald. I assumed, therefore, that it probably was an emerald. I recall a gemmologist once saying that if one or maybe two tests were sufficient to identify a gem then it was pointless in carrying out further tests.

If gemmology was about testing gems to identify them, then we could leave it all to the people in white coats who could feed in gems at one end of a machine and get the answer out of the other. However — as I think I've demonstrated in previous articles — there is no fun in that and for gemmology to be appealing we need to be interested and have some fun. From a professional point of view, there is a huge difference between a gemmology student (and anyone else) saying, "I think it's an emerald" and giving this advice freely, and a gemmologist stating, "It is an emerald and here's my signature on a certificate to that effect" — it doesn't matter whether that gemmologist charged for the service or not.

2: The emerald showing general inclusions.

Therefore, if we carry out the one or two tests that are necessary to identify a gem, then how very nice if one or two more actually confirm that identity. There is another reason (other than niceness) for these confirmatory tests; some gems like to play games! A favourite gemstone game is not allowing a refractometer reading to be taken, despite all cleaning efforts or prayers being offered. Other gems, although being highly colourful, seem reluctant to show off a decent absorption spectrum, whilst others (one of the most infuriating of games) sit there without a single inclusion being visible even under 80× magnification!

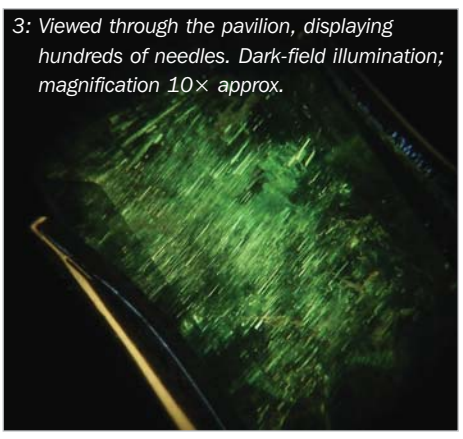


1: The 2.65 ct emerald. All photos in this feature by Grenville Millington.

These are the more mischievous gems, and fortunately they are in a minority. However, some gems (like us) just like to have fun and offer up a few surprises… just to see if we are alert.

The stone in question was an emerald weighing 2.65 ct, one of a few assorted stones that were visiting me for a very short time. Included were three blue sapphires, one yellow sapphire, two emeralds and some diamonds. All seemed straightforward, including this particular emerald (**1**).

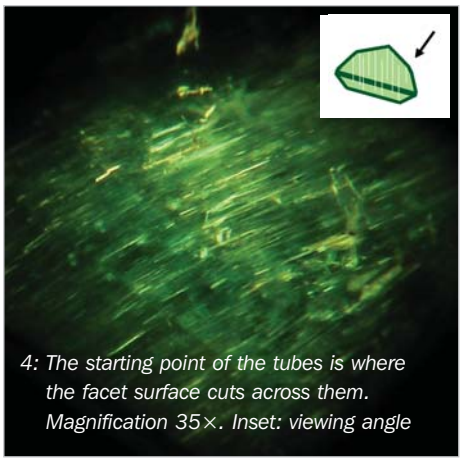
It was compliant on the refractometer, enabling me to read 1.590–1.597. The spectrum was not too strong, considering the strength of green of the gem, but it showed a distinct set of fine lines in the red in the manner expected. The Chelsea Colour Filter produced a yellowish residual colour (with the stone's tone of green, I would have been surprised if a pronounced red colour had been visible). Under the 10× lens there were obvious inclusions, nothing too specific, except for quite a few needle-like ones (**2**).



3: Viewed through the pavilion, displaying hundreds of needles. Dark-field illumination; magnification 10× approx.

I decided to place the stone under the microscope. I did not expect what I saw next: in place of the few needles there was a firework display. We expect to see 'rain' in aquamarine and yellow beryl, but it's actually not that common in emerald, and in this stone it was positively torrential. Under the 10× lens the needles were transparent and not overtly obvious, whereas under the microscope lens and with darkfield illumination the needles picked up and reflected the light, providing a spectacular display (**3**).

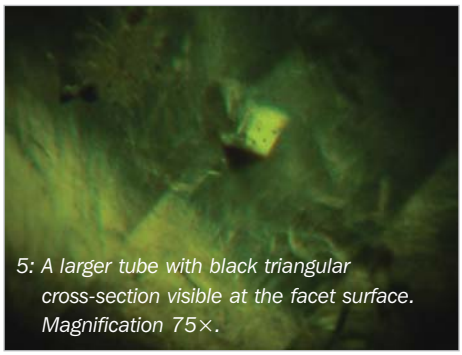
The first thing to be established was that the needles were in fact hollow tubes, so when I noticed many had dark 'ends' I immediately thought of nail-head spicules. Such inclusions we associate with hydrothermal synthetic emeralds. Cue mild panic! I had already established in my own mind that this was a straightforward, natural emerald (or rather, one of natural origin, as I hadn't yet looked for any fracture filling). The RI was surely too high for a synthetic



4: The starting point of the tubes is where the facet surface cuts across them. Magnification 35×. Inset: viewing angle

(it is at this point that I acknowledged the fact that I can't possibly be up-to-date with all developments that might have happened anywhere at any time, and why was I even bothering to look at someone else's gems/problems when I could be sat outside on a warm beach drinking a cold beer?!)

Despite all this, another view through the microscope eyepieces was called for, once my rational side had said, "The RI is what I expected of an emerald of this tone of green, there is no redness under the Chelsea ColourFilter, it is hand-faceted,



5: A larger tube with black triangular cross-section visible at the facet surface. Magnification 75×.

and I've looked at enough emeralds to know that this one is all right, even if it is playing games." This highlights the importance of the conscious and unconscious parts of the mind in looking at gems for identification. Hand- or machine-faceting is no proof when it comes to identifying a gem, but it is usually found that natural gems are hand-faceted, whilst usually more synthetics are machine-faceted. The quality of the surface polish is usually good on all, except the very poor qualities of natural gem, with the girdle being multi-worked on most natural stones, whereas machine-cut synthetics usually have a relatively poorer polish and a single surface girdle, often fairly thick. Probably more importantly, after the brain has examined thousands of gems, natural, synthetic or artificial, then subconsciously it picks up within less than a second on anything that appears untoward. This is not proof of course (which is why we carry out physical tests), but it is usually a good line of defence — if it looks wrong it probably is.

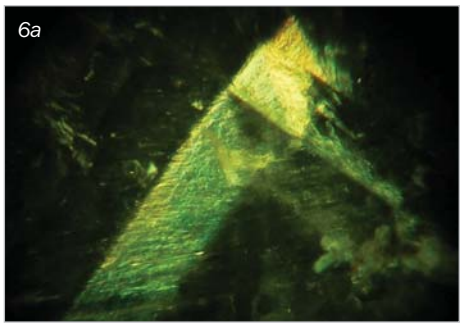
The second look at this emerald showed that the 'dark ends' of the tubes were not crystals at all, but the point at which the facet surface had cut across them and debris or polishing compound had accumulated. As no light was being reflected off the surface through which I was viewing, the facets seemed invisible and I was unaware at first that I was seeing the tube ends being cut by the facet (**4**). One larger, short tube displayed a black triangular end section (**5**).

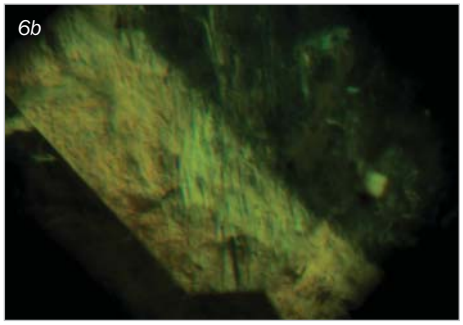
Inclusions in Gemstones (Gübelin and Koivula, 1986) shows a Brazilian emerald with a host of parallel growth tubes and something similar in a Pakistani emerald. Just as I appeared to have solved this synthetic/nail-head spicule anomaly, a turn of the stone to a different view presented another. The hydrothermal synthetic emerald is characterized by an optical effect, usually giving a chevron, or rippled effect, or what I described in an earlier article in *Gems&Jewellery* (Millington, 2013) as crumpled tissue paper. This stone presented such a refractive aberration effect, as shown in **6**.

This effect is similar to the *gota de aceite* ('drop of oil') effect seen in some Colombian emeralds, but I am unsure whether it is applied to other emeralds. The fact that the effect seen here is irregular in pattern points to it being a natural phenomenon, rather than the regularity of the effect I've seen in synthetic emeralds, grown under stable conditions.

Other inclusions visible in this emerald were rather explosive, yet non-descript, as seen in **7**.

Examination also revealed that what few surface-reaching fractures there were The stone in question was an emerald, one of a few assorted stones that were visiting me for a very short time. evidence of filling. So far I had come across two unexpected scenes: the light effect from the multitude of included

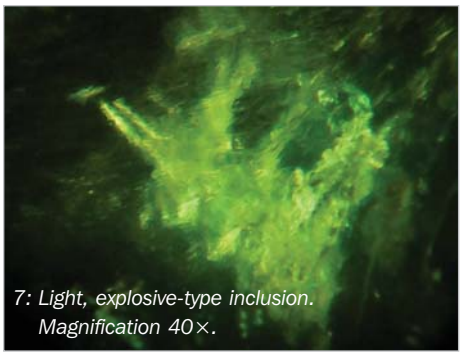




6: Crumpled effect. Magnification (a) 25× and (b) 50×.

Hands-on Gemmology

Tales of the unexpected (cont.)



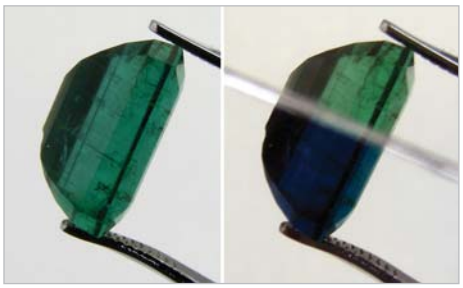
7: Light, explosive-type inclusion. Magnification 40×.

tubes (that was not hinted at under normal 10× lens conditions) and the 'roiled' effect due to growth interruptions or grain boundaries. I returned the stone to the white paper pad and looked again with the loupe. The 'roiled' effect was visible but not obvious, and as I looked through the table facet I was aware that when the stone was tilted approximately 30° to the left it looked yellowish green and when turned the same to the right (i.e. through 60° in total) the stone took on a bluish green colour. This emerald was not what you would call a pretty stone and all emeralds ought to show some aspect of their dichroic nature without us resorting to a dichroscope. It is part of that subconscious view I mentioned earlier — if it wasn't there then we would be suspicious. So what (having noticed this dichroism by eye) made me reach for the dichroscope? Probably the same insanity that makes me notice in daylight that a diamond is fluorescent (because of a vague, bluish haziness), yet I still feel compelled to place it under long wave ultraviolet light (LWUV) just to prove it.

Viewing with a split-polaroid dichroscope (**8b**), I noted two things: one of the rays is blue, not bluish green as expected (this will be the extraordinary ray) and it is quite dark. I recall when Zambian emeralds were made available to the trade (1970s, maybe 1980s) their general colour was a lightish bluey green, and they showed a blue ray through the dichroscope. However, I was not expecting such a strong blue in this stone.

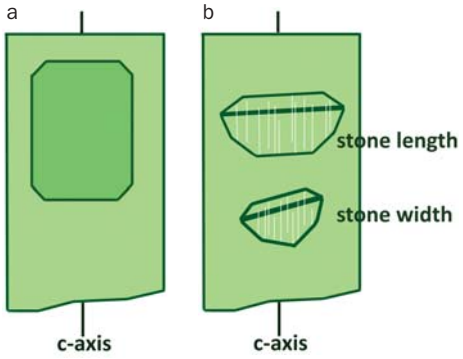
Gems&Gemology (Moses et al., 2003) once reported a Brazilian emerald showing greenish yellow and blue dichroism. The stone also had higher-than-usual RI figures for Brazilian stones (1.595– 1.601), which are quite close to those of the emerald in question (1.590– 1.597). The blueness was attributed to iron — the stone showed a line at 427 nm in its spectrum. I did not notice such a line in the spectrum of the 2.65 ct stone, but I only had time for a quick spectrum test, and the stone had to be returned before I could look up the *Gems&Gemology* report (Moses et al., 2003).. There was no fluorescence from this test emerald under LWUV, which is the result that would be expected if there was a significant iron presence. Also, in that same *Gems&Gemology* magazine, there is a report of 'nail-head spicules' in a natural emerald with flat platelets in place of the crystal head, and with an RI of 1.584–1.590.
I said earlier that there were two things to note about the photograph in **8** — the second is also something else that I did not expect. Look at the diagram in **9**.

This emerald was a standard emerald cut, 9.4 × 6.3 × 5.3 mm, and rather 'chunky'. We would have said its shape was probably dictated by the original crystal and we would expect it to be as in **9**. In other words, when we point the dichroscope at the table facet we would expect to see maximum dichroism (90° to the *c*-axis). After all, I have already mentioned that I looked through the table facet with the loupe and as I turned the stone through to the left and right I could see a yellowish green in one way and a bluish green in the other, as expected. But, when I applied the dichroscope to the table facet, there was hardly any change of colour in the two windows. Unexpected, because I had already (or so I thought) noticed strong dichroism. When the stone was viewed through the dichroscope from its side direction then the result was as is seen in **8**, i.e. maximum dichroism. Now, if that were the case, then the stone could not be cut as expected, as in **9a**. I moved the stone to the polariscope and could easily get a uniaxial interference figure with the stone turned just off perpendicular to the table. It must have been cut as shown in **9b**. As far as I could tell, the tube inclusions were parallel to the *c*-axis.



8: (a) side view of emerald and (b) through a split-polaroid dichroscope.

This rather unassuming emerald had fooled me several times during the course of examination. It had been having great fun at my expense and I wonder how much longer it will have to wait before it finds someone else it can challenge in the same manner. I'm almost sure I could hear this emerald chuckling as the package went through the door.



9 (a): Usual orientation of a cut emerald in relation to the original crystal.
(b): Orientation of the stone and original crystal.

Now, imagine if all the jewellers, or 'ordinary' people, knew about this great interest and fun that was available to us gemmologists — they'd all want to be in on it! So perhaps it would be better if you forgot all about what I've written above. This article will self-destruct in five seconds…

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Shows and Exhibitions

Goldsmiths' Fair

Kim Foxwell takes a look at some of the new and interesting pieces featured at this year's Goldsmiths' Fair, held at Goldsmiths' Hall from Monday 22 September to Sunday 5 October.

1: Brilliant green tourmaline set in a ring by Ingo Henn. Photo courtesy Ingo Henn.

Goldsmiths' Fair is an annual Aladdin's cave for gemmologists and jewellery enthusiasts alike — and this year was no exception. Guest-curated by prize-winning architect Zaha Hadid DBE, the fair spanned two weeks and comprised some 170 designer-makers. With the addition of a new series of breakfast and in-conversation talks, it provided nourishment for the mind as well. Other positive changes to this year's fair included late openings on both Thursdays, which opened the fair up to a wider audience.

Fabulous stones

As to be expected, there were some magnificent examples of gemstones on display amongst the jewellery. Ingo Henn had several particularly incredible pieces that wouldn't normally be seen outside a museum or a royal wedding, including a 17.23 ct trillion Santa Maria aquamarine and some brilliant green tourmalines (**1**). Nearby, Luke Shimmell and Emma Madden displayed a mirror-cut aquamarine set in a ring and baguette-cut tourmalines (**2**) — the tourmalines being remarkable due to their length and precision of cut, and the way in which they had incorporated the stones into their designs. Jean-Scott Moncrieff also had some unusual Andean opals of a curious blue colour (**3**). There were also a number of lesser-known and rarely used gemstones making a debut; kyanite appeared more than once, while in amongst Catherine Best's more traditional jewellery pieces lurked a 'dinobone' torso brooch (**4**), made from agatized dinosaur bone. Another unusual stone was shown by Josef Koppmann, who featured hypersthene on carbon cufflinks (**5**) — something most people had never heard of, let alone seen.

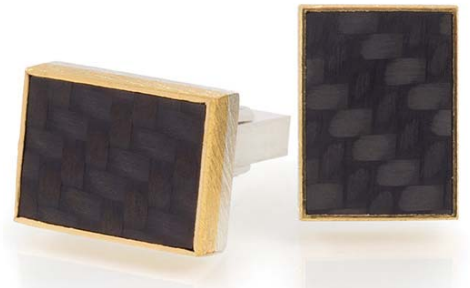
2: Luke Shimmell and Emma Madden's mirror-cut aquamarine (left) and baguette-cut tourmalines (right). Photo courtesy Luke Shimmell and Emma Madden.

3: Blue Andean opals by Jean-Scott Moncrieff. Photo courtesy Jean-Scott Moncrieff.

Interesting and unusual examples of gemstone fashioning were also in abundance, with some beautiful fancy cuts nestling amongst the more traditional brilliants and baguettes.

There seemed to be no sign of the recent trend in rose cut stones abating, with Barbara Bertagnolli, Mikala Djørup and Disa Allsopp in particular employing rose cut corundum and beryl in their designs. The beauty of the rose cuts seen at Goldsmiths' Fair was that they had clearly been chosen for the way they displayed and enhanced natural inclusions, usually considered a less desirable feature, in a complementary and more stimulating way. Jacqueline Cullen also deserves a mention, as she continues with her lines of beautifully hand-carved Whitby jet (**6**).

4: Catherine Best's 'dinobone' brooch. Photo courtesy Catherine Best.



5: Pair of 24 ct gold and silver cufflinks with hypersthene on carbon by Josef Koppman. Photo courtesy Josef Koppman.

Another theme that appeared to recur across the fair was the use of gemstones as a lens. Alexandra Raphael's 'Within the Stone' series (**7**) is particularly worth a mention here, combining cloisonné with beautifully clear, mirror-faceted beryl and quartz. The subsequent effect is one of peeking into another world, where the slightest movement shatters your view, and where the delicacy of the subjects (often insects) is captured rather than overwhelmed by the solidity of the stones. Another exhibitor to use gemstones in this way — but to an entirely different effect — was Sabine Konig, who placed green quartz cabochons over engravings, which gave the pieces an eerie, beautiful, gold-tinted depth.

Mimicking gemstones

Conversely, rather than using jewellery to set off stones, a few designer-makers eschewed them altogether, instead employing a mixture of techniques and other materials to add colour and interest to their designs. Enamellist-engraver Rachel Emmerson exhibited a few pieces that appeared to mimic trapeze-cut stones, combining colour and texture in such a way that it took more than one glance to realize this was enamelling rather than a faceted stone (**8**), while Cristina Zan's pieces combined painted wood and gold which evoked much of the beauty of lapis lazuli. Similarly Jo McDonald used British porcelain in a mixture of jewel-tones to emulate the beauty of gemstones found in nature. Jonathan Boyed also mostly ignored coloured gemstones, instead letting his pieces give three-dimensional physicality to words — allowing the metallic corporeal to meet the literal ethereal.

6: Jacqueline Cullen's delicate hand-carved Whitby jet earrings, set with black diamonds. Photo courtesy Jacqueline Cullen.

7: Alexandra Raphael's 'Within the Stone' series created with mirror-faceted beryl and quartz, featuring cloisonné butterlies. Photo courtesy Alexandra Raphael.

8: Ring by Rachel Emmerson, which uses enamelling to mimic trapeze-cut stones. Photo courtesy Rachel Emmerson.

There were also stories behind many of the pieces. Jo McDonald had some sapphires that had been passed down to her over a few generations, which had originally been smuggled out of Germany along with their owners when World War II began.

A grand finale

One of Martyn Pugh's pieces deserves a particular mention. Commissioned to make a ring that would evoke the colours of a tropical sunset while including three stones picked out by the client (unable to decide between them she opted to have all three), he set about engineering a ring that would be both physically robust and aesthetically pleasing. Combining a variety of modern and old techniques and an array of gemstones, it is a fantastic example of ingenuity and engineering. With a hand-made shank, a mixture of CAD-CAM, model-made and wax-carved settings, and multiple layers to the design, it was a challenging piece — even for an experienced master goldsmith. There were several stages, beginning with the creation and assembly of the shank and the mounts, followed by a careful removal of the top layer so the sunset of sapphires could be pavé set. The horns and the mounts of the top layer were attached to a specially-made metal jig so the diamonds, aquamarine, kunzite and spinel could be set, before being removed from the jig and laser-welded back on to the rest of the ring. As a final, special secret, inside the shank were set some family diamond chips. The ring itself took Martyn at least 75 hours at the bench, with another 40 spent on setting the stones. Needless to say his client was delighted, seeing it for the first time at the show, and exclaiming that it was even better than she expected.

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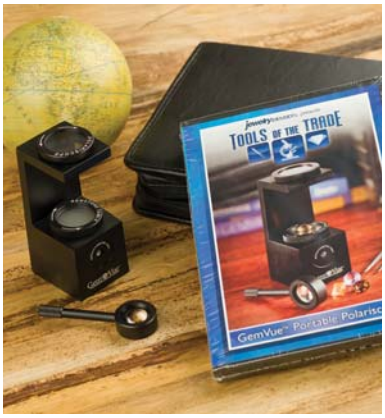

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