



Gemmology Today

November 2016 / Volume 1 / No. 1
Quarterly Publication

A Star



is Born.....



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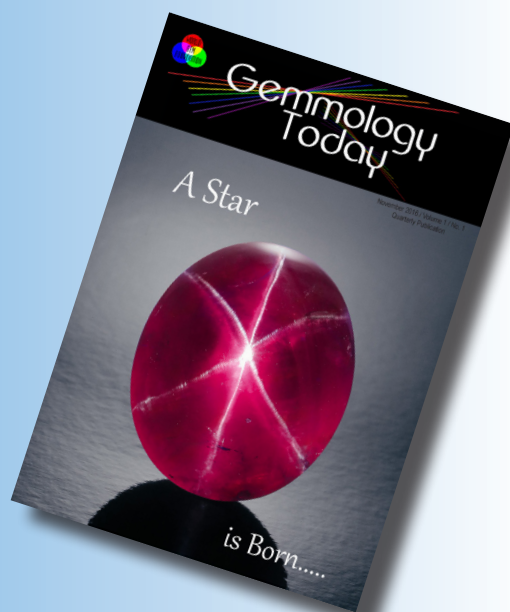
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'Sometimes it's the journey that teaches you a lot about your destination'

WORLD GEM FOUNDATION

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Cover Photograph

Rosser Reeves Star Ruby by Tino Hammid

Published by The World Gem Foundation & Amazonas Gem Publications

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Geoffrey M. Dominy is the author and creator of the digital e-book 'The Handbook of Gemmology', founder of the World Gem Foundation and editor of Gemmology Today.



World Gem Foundation Founder
Geoffrey M. Dominy

In April, I was having a conversation with a gentleman who was interested in becoming apart of the World Gem Foundation. He asked me what my 'vision' was for the WGF? I have to confess that I have never been asked this question before but without hesitation I answered 'An E.U that works'. He laughed.....

I told him I wanted an international gemmological organization that was made up of strong national, regional and in the case of the U.S, state gem academies. An organization that allowed students to study gemmology locally but to be recognized internationally. An organization that allowed Kenyans to be taught by Kenyans in Kenya, for Indians to be taught by Indians in India, and for Scandinavians to be taught by Scandinavians in Scandinavia. An organization that always put its major stakeholders (the students) first and made informed decisions based on what was best for them. An organization that was made up of like-minded people, passionate about education and gemmology, you wanted to work together rather than pull each other apart. An apolitical organization that offered quality education at an affordable price. A 'Uptopian Dream'? Perhaps but I have always maintained a strong belief that if you work hard and surround yourself with the right people, anything is possible.

Today, the World Gem Foundation consists of ten national, regional and state gem academies, in Britain, Holland, Spain, Scandinavia (Sweden, Norway, Finland, Denmark and Iceland), India, Kenya, South America (Brazil, Argentina, Bolivia, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, and Venezuela), Central America (Mexico, Guatemala, Honduras, Nicaragua, El Salvador, Costa Rica and Panama), the Caribbean (Cuba, Puerto Rico, Haiti and the Dominican Republic) and the U.S. All working for each other, sharing ideas and making a difference in the lives of their students.

To me, there is no nobler profession than teaching. The World Gem Foundation and our affiliated gem academies are giving talented and enthusiastic people the necessary tools they need to succeed, and to forge a career that will hopefully provide a livelihood for themselves and their families for many years to come.

We can all make a difference; we just have to make a conscious effort. A star has indeed been born and I sincerely hope it will illuminate and enlighten our industry and bring opportunities for personal and professional growth to all those people who, like me, are passionate about the science of gemmology.

Carbon Copy

The World of Diamonds

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Diamonds through Antiquity

Although mankind's first encounter and use of diamonds is probably forever lost, we can still establish roughly, through historical and archeological evidence, when diamonds were first used.

It is often stated in introductions to literature on diamonds that diamonds have been known since a certain time period which varies considerably depending on the author's view. Hershey states that "It appears certain that diamonds were known and appreciated in India at least five thousand years ago" while later works usually state the discovery of diamonds considerably later with formulations similar to Harlow's "... sometime before 400 BCE". (Hershey 1940, Harlow 1998) Most texts describing the origin of diamonds start with a short passage on the origin of the word diamond and usually include a sentence such as "the word diamond comes from the Latin word 'Adamas' meaning unconquerable" or something similar. The word 'Adamas' is the Latin variety of the earlier Greek word 'Adamao' and its etymology is quite well researched and recorded.

The first recorded use of the word is by Hesiodos around 700 BCE for describing the qualities in iron. There is no known example where 'adamas' or 'adamao' actually refers to diamond before Pliny the Elder used it in his *Historia Naturalis* in the first century CE. Many translations of older religious texts translate variations of the word 'adamas' into diamond however since this word was used to describe any hard and stable stone or metal, it is difficult to include them as 'historical proof' regarding the actual use of diamonds.

The Hebrew word 'Jahalom' (with variations in the spelling) have a similar meaning as 'adamas' but in a 17th century translation of the Bible the word 'jahalom' is translated into diamond causing further misconceptions of our understanding of the early history of diamonds (Maillard 1982, Davies 1984).

There are many referrals to Plato and his supposed theory on diamonds by a long list of respected authors (Bruton 1978, Burnham 1886, Moore 1834) but Plato never mentions diamond in any of his works, instead Plato's use of the word 'Adamas' describes a dark or black coloured material of high density (Plato 2016, King 1870). To find evidence of diamonds

being known to mankind before the first century CE we need to look elsewhere.

The oldest archeological evidence is from Yemen and dates to around 400 BCE. The earliest evidence consists of drill holes in beads showing patterns diagnostic for drilling with twinned diamond crystals. We have similar evidence from India dating to roughly 200 BCE but archeological research does suggest that diamond might have been used mixed with corundum for polishing nephrite axes in China as early as 2500 BCE. However the earliest actual artefacts containing diamonds date back to the first century CE in the form of Roman jewellery (Harlow 1998, Lu et al 2005).

Unfortunately historical evidence can be quite contradictory, as we have just found with the words 'Adamas' and 'Jahalom' due to the liberal use of these words and whether or not their definition or meaning are the same based on their historical context.

We do know that the Sanskrit word 'Vajra' is used for diamond in the *Arthashastra*, a handbook on how to run an empire, written presumably by Kautilya in India around 300 BCE. However since the word 'Vajra' was also used to refer to lightning or a thunderbolt, misconceptions have arisen over the years regarding its usage.

In *Mahabharata*, an epic saga written in Sanskrit around 900 BCE the word 'Vajra' is used and has in several instances been translated into 'diamond'. However in the context it is used, it clearly refers to lightning, flash or a thunderbolt rather than diamonds. In *Arthashastra* the Indian diamond trade is well described and we can see that diamonds were subjected to taxation and was an important income for the royalty (Arthashastra 2016, Menon 2006).

Of course there are many other theories on the origin of diamonds and other gemstones, some more fanciful than others, including the belief that they are fallen stars or even the tears of Gods.

The Greek word 'Krystallos' is a variation of 'Kryos' that translates into 'deep cold'. Pliny the Elder describes the formation of rock crystal as the result of a violently contracting



Exceptional Diamond Octahedron

Photo: Tino Hammid

coldness and thus he established a connection between ice and crystals. '*Krystallos*' was then used to describe all manner of transparent substances leading to today's word '*Crystalline*' (O'Donoghue 2005, Harlow 1998, Read 2005). The original use of the word '*Krystallos*' might explain the theory that diamonds were formed of deeply frozen ice that would never melt.

Diamonds do appear to have been highly regarded and valued for as long as they have been known to Man. Manilius states in '*Astronomica*' 14 CE that diamonds are more precious than gold, a sentiment also held by Pliny the Elder (AD 23-79), when he described diamonds as 'the most valuable there is' in his book '*Historia Naturalis*'.

The same is true in India where Ratnapariksa diamonds are described and various colours allocated to the different castes. Not surprisingly the white or colourless diamonds were reserved for the highest caste (the Brahmin). The Ratnapariksa (6th Century CE) also refers to the magical powers that are so often attributed to diamonds (Manilius 1977, Harlow 1998).

In Volume 37 of his book *Historia Naturalis*, Pliny the Elder included all known information on diamonds. He documented six different varieties of diamond from earlier records and available knowledge at the time and proclaimed the Indian diamonds to be of the best quality followed by the Arabic diamonds. However based on the physical characteristics Pliny gave the six varieties, it is clear that the other four (including the 'Macedonian' and the 'Cyprian') were not diamonds.

Although Pliny also mentions Ethiopia and Meroe, an ancient city in Sudan, as sources of diamonds, it is highly likely that diamonds originating from these areas were merely the result of diamonds traded in Yemen and transported to both sides of the Red Sea on their way to Alexandria, Rome or Constantinople (Pliny 2016, Harlow 1998).

Pliny also wrote that diamonds often formed in or together with gold with Indian stones being found in a quartz-like matrix. Interestingly Pliny describes the appearance of diamonds as resembling rock crystal with smooth faces meeting at six corners, a nice description of an octahedron! (Pliny 2016).

In China knowledge regarding diamonds seems to appear around the same time as in Europe. It is interesting that early mention of diamonds in China suggests that diamonds came from Rome. This is highly probable since splinters of diamonds were set in iron and used as tools for carving. These tools were subsequently exported all over the known world and were highly appreciated by the jade loving Chinese (Laufer 1915, Harlow 1998).

While it is impossible to know when diamonds were first discovered and used by humans, it is possible to get some indication as to their discovery and usage by carefully examining the historical data. While there are many myths

and legends surrounding diamonds in various texts throughout history, one must realise that these were often written without any scientific basis.

Fortunately historical and archeological evidence indicates when diamonds might have been known and the importance of diamonds in India is well documented. It is also clear how important diamonds were to the various rulers as they were subjected to taxation and export regulations. The latter seemingly confirmed by the fact that only small diamonds of a lower quality were found in Roman jewellery.

What is perhaps the most surprising revelation from the research carried out on diamond usage in antiquity is that diamonds were not known to the ancient Greeks. A fact that is somewhat strange considering the insistence throughout history that the word 'diamond' originated from the Greek word '*adamao*'!

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The Spice of Life

Coloured Gemstones



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Chatoyancy - Is it magic or simply Mother Nature?

For true gem connoisseurs, gemstones that display the unique optical phenomena known as 'chatoyancy' or more simply the 'cat's eye' effect are of particular interest with the deliciously beautiful 'milk and honey' cat's eye chrysoberyl and the even rarer cat's eye alexandrite the most highly sort after.



Cat's Eye Chrysoberyl & Cat's Eye Alexandrite Photo: Tino Hammid

Resembling the narrow slit of a cat's eye, the name 'chatoyancy' is actually derived from the French word 'oeil de chat' or 'eye of the cat' with the optical effect best viewed in stones cut en cabochon (with a rounded surface) as it is moved under a concentrated light source.

The band of light is caused by light scattering from parallel mineral fibres, small holes, hollow tubes or small channels within the gemstone when they are positioned parallel to the base. While a more defined cat's eye is often produced by the presence of more fibres, the intensity of the band, position and overall clarity of the gemstone play an important role in the gems overall value.

While there are a number of gemstones that exhibit chatoyancy, cat's eye chrysoberyl reigns supreme in the gem kingdom and has quite rightly earned the honour of being known only by its prefix 'Cat's Eye' while other 'chatoyant' gemstones are more correctly referred to by their species or variety name (i.e. Cat's Eye Aquamarine). However in a world where name dropping has become a national pastime, how we market a gemstone is often just as important as the gemstone itself and this often leads to extreme liberties being taken by gem dealers and jewellers to enhance the sale!

Lab-created cat's eye chrysoberyl produced by the Inamori Company, a division of Kyocera, are characterized by a dark-greyish green body colour with slight purplish overtones under fluorescent lighting, an absence of inclusions, and parallel undulating striations, which run the length of the cabochon. Variations have also been noted in their reaction to short wave UV light with a weak opaque chalky-yellow fluorescence confined to the surface area and an underlying weak orange-red fluorescence. The bottoms of these stones are generally flat, which should always be viewed with suspicion when dealing with cabochons cut from expensive gem material since weight retention is of the utmost importance. Invariably, the majority of natural stones cut in this fashion will have a lumpy base.

Cat's eye chrysoberyl is not generally enhanced, however stones can be treated with radiation although the stability of this procedure is unknown.

The name 'cymophane' (derived from the Greek word meaning 'wavering light') has in the past been used to refer to cat's eye chrysoberyl although today due to the marketing prowess of the name 'chrysoberyl', it is rarely used.

The best localities for 'Cat's Eye' gemstones are Brazil, India, China, and Zimbabwe

Other gemstones that can exhibit the 'Cat's Eye' effect include tourmaline (green and pink), quartz (several varieties with the most famous being tiger's eye), aquamarine, moonstone, apatite (colourless, pink, yellow, green, pink, blue and violet), scapolite, tanzanite and more recently pezzottaite. Compared

AGTA GEMOLOGICAL TESTING CENTER

IDENTIFICATION REPORT

Date: September 18, 2006
Report No. 90018009

The item described below has been examined by at least two professional staff gemologists of the AGTA Gemological Testing Center. The results of the examination are presented here subject to the limitations printed on the reverse of this report.

Item Description: Loose stone

Number of gems examined: 1
Color: Dark greenish yellow
Transparency: Translucent
Weight (ct): 465.87
Dimensions (mm): 39.34 x 37.70 x 33.13

Shape: Irregular oval
Cut: Cabochon
Enhancement: None

Species: NATURAL CHRYSOBERYL

Variety: NATURAL CAT'S EYE CHRYSOBERYL¹

Comments: "This chrysoberyl displays a 'cat's eye' (chatoyancy) in reflected light."

The reverse of this page is an integral part of the report, it contains important information that may help in the interpretation of the information on this side.

S. Du Toit
Garry Du Toit

Riccardo Betti
Riccardo Betti

For and on behalf of the

Tests Conducted to Establish the Identity of the Chrysoberyl Described Above											
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31	32	33

American Gem Trade Association Gemological Testing Center
18 East 48th Street, New York, NY 10017, USA Tel: 212.752.1717 Fax: 212.750.0930

AGTA New York Laboratory Certificate

to other 'chatoyant gemstones, cat's eye chrysoberyl has the greatest hardness.

The world's largest cut cat's eye chrysoberyl is the so-called 'Eye of the Lion'. Weighing over 700 carats, the rough crystal was discovered in the late 1800's in the gem gravels of the Pelmadulla rice paddy fields (Sri Lanka) and was owned by the Grand Lady Iddamalgoda Kumarihamy. As the Grand Lady did not have any sons (she had four daughters) she legally adopted her grandson who decided to cut the precious gem into the beautiful 465-carat 'Eye of the Lion' so named to honour the symbolic lion that graces the Sri Lankan flag.

Although Paul E. Desautels, curator of the division of Mineralogy at the Smithsonian Institute in Washington, expressed his interest in acquiring the 'Eye of the Lion' in 1978, nothing was heard of it for nearly three decades until it resurfaced at the AGTA New York Laboratory in September 2006 in the hands of gemstone dealer Jeffery Bergman of Primagem, Bangkok, Thailand.

References: Minerals.net, In Color, World Gem Foundation, Handbook of Gemmology & GemSelect.com



Cat's Eye Tourmaline Photo: Tino Hammid



Tiger Eye & Cat's Eye Quartz Photo: Tino Hammid



God Save.....Us



On June 23rd, Britain held a public referendum of seismic proportions; a referendum that will ultimately affect every person living and working in Britain, and every British national living and working in Europe. The simple question, whether to stay within the EU or leave.

Rolling Back Time

The genesis of this referendum dates back to 1975 when Britain, under the stewardship of Harold Wilson and the Labour Party, held the first EU referendum. At that time with the support of Margaret Thatcher and the Conservatives, there was an overwhelming majority (over 67%) to stay within the European Economic Community (or Common Market), despite several Labour cabinet ministers voting in favour of a British withdrawal.

However during the ensuing years, Britain and the rest of the European Union have remained uneasy bed partners with Britain frustrated by many of the decisions made in Brussels and the EU equally frustrated by Britain's unwillingness to accept them.

So why have another referendum?

While some will argue it was designed to force the EU to be more flexible and willing to negotiate with Britain, in reality it was simply to squash an internal revolt within the Conservative Party?

One of the most common complaints about politicians is that they are fickle, power hungry, and only interested in their own self-promotion and self-preservation, willing to jump onto any



bandwagon provided it will increase their chances of seizing or staying in power. The very nature of politics dictates that one party must always be diametrically opposed to the other and here is where the whole system is flawed. It is not about what is best for the country or its citizens; it is simply about what is best for the party.

What should have happened?

On the morning of June 24th, the nation awoke to the news that 51.89% or 17,410,742 had voted to leave while 48.11% or 16,141,241 2% had voted to stay. Rightly or wrongly 26.7% of the total population of Britain had chosen a different path for Britain to follow.

Since this was a non-binding referendum, the first order of business should have been a parliamentary vote. If the majority of the members of parliament agreed with the referendum mandate, David Cameron should have triggered Article 50 of the Lisbon Treaty to officially start the 'divorce' proceeding.

What really happened?

Rather than be consigned to the history books as the prime minister who lead Britain out of the EU and in the process caused the probable break-up of the United Kingdom (Scotland and Northern Ireland voted overwhelmingly to stay in the EU), David Cameron announced his resignation. A simple case of self-preservation, passing the now poisoned chalice of leadership to his one-time friend, heir apparent and now political nemesis Boris Johnson.

Although Cameron was clearly the loser, Boris Johnson soon realised that he too had lost and had been out-manoeuvred by Cameron.



While Nigel Farage was 'gloating' in the European Parliament, chastising its members and alienating everyone he could, Boris Johnson was nowhere to be found, faced with the new realization that even though he had campaigned for Britain to leave the EU, he would now potentially be the prime minister that pulled Britain out of Europe and broke up the United Kingdom.

Broken Promises

While we have all become accustomed to politicians routinely breaking campaign promises, the sense of betrayal we feel when this happens still leaves a bitter taste in our mouths. Jean Chretien, the former liberal prime minister of Canada, campaigned in 1993 against the despised 'Goods and Services Tax' implemented by Brian Mulroney and the Conservatives in 1991 promising Canadians that he would eliminate the tax if he were elected. Voters believed him and delivered a stunning majority and yet the moment he took office he backtracked on his main campaign promise explaining that to eliminate the tax would create too many financial hardships. The same happened with the 'Leave' campaign. You can promise the moon if you do not think you will win but what happens if you do?

Within 24 hours of the referendum, prominent Brexiters started backtracking on the promises they had made regarding National Health Service funding and the curbing of immigration. Nigel Farage, interviewed on ITV's Good Morning Britain, disowned the pledge to spend £350 million of European Union cash on the National Health Service (NHS) after Brexit stating 'No I can't [guarantee it], and I would never have made that claim. That was one of the mistakes that I think the Leave campaign made'. When it was pointed out to him that 'Vote Leave' had emblazoned the £350 million claim onto the side of a tour bus and drove it around the country, Mr Farage said: "It wasn't one of my adverts – I can assure you! I think they made a mistake in doing that.' On limiting immigration, the 'Leave' campaign also acknowledged that it would be difficult to achieve this if they still wanted access to a single market largely because of the EU's insistence that the 'free movement' of EU citizens was non-negotiable.

Even more disconcerting was the realization that none of the major players (the Conservative Party, the Labour Party, the Social Democrats or the 'Leave' campaign) had an exit strategy.

The Plot Thickens

In a true display of Machiavellianism, Michael Gove promptly withdrew his support for Boris Johnson and declared his own candidacy for leader of the Conservative Party along with current Home Secretary Theresa May. The 'accidental' sending of an email from Sarah Vine (wife of Michael Gove) to a member of the public outlining her concerns about Boris Johnson's popularity with the Tory membership and with media bosses Rupert Murdoch and Paul Dacre leaves one questioning just how 'accidental' it really was.

Rachel Johnson, sister of Boris Johnson wrote 'Michael Gove knifed Boris Johnson in the back and in the front, pushed him under a bus, ran over him several times (thank you Piers Morgan for this image) and then declared he was running for the leadership himself.'

The insistence by both leadership hopefuls that the results of the referendum would be upheld (without a parliamentary vote) and that any triggering of Article 50 would not happen until next year also raised eyebrows and blood pressures the length and breadth of Britain.

On the Other Side of the Floor

Meanwhile, while certain members of the Conservative Party were scheming and plotting against each other to seize control of the party, the Labour Party was imploding with twenty members resigning in protest of Jeremy Corbyn, a leader they had elected only one year earlier. This was followed by a secret non-confidence with 172 members voting against Jeremy Corbyn while 40 supported him as leader. Unlike Cameron however, Corbyn dug his heels in and refused to step down prompting Cameron to say 'It might be in my party's interest for him to sit there, it's not in the national interest and I would say, for heaven's sake man, go'. It would seem Jeremy Corbyn is made of sterner stuff.

While Corbyn was less than enthusiastic about keeping Britain in the EU, he did at least back Cameron, just as Margaret Thatcher had done with Harold Wilson, during the 1975 campaign. Again one questions why he did not push for a parliamentary vote. With roughly 17 million Britons wanting to leave, 16 million wanting to stay, the dire economic consequences the referendum has caused and the desire of many disillusioned 'leave' voters to change their votes, squashing the vote would not necessarily have been deemed 'political suicide'.

The European Union

Across the English Channel, and behind closed doors in Brussels, the EU leaders were quietly smiling. A once powerful nation and perennial thorn in their side reduced to nothing more than a comical sideshow more reminiscent of 'Little Britain' than of 'Great Britain'. As a consequence of the dire economic fallout, Britain has not only lost any negotiating power they 'thought' they had but also single-handedly demonstrated to other disaffected European states the huge price one must pay to leave the EU. While many Brexiters had scoffed at the economic consequences voiced by experts before the vote, accusing the 'remain' campaign of scaremongering, numbers simply do not lie and in the cold light of the day, the numbers look positively scary. In the days following the referendum, a staggering three trillion dollars was wiped off the value of global shares, sending the pound to its lowest point in more than three decades against the dollar.

While Britain represents the fifth largest economy in the world, it is evident from what has happened that Britain needs Europe far more than Europe needs Britain. While of course the official EU party line is that a 'swift' divorce will create market stability, in reality, they have been waiting for this opportunity for some time now. Without bloodying their own hands, David Cameron, in his quest to squash an internal revolt and consolidate his own position, single-handedly presented the EU with 'Britain's Head' on a silver platter and the EU could not be happier.

So where does this all lead?

Well the Conservatives have said that no action will be taken until a new leader is in place in September. The Labour Party is currently trying to force Corbyn out and replace him with somebody they believe could win the next election and Nigel Farage resigned unexpectedly on July 4th as leader of the UKIP Party (United Kingdom Independence Party). While publically Farage states that he wants his life back, one suspects that by admitting the promises made by the 'Leave' campaign prior to the election were a 'mistake', he now became a political liability to the party and decided it was best to jump off the political landscape rather than be pushed.

The extraordinary events playing out in both the Conservative and Labour parties are now clearly motivated by political power and trying to see where the dust settles before either party decides to throw all their cards on the table. If the new leader of the Conservatives is pro-leave, the Labour party will need a credible pro-stay candidate. If on the other hand, the Conservatives decide to elect a new leader who wants to work with Europe, the Labour Party will be forced to find a new leader who will appeal to those voters who want to leave. Ultimately it is a numbers game.

So what happens now?

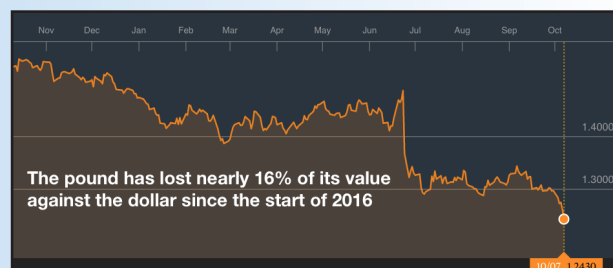
Typically when a currency loses value it makes imports more expensive and exports more attractive. This is fine if the products you are exporting use raw materials that are home produced. In the case of the British jewellery and gem industry, the cost of the raw materials will certainly increase since unlike Russia, Botswana, Canada, Angola, South Africa, Namibia, Australia (diamonds) or Myanmar, Sri Lanka, Thailand, Colombia and Madagascar (primary coloured gemstones), Britain is not a gem-producing country nor is it blessed with deposits of precious metals. All the raw materials therefore will need to be imported with a weaker pound and this will negate any potential savings to overseas buyers.

There is also the possibility of a 'nationalistic' backlash with some European firms simply refusing to deal with British firms on principle. Of course, businesses are just as fickle as politicians and one would suspect that if it makes economic sense to deal with British firms, European firms will continue to trade. However if the free movement of goods is stopped and the pound continues to underperform, buyers will obviously need to look elsewhere.

One potential silver lining is that this unfortunate and painful sequence of events will mobilize the British jewellery and gem industry and force it to re-invent itself by developing new overseas markets and products that incorporate lesser-known gemstones. While this will require re-educating their clients, with the prices for fine quality rubies, blue sapphires and emeralds skyrocketing, perhaps it is time for red and blue spinel, tanzanite, rhodolite, spessartite, and tsavorite garnets to finally take centre stage.

Fast Forward to October 2016

Well an awful lot has changed since the days following the referendum. Theresa May is now Prime Minister, Boris Johnson is the new Foreign Minister, Owen Wilson tried and failed to unseat Jeremy Corbyn, Diane James took over the UKIP leadership from Nigel Farage and promptly resigned eighteen days later, UKIP Steven Woolfe got into a physical altercation with Mike Hookem that resulted in Mr Woolfe being hospitalized and then later resigning from the party, British fruit and vegetable producers have claimed that without immigrant



The British Pound Against the U.S Dollar

labour, they will go out of business, the British pound has sank to its lowest level since 1985 causing the price of petrol and imported items to rise substantially and Theresa May, who is now looking and acting more and more like Margaret Thatcher, has indicated that Article 50 will not be triggered until the end of March 2017 prolonging the uncertainty.

Fast Forward to November 2016

While the legal challenge mounted by financial entrepreneur Gina Miller (pictured below) and the other claimants was successful, Theresa May has indicated that she is determined to push through with Brexit and respect the wishes of those who voted to leave. Jeremy Corbyn has now stated that Labour will block Article 50 if the government cannot guarantee access to the single market, a commitment to EU workplace rights, guarantees on safeguarding consumers and the environment and a pledge to commit funds for any EU capital investment lost by Brexit.

This now goes completely against the theory floated only last week that while a majority of the MP's were against leaving the EU, many would still vote for Brexit claiming that they are simply upholding democracy. Given the internal struggles that have plagued the Labour Party over the summer, one wonders if Labour MPs would dare to vote against the party's wishes. Mr Corbyn has already demonstrated that he will not tolerate insubordination and many may feel reluctant to open up wounds that have barely healed.

Given the financial turmoil that has ensued, one could certainly see grounds for at the very least a re-vote. Given the 'reality' of the decision to leave, one wonders if the 'Leave' campaign would still win. On the other hand, what does the government have to lose? If those who voted to leave still feel strongly that Britain should abandon the EU, then the 'leavers' would still prevail. At the same token if the 'Stay' campaign wins then is this not also democracy? Maybe we should have a 'Best out of Three'?

The future?

It is hard to say where all this will lead. While it is fine to support leaving the EU, the meltdown of the British pound will have a profound effect on people's lives and this will undoubtedly affect the 'working class', who were so vocal about leaving, the most.

The general perception that nobody really thought this through is becoming more and more evident as time passes. The devaluation of the British pound speaks volumes and while many will insist that Britain should be the captain of its own ship, the markets clearly do not agree.

Sadly for Britain they are heading into extremely turbulent waters, let's just hope they packed enough life jackets.



Gina Miller

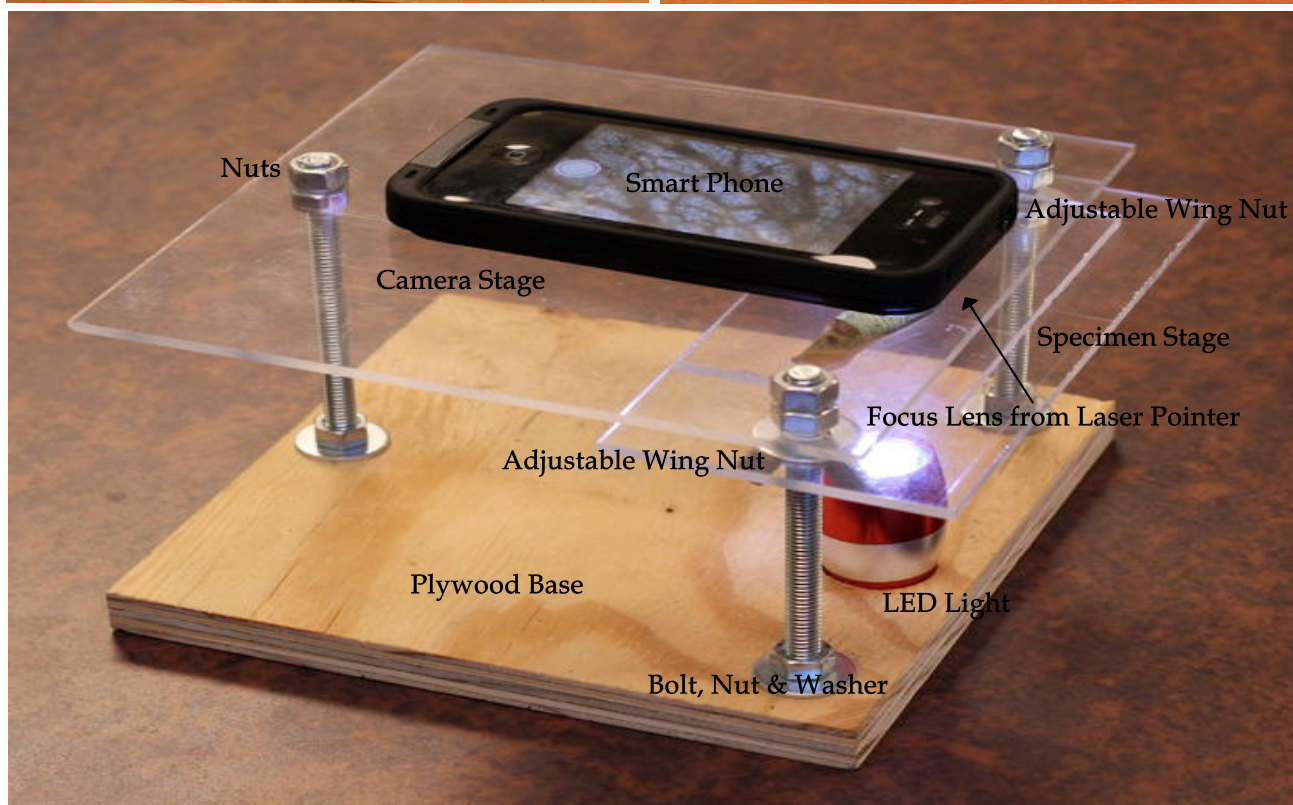
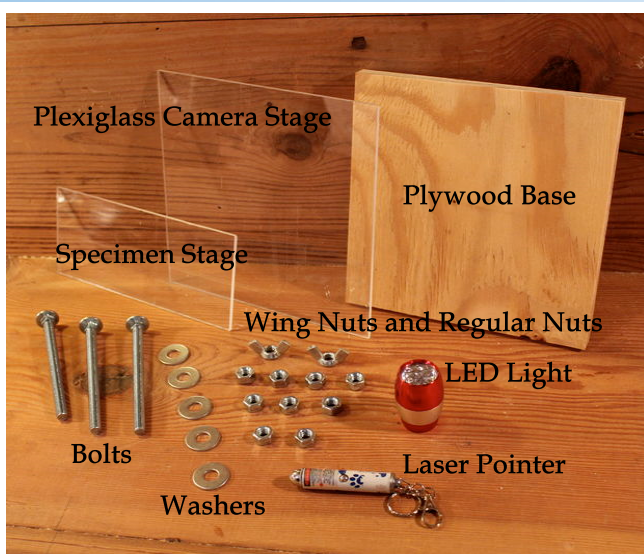
(AP Photo/Tim Ireland)

Smart Thinking

Smart
is good.

Innovation, modernization, alteration and modification. Leading edge technology that pushes the limits. Great ideas from even greater minds.

How to Build a Smart Phone Microscope



An ingenious idea illustrating how a smart phone can be used to create a portable microscope capable of magnification in excess of 150X for less than \$ 10.00.

Requiring less than half an hour to construct, this not only makes it possible to build an inexpensive microscope (provided you have a smart phone) but also gives the user the capability of photographing or capturing on video inclusions and other external features.

Materials Needed:

Three x 4 1/2" x 5/16" carriage bolts
Nine x 5/16" nuts
Two x 5/16" wing nuts
Five x 5/16" washers
3/4" x 7" x 7" plywood for the base
1/8" x 7" x 7" plexi-glass for the camera stage
1/8" x 3" x 7" plexi-glass for the specimen stage
Laser pointer focus lens (use two for increased magnification)
LED light (necessary only for viewing backlit specimens)

Tools Required:

Drill
Assorted Bits
Black Marker
Ruler

Procedure:

1. Unscrew the housing and remove the batteries from the laser pointer.
2. Using the back of a pencil, push the inner assembly out from the front of the housing. The focus lens is located behind the nose cone.

3. Unscrew the plastic cap and free the lens.
4. Make two marks with the black marker on the plywood base 3/4" from the top and side edges with a third centred 3/4" from the bottom edge.
5. Lay the plexi-glass camera stage on top of the plywood making sure that you line up all the edges.
6. Lay the specimen stage on top of the plywood ensuring that the top edge extends 3/4" over the top of the plywood board.
7. When all three pieces are lined up, drill the three holes that correspond to the three black marks made previously in Step 4.
8. Turn over the plywood base and countersink the three holes. This will ensure that when the support bolts are inserted, the base will lie flat.
9. Insert the three bolts from the backside, turn the base over and add three washers and secure with three regular nuts.
10. Drill a hole, the same diameter as the focus lens, in the centre of the plexiglass camera stage that is in line with the two top holes.
11. Using the plexi-glass camera stage as a guide, countersink another hole in the centre of the plywood base so that it is in line with the hole created in Step 10. This will hold the LED light.
12. Insert the focus lens in the camera stage.
13. Attach two wing nuts and washers to the front bolts and insert the specimen stage.
14. Attach three more nuts to the bolts, insert the camera stage and secure with the remaining three bolts using a leveler to ensure it is level.
15. Insert the LED light into the countersunk hole in the base.

VIDEO LINK: <http://www.instructables.com/id/10-Smartphone-to-digital-microscope-conversion/>

CREDIT: Yoshinok @ www.instructables.com



Fair Play

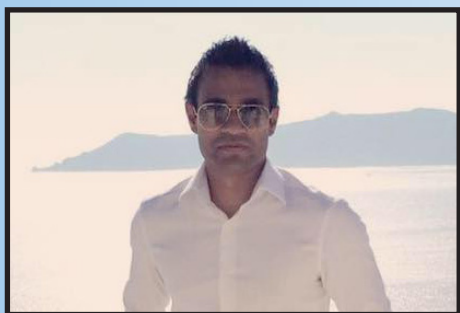
Ethical Business Practices

In this issue we look at Nineteen48, its two founders, Gary Seneviratne and Stuart Pool and why they are making a difference in the gem and jewellery industry.

More than just a Gemstone

The idea for Nineteen48 (named after Sri Lanka's year of independence) began with one of the co-founders, Gary Seneviratne, looking for a way to support charitable work in the country of his ancestry, Sri Lanka. Already a successful businessman in his own right, Gary wanted to continue a long family tradition of donating to good causes.

To help with this ambitious project, Gary recruited another successful entrepreneur, Stuart Pool, who shared his vision and brought a wealth of business development and management experience into the company. Stuart has a long track record of founding and growing successful commercial operations.



Gary Seneviratne

With over 10 years' experience as an entrepreneur, Gary's strengths are his vision, self-belief, determination and the ability to deliver results under pressure.

As well as running Nineteen48, Gary is the Business Development Director of Adido, a company founded with three friends from university that now has a turnover of over £2m and employs 33 full-time staff. Adido has become a top 50 agency in the UK (according to the industry-recognised NMA rankings) and has won national awards for their work. Adido's clients include Orange, EasyJet, Iceland, Haier, Bowlplex and the NHS.

Gary was one of the youngest ever committee members of the Institute of Directors, is a former President of the Dorset Junior Chamber (DJC) and a co-ordinator of the Business-X-Change. While President of the DJC, Gary was instrumental in significantly increasing the membership of the organisation.

Gary often gives talks at local universities to inspire students to follow an entrepreneurial path and shares with them his first-hand experience of running his own business.



Stuart Pool

Stuart has almost 20 years' commercial experience at senior management and director level. During his nine years at Redweb (an award-winning digital agency), Stuart was instrumental in developing the business, defining the strategy for the agency and nurturing a fantastic team with whom he grew the business year-on-year, not just in the financial sense (to a turnover of over £5m), but also increasing the employee headcount from 20 to over 100. Redweb's clients included Sky, Transport for London, HM Treasury, CenterParcs, Scottish Parliament, Aviva, e-on, Unite the Union and the Home Office.

Prior to that, Stuart had successfully run his own web agency (KAN) for almost 5 years. KAN was a start-up digital agency providing bespoke website design & build, application development and hosting services to a wide range of clients. From very modest beginnings and with limited resources, Stuart grew the business into a respected regional agency with over 50 clients, including the Cancer Research Campaign, BT, Cambridge Building Society, GE Smallworld, KBC Financial Products and the Internet Watch Foundation.

ETHICS

Nineteen48 is fully committed to following ethical practices, both in terms of manufacture and production, as well as sales and marketing. This includes fair treatment of their employees and that they operate in an environmentally friendly manner.

They aim to ensure that all of their products and services are sourced, processed and delivered according to strict ethical guidelines.



Stuart Pool in Sri Lanka

Before they start a trading relationship with another business, they look closely at the way they operate. This includes, for example, visiting their premises and speaking with their staff. They also discuss with their partners the best way to achieve full traceability of their products and any improvements that may be required to bring them in line with ethical trading practices.

Nineteen48 aim is to provide a completely transparent and traceable route to market for all of their gemstones, so that their clients have guaranteed peace of mind.

CORPORATE VALUES

Nineteen48's ethos is encapsulated in the following three values:

- Charitable
- Commercial
- Ethical

CHARITABLE

Nineteen48 aim is to contribute a minimum of 25% of the company's profits directly to charitable projects in Sri Lanka, specifically those projects that are aimed at giving educational opportunities to underprivileged children or young people.

At the same time, their ultimate goal is to establish a separate foundation, which will provide investment and donations to charitable projects and social enterprises over the long term.

Gary and Stuart regularly review the proportion of the company's profits that they can contribute to either the charitable projects or the foundation fund with the aim to maximise contributions whilst maintaining a sufficient cash flow for the business itself.

COMMERCIAL

To generate the profits from which they make charitable donations, Nineteen48 operates as a commercial entity, with a clear focus on trading in gemstones sourced primarily from Sri Lanka.

By trading with Sri Lanka in this way, they are also helping the local economy and specific communities within the country.

They understand that there are inevitable operating costs, which arise from running any business, but are committed to keeping those costs to a minimum. They also appreciate that it is necessary to re-invest some profits into the commercial side of Nineteen48 in order to grow the business, but that this reinvestment is balanced with their ability to make charitable donations on a regular basis.

ETHICAL

Nineteen48 is fully committed to doing business in an ethical and responsible way.

As well as producing from their own mines, they have a small and select group of Sri Lankan partners from whom they sometimes purchase gemstones. These partners follow best practice when mining and processing their gem material.

CHARITABLE CAUSES

An essential part of realising their vision is to have well-defined charitable projects to support. They are currently working with two good causes that operate in Sri Lanka, Emerge Global (Emerge Lanka Foundation) and Kandy Kids.

Whilst these projects are currently the main beneficiaries of Nineteen48's charitable donations, they are open to other worthy causes and continue to investigate other projects that they can support in the future.



Emerge Lanka team: Bryanne Gilkinson (Country Director), Alia Whitney-Johnson (Founder and Executive Director of Emerge Global), Nirukshi de Lanerolle (Program Coordinator) and Iroshini Kalpage (Program Development Officer)

Photo: Ian Caddy

Nineteen48's long-term vision is to form a foundation, which can provide funding to numerous charitable projects and social enterprises into the future.

Emerge Global is a Boston-based, non-profit organisation (EIN: 26-3230131) that aims to empower young women in Sri Lanka who have survived abuse and sexual violence, or are at high-risk to such abuse, to celebrate their personal sense of beauty, develop their self-sufficiency and become leaders in their own communities.

In Sri Lanka, girls who have survived sexual abuse and have the courage to take their perpetrator to court are placed in protective shelters during their court cases. While living in these shelters, they are isolated from their community and do not have access to formal schooling; Consequently, without programs like those that Emerge offers, these young women lack the education, skills, and capital to be self-sufficient when they transition back into communities. Without a support network or skills, and facing incredible societal stigma, it is easy for these young women to be exploited.

Emerge Global works with its Sri Lanka-based sister entity, Emerge Lanka Foundation (Company Number: GA2247), to implement the Emerge Beads-to-Business, Life Skills and Mentorship programs. The programs equip Sri Lankan teenage girls with skills and resources for their futures, using

comprehensive curricula that emphasise leadership, life skills, and business knowledge, whilst simultaneously generating savings through jewellery design. Emerge currently works in three homes with a total of 70 teenage girls at a time.

Nineteen48 is assisting Emerge to find new sales channels for their jewellery, particularly in the UK. This will raise awareness and promote the good work of the charity, whilst simultaneously generating more money for the young girls they are helping.

You can contact them at: www.emerageglobal.org

Kandy Kids (Charity Number: XT37134) is run by Steve O'Driscoll and Edith Bluker, who are based in the UK. The charity has been operating since 2007 and is focused on three key areas – food, fun and education.

It supports several orphanages in the Kandy area of Sri Lanka with food and equipment (both general and educational), as well as providing support in the form of scholarships to individual children from underprivileged families from the Kandy area.

You can reach them at: <http://www.facebook.com/kandykidscharity>

As the World Turns

What's Happening Around the World

News and updates from the World Gem Foundation Academies



Nineteen48 Workshop

The British Gem Academy is pleased to announce a series of four one-day seminars that will be offered in 2017 in conjunction with Nineteen48. The one-day sessions will be taught by Stuart Pool and will focus on Rubies, Sapphires and Emeralds, Diamond and Coloured Gemstone Grading, Gemstone Enhancements and Treatments and Birthstones of the Month.

For more information on dates and availability, please contact Stuart at stuart@nineteen48.com

The Scandinavian Gem Academy in conjunction with the Swedish Gemmological Association (SGRF) will be hosting the 2nd Annual Scandinavian Gem Symposium in Kisa, Sweden on June 17th & 18th, 2017. Speakers include Elise Skälwold, Richard Hughes, Alan Hodgkinson, Geoffrey Dominy, Conny Forsberg and Jan Asplund.

For more information, please go to sgs.gemology.se

Rahul Desai & SRDC WorldGem (India) report:

India is one of the world's largest diamond and gem polishing and jewellery manufacturing centres with over 80 percent of the world's rough diamonds being processed in the country. Also,

its gems and jewellery sector contributes to around 6 to 7 per cent of the country's GDP. India exports 95 per cent of the world's diamonds, according to statistics from the Gems & Jewellery Export promotion Council (GJEPC).

Diamond is a commodity that is least traded because of the difficulty in standardizing it and the perceived lack of transparency in its pricing. Some of the biggest commodity exchanges in US, UK and Asia steer well clear of trading diamonds, because apart from jewellery usage, it has very little industrial value. With the recent development of introducing diamonds among the list of 91 commodities that can be traded on Indian exchanges, India will be among a handful of nations that are trying to trade diamonds.

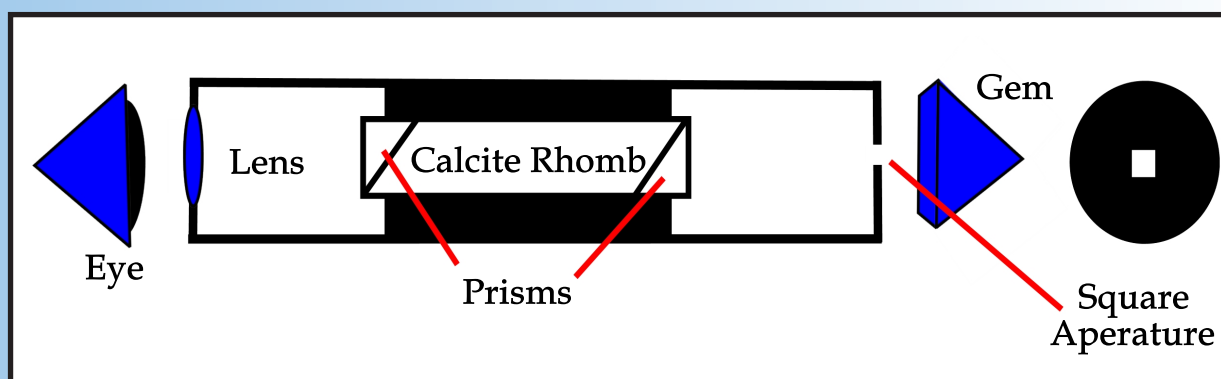
Mumbai Market at Diwali Vacation...

Market slow with dealers already in festive mode after auspicious Dussehra holiday on Tuesday (Oct. 11). Very few foreign buyers in Mumbai during Jewish holiday period. Polished inventory rising ahead of Diwali break (Nov. 1). Selective good demand with dealers shifting to lower price points. Steady U.S. demand for 0.20 to 0.70 carat., H-K, SI-I2 diamonds. 1 carat. and larger slower. Melee improving, stars remain weak.



In this issue we look at the dichroscope. It's capabilities, it's limitations and why you should always have one at your disposal.

The Dichroscope

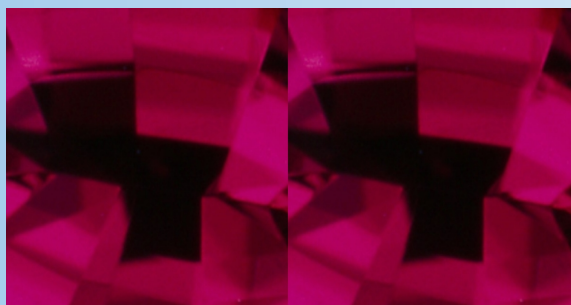


It's small, highly portable, simplistic in design, ridiculously inexpensive and highly effective. The dichroscope is the ultimate palm pilot for seasoned and budding gemmologists. Finely tuned to separate singly refractive coloured gemstones from doubly refractive coloured gemstones, this simple device can separate red spinels and garnets from rubies, blue spinels (natural or lab-created) from blue sapphires, green glass, tsavorite and demantoid garnets from emeralds and green tourmalines, blue topaz from cubic zirconia and lab-created blue spinel plus a host of other coloured gemstones that are often confused with each other but have different optical natures. How does it do this? Well that is a little more complicated.

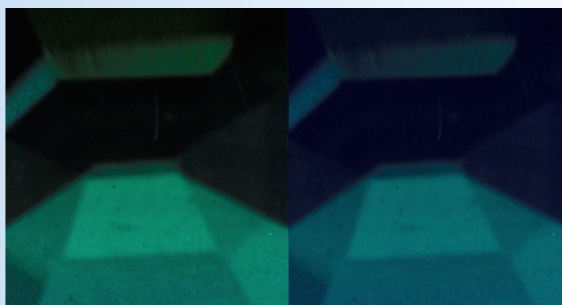
When light passes through a gemstone, some of the wavelengths are absorbed while others are freely transmitted

to the eye. The combination of these freely transmitted wavelengths gives us the sensation of colour. When light passes through a doubly refractive gemstone, the incident light is split into two rays, which are polarized at right angles to each other, and travel at differing velocities through the gemstone. How much the rays deviate is dependent on the change in their velocity as they slow down upon entering the gemstone. The more a ray slows down the greater its refraction or deviation from its original path.

This deviation causes the individual rays to absorb wavelengths differently, and while, in most cases, these subtle differences in the colour of the re-emerging light may be difficult for the human eye to detect, in others, such as in andalusite the difference is so noticeable that it has become a trademark of the gemstone.



Simulation of a Singly Refractive Gemstone



Simulation of a Doubly Refractive Gemstone

The term used to describe the differing shades or colours from the emerging rays is called **differential selective absorption** or **DSA**. Most of us however are probably more familiar with the term **pleochroism**, an all encompassing term for dichroism (two colours) and trichroism (three colours).

But the dichroscope is not only useful in separating coloured singly refractive gemstones from coloured doubly refractive gemstones, it can also help us determine with practice, the optical character of the gemstone (uniaxial or biaxial), and is invaluable when colour grading coloured gemstones or when trying to locate the optic axis (direction of single refraction) in a coloured gemstone.

Of course it does have one limiting factor; it will only work with coloured gemstones so if you were thinking that this compact gemmological dynamo was your answer to separating diamonds from a host of colourless wannabees, you will be disappointed.

The dichroscope consists of a suitably cut rhomb of Iceland spar (calcite), two prisms to ensure zero deviation of the light rays, and a lens system inside a short tube that has a square aperture at the opposite end. The calcite rhomb, due to its strong birefringence, helps to separate the polarized rays so that they may be observed side by side.

Mastering the dichroscope is relatively simple and requires placing the gemstone between the dichroscope and the light source so that the light transmitted through the gemstone is captured through the dichroscope. The light emerging from the gemstone and entering the dichroscope will then be split into two polarized rays by the calcite rhomb. Although there is only one square aperture, the high double refraction of the rhomb gives the appearance of two squares side by side. As you slowly rotate the stone, differing shades or colours will be seen when you are viewing a doubly refractive coloured gemstone.

It is important to remember that pleochroism will only be seen in doubly refractive gemstones and only two colours or differing shades of colour will be seen at any one time. For this reason it is important to note the various colours or shades because

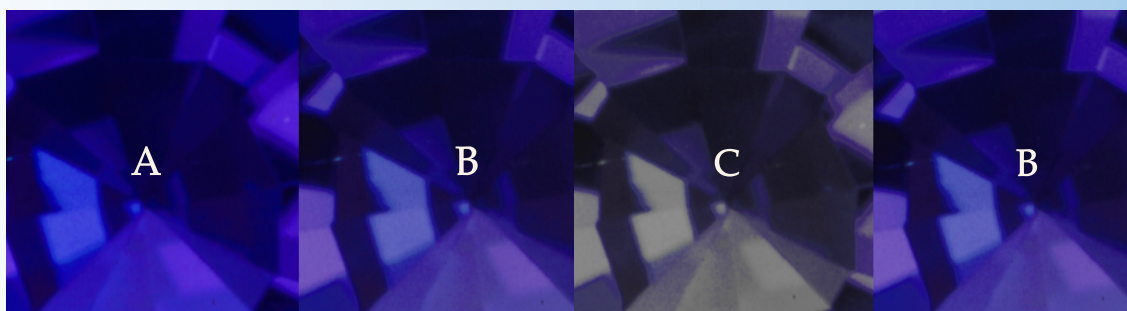
with practice, this will allow you to not only separate singly and doubly refractive gemstones but also uniaxial and biaxial coloured gemstones since the latter will produce three colours or shades (A, B & C) as the stone is rotated.

Pleochroism will not be seen in gemstones that display anomalous birefringence (diamond and spinel most notably) since these are actually singly refractive and is dependent on the depth and intensity of the colour making it difficult to detect in pale coloured aquamarines and light blue topaz. To ensure accuracy, stones must be rotated and viewed from all angles otherwise you may find yourself wrongly diagnosing a doubly refractive gemstone, viewed down an optic axis, as singly refractive. Proof that a coloured gemstone is doubly refractive lies in the appearance of more than one colour or shade when viewed through a dichroscope, not the actual colours seen.

For those of us who find coloured gemstone grading challenging, especially when trying to describe the primary and secondary hues, the dichroscope is particularly helpful since it separates the colours for us, allowing even the slightly differences in hues to be detected. As we can see from the simulated image above, the colour of this tanzanite is made up not only of blue but also violet, a distinction not always possible when using the unaided eye. However in this case, we must ensure that we are only viewing the stone in a face-up (through the table) position since this is how the cutter has oriented the stone. If we base our opinion of the colour in any other direction, we are not only doing a great disservice to the cutter but also negatively impacting on the overall value of the stone.

Finally for gem cutters, locating the optic axis of a gemstone is of prime importance and while this can be done with a polariscope, the portability, simplicity of use and low cost of a dichroscope will likely ensure that it is the 'weapon of choice' for future generations of gem cutters.

Depending on the maker, dichscopes can be purchased for as little as \$ 30.00 USD, which to quote the immortal words of Pete Townsend of The Who 'I'd call that a bargain, the best I ever had'.



Simulation of a Biaxial Gemstone

Meet the Team

Meet our team of dedicated professionals who all share a common philosophy, a common goal and a passion and commitment to gemmology and education.



Geoffrey M. Dominy
WGF Founder

Geoffrey Dominy is an author, independent gemmologist and former jewellery appraiser who appeared on the Canadian Antiques Roadshow for four seasons. He received his F.G.A through the Gemmological Association of Great Britain (Gem-A) in 1987 passing the diploma examinations with distinction.

Throughout the 1990's, Geoff developed and taught the 'Gemmology' program at Red River Community College and The University of Manitoba in Winnipeg, Canada, worked for the Canadian Institute of Gemmology, was President and Founder of the Jewellery Appraisers Association of Canada and was a contributing author for the 5th & 6th Editions of Robert Webster's 'Gems' which even today is considered one of the most authoritative textbooks in Gemmology.

In 2013, he released the first digital gemmological textbook entitled 'The Handbook of Gemmology' in collaboration with world famous gem photographer Tino Hammid. Now in its third edition, the handbook has been sold or downloaded in forty-seven countries, is used by fourteen schools, colleges, universities and gemmological organizations as their recommended textbook and now features photographic contributions by another award winning photographer Jeff Scovil.

Geoff currently lives in Palma de Mallorca, Spain and in addition to lecturing and promoting his book, is the founder of the World Gem Foundation and Mi Isla También.



Leone Langeslag
Dutch Gem Academy

Leone Langeslag is a graduate of the Federation for European Education in Gemmology (FEEG) (2006), an independent gemmological consultant and is actively involved with the Gemma Association in Holland offering lectures and workshops. Her desire to provide accessible gemmological training in the Netherlands has led to the formation of the Dutch Gem Academy.

Leone is a frequent visitor to international symposiums, exhibitions and trade shows where she continues her own gemmological education and passion for collecting gemstones and minerals.



James Riley
British Gem Academy

James Riley is a sixth-generation jeweller who studied modern history at university, was the former manager of Backes and Strauss in the U.K and the former Chief Executive Officer of Gem-A.

During his time at Gem-A, James along with other Board members, was instrumental in revitalizing the association, securing Ely Place as their London headquarters and implementing several key initiatives.

He is a well-respected figure in the gemmological community, is passionate about education, gems and jewellery and brings a wealth of experience to the British Gem Academy and the World Gem Foundation.



Conny Forsberg
Scandinavian Gem Academy

Conny Forsberg has over thirty years experience as a gemmologist and precision gem cutter. He received his FGA in 1986 through Gem-A, his diamond grading diploma through Hoge Raad voor Diamant (HRD) in 1994 and is an Accredited Senior Gemologist with the Accredited Gemologist Association (AGA).

He is currently the owner of the Swedish Gem AB, a modern and accomplished gem lab as well as a precision cutting facility. He has twice received 'Honourable' mention in the Gem-A photo competition for his photomicrography (2011 & 2013) and is a valued contributor to the Handbook of Gemmology, with a large collection of his photomicrographies planned for the upcoming 4th Edition. Conny is also an Accredited PRINCE2 Practitioner (Project Management), experienced in public procurement and contracting (EU law) and the initiator and organizer of the Scandinavian Gem Symposium. He is currently the auditor for the Swedish Gemmological Association.



Jan Asplund
Scandinavian Gem Academy

Jan Asplund is a gemmological consultant specializing primarily in the identification and valuation of diamonds, both cut and rough, as well as coloured gemstones and jewellery.

He received his FGA & DGA (Gem Diamond Diploma) through Gem-A in 2011, his BA

in History from the Mälardalens University in 2000 and studied geology and gemmology at Luleå Technical University (2005 – 2007), cultural and industrial history at the Uppsala University (1998 – 2000), and archival science at Karlstads University (1998 – 1999). Jan also took his Accredited Jewelry Professional – AJP (Gemmological Institute of America 2011), Introduction to Watches (International School of Gemology 2012), Jewellers Education Foundation – Graduate Sales Associate (American Gem Society 2011), Blacksmithing (Sätergläntan 2002) and Silversmithing (Tärna Folkhögskola 1996).

He is a board member of the Swedish Gemmological Association, fellow and diamond member of Gem-A and initiator and organizer of the Scandinavian Gem Symposium.



Leroy Bakelmun
Pacific Northwest Gem Academy

Leroy Bakelmun started his gemmological career after receiving his certificate in gem cutting and polishing at the Lapidary Training Centre Sri Lanka in 1995. In the same year he also received his certificate in Gem Identification, through the A.K. Institute of Gemmology in Sri Lanka.

In 2006 he received his 'Gemmologist' certificate through the Canadian Institute of Gemmology (C.I.G.)

Leroy has extensive experience buying and selling gemstones. From 1997 to 2014, he owned and operated GeoGem Jewellers in Langley, British Columbia, Canada and from 2012 to 2014, he also owned the 925 House of Silver in Fort Langley, British Columbia, Canada.

He currently lives in Grass Valley, California with his wife Sally and family.



Majala Mlagui
Kenyan Gem Academy

Ms Majala Mlagui is a mining entrepreneur and African gemstone lover.

Majala founded her social enterprise Thamani Gems, to empower such miners in East Africa by helping them create sustainable livelihoods through responsible mining, ethical sourcing and access to fair-trade markets.

Majala also provides professional-development resources to miners and helps them navigate complex regulatory and legal systems in their country. Her work raises the profile of local miners in Africa and improves their economic conditions.

Majala received her BEng in Software Engineering from University of Sheffield in England and is a certified PRINCE 2 Project Manager. She has taken the Exploring Gemstones Certificate from Holts Academy, London (UK) and is a Gemmological Institute of America (GIA) Accredited Jewellery Professional (AJP).

Majala is working towards the GIA Coloured Gemstones Programme certification.



Rahul Desai
SRDC WorldGem

Rahul Desai began his career taking forward his father's creation Shreeji Rajendra Diamond Classes (SRDC-INDIA), a pioneer in diamonds, gems and jewellery education throughout India that has graduated more than 50,000 jewellers, gemmologists, diamond traders and jewellery designers through their educational programs.

One of the first and foremost private institutions in gems and jewellery education, SRDC – INDIA received world recognition through its corporate education program in various countries including Turkey, Hong Kong, Bangkok, Myanmar (Burma), Dubai and Bostwana.



Renuka Punjani
SRDC WorldGem

Renuka Punjani has worked within the jewellery industry for nearly 25 years with a tremendous inclination towards designing and fine jewellery and has worked closely with some of the industry leaders, designing personal family fine jewellery.



Cristina Rzepka de Lombas
Spanish, South American,
Central American and Caribbean
Gem Academies

Cristina Rzepka de Lombas is a geologist, gemmologist, appraiser of gemstones and jewellery and an expert in diamond and coloured gemstone grading.

Currently Cristine serves on the Board of Directors of the Instituto Gemológico Español (IGE) in Madrid, Spain where she also teaches their 'Gems of Organic Origin' course.

She is also the Director of Education for the Spanish, South American, Central American and Caribbean Gem Academies.

World Gem Foundation Gem Academies

To contact the individual gem academies,
please click here



AUSTRALIAN OPAL CENTRE

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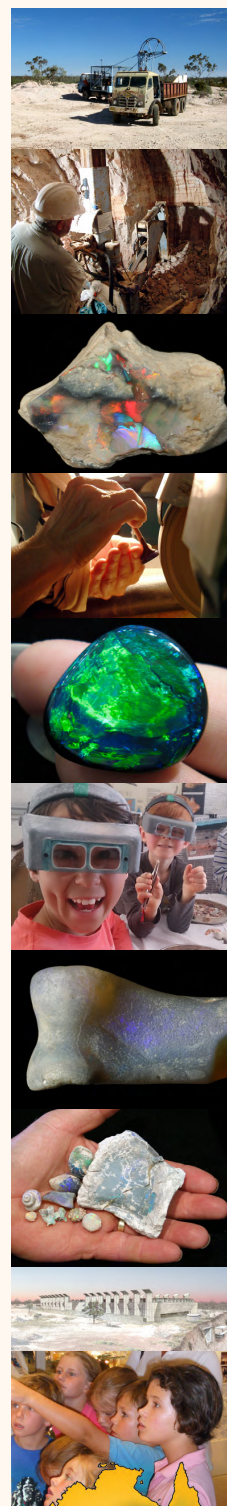
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From the obvious to the proverbial needle in a haystack, this is where the fun starts....

The Lost Art of Gem Identification



Ask any child to divide 456.34 by .37 without the aid of a calculator, and they will look at you nonplussed. Long division? What's that?

When was the last time any of us hand wrote a letter, put it in an envelope, addressed it, purchased a stamp and then put it in a mailbox?

Do children today even know what a fountain pen is, or what we mean by the terms cursive or longhand?



While cooking shows and celebrity chefs feature prominently on television, a vast majority of people are opting for 'convenience' over 'preparation', content to fill their stomachs with processed foods, packed full of preservatives, cooked in microwaves that make it possible to serve meals from 'the freezer to the dinning room table' in less than five minutes.

Microsoft Word has become the new standard in 'spelling' and 'grammar', correcting our mistakes while still contending that there is no 'u' in colour, no second 'm' in gemmology, only one 'l' and two 'e's in jewellery and no second 'i' in aluminium.

We don't go to libraries any longer, we simply go online, content to believe that everything that is posted is factual. 'Googling' is not only a national pastime; it is now defined as a 'transitive verb', a remarkable ascendancy for a word that prior to 1998 did not even exist.

Does anyone remember manual typewriters?

Today even conventional word processing programs are becoming obsolete, replaced by 'voice recognition' software that eliminates the need to type.

The automobile industry is keenly developing the car of the future, self-driven using 'autopilot' technology. Twenty years from now will we remember how to drive a stick shift? Twenty years from now will we remember how to even drive?



GPS (Global Positioning System) technology is clearly our preferred navigational tool when driving. When we take a wrong turn, it simply re-calculates our journey while at the same time desensitizing us to the world around us.

We are even struggling to communicate with each other, preferring instead to text message. We text on crowded buses, in restaurants, while we are driving the car, riding a bicycle, or crossing a busy street. Judging by the error filled messages I have received, it would appear we are also losing our ability to proof read.

Couples sit in bars and restaurants engrossed in what their friends have posted on Facebook, Twitter and other social media outlets rather than engage in a meaningful conversation with each other.

Is it possible that as a society, we are becoming more anti-social as a direct result of using social media?

Skills that our fathers and grandfathers took for granted are slowly being eroded by our over-reliance on technology.

In a nutshell, we are rapidly losing our ability to think, to use logic, to problem solve, and to do things for ourselves, all in the name of convenience.

So what does this have to do with gemmology and gem identification?

Well quite a lot actually because without these qualities, trying to correctly identify a gemstone is virtually impossible.

Gem identification is a forensic science that relies on three things: the collection of data, the analysis of the data and the correct conclusion being drawn from the data. It requires you to think, to be logical, rational, cognizant, determined and persistent. Ultimately your reputation and professional success will be determined by how proficient you are. Close doesn't count in gem identification. You are either right or you are wrong, there is no middle ground.

Collection of Data

It goes without saying that the collection of data is the most important step in the identification of any gemstone. If we collect the wrong data, it will be impossible to arrive at the correct conclusion.

The 'quality' of the data collected is also of vital importance. Collecting irrelevant or non-conclusive data may be fine for a hobbyist but not for a professional gemmologist. Today we must not only have a comprehensive understanding of the physical and optical properties of each gemstone but also a thorough understanding of the various gem testing instruments, the scientific principles they are based on, their capabilities and their limitations. This will ensure that we select the right tools for the right job.

While nobody is disputing the need for sophisticated instrumentation to detect lab-created, treated and enhanced gemstones, we must not forget that the majority of gemstones can be identified using standard gem testing equipment.

A blue topaz, for example, can be identified using a refractometer. This under-rated instrument will yield a wealth of information (provided the gemstone being tested has a polished surface and its refractive indices fall within the range of the refractometer) including the measurement of the refractive indices to two decimal points, confirmation as to whether it is singly or doubly refractive, the amount of birefringence and its optical character and sign (uniaxial, biaxial, positive or negative).



Assorted Blue Topaz Photo: Tino Hammid

If we look at the properties of blue topaz, we can see that it has an R.I. range of 1.610 to 1.620 and it is biaxial positive. While there are a number of gemstones that could be confused for blue topaz, the main ones include lab-created blue spinel, aquamarine, quartz, blue tourmaline and blue zircon.

Lab-created blue spinel has an R.I. of 1.727 and is singly refractive. Aquamarine and quartz have very low R.I.'s of 1.564 to 1.596 and 1.544 to 1.553 respectively and are both uniaxial. Blue tourmaline has a similar R.I. of 1.614 to 1.666, has marked birefringence and is also uniaxial, while blue zircon produces a negative reading on the refractometer (meaning it has an R.I. higher than 1.79) and has marked birefringence that can be seen clearly using a hand loupe or microscope.

The problem of course is time. In an age of instant gratification, we don't want to waste our time conducting exhaustive tests. We want a quick fix, somebody or something to do the work for us; a little 'black' box that will magically identify the stone for us in a blink of an eye?

This is why jewellers and gemmologists leapt at the chance to buy moissanite testers when they first appeared on the market. They were easily 'conned' into thinking that the separation of moissanite from diamond was difficult. In reality, the separation of lab-created moissanite from diamond is one of the easiest to conclude if you know what you are looking for. A simple examination of the stone between crossed polars or under magnification in the right direction will reveal



Presidium Moissanite Tester Photo: Geoff Dominy

moissanite's anisotropic (or doubly refractive) nature while diamond is isotropic (singly refractive). Yet instead of using tried and proven tests to establish the optical nature of the stone, most are happy to place their 'blind' trust in testers without fully comprehending what in fact the device is testing.

Analysis of the Data

Students often make the mistake of trying to fit square pegs into round holes. For some strange reason they seem to believe that the physical and optical properties of gemstones are inconstant and can be manipulated when needed. Nothing could be further from the truth.

Drawing the Right Conclusions

In gem identification 'almost' just doesn't cut it. If the data collected does not match exactly, it simply cannot be the right match. It's that simple. I hate to burst your bubble but that is how it works, how it has always worked and how it will work in the foreseeable future. This is why we must be extremely mindful of any 'anomalies' that exist in the data we collect and repeat any tests if necessary to avoid wasting valuable time. The trick of course lies in spotting these anomalies.

While we certainly don't want to pre-judge a gemstone, it does help to have a list of 'possibilities' and through a process of elimination, remove all probable contenders until only one is left. This list must include all known gemstones in a particular colour and transparency range (including all common and rare gemstones) otherwise we could find ourselves looking for a non-existent needle in an increasingly frustrating haystack.

Submissions

If you would like to submit an article to Gemmology Today, we would love to hear from you.

The deadline for the next issue is January 15th, 2017.

Guidelines:

- We do not accept highly scientific articles. These are better suited to either the Journal of Gemmology or Gems & Gemology
- All articles should be a minimum of one page
- All accompanying photographs must be high resolution and must be accompanied by written permission to use the images unless the author owns the rights
- We reserve the right to refuse articles

E-mail all submissions to information@worldgemfoundation.com.

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Idar-Oberstein with a touch of 'Splendeur Française' !



Ewen Taylor, Moira Verwijk, Archie Steele, Sarah Steele, Deborah Mazza, Rupert Huddy

Returning to Idar-Oberstein is always exciting, maybe it is the atmosphere of this tidy little German town, maybe it is the beautiful countryside, maybe it's the expectation of admiring beautiful gemstones, or maybe just because I lived there for a very long time.

This June I repeated the very successful trip previously organised for Gem-A on two occasions, with a small group, and we had an amazing experience! On this trip we also visited the St Marie aux Mines show in France, just a hop and a skip from Idar. We were lucky enough to be sponsored by The World Gem Foundation who kindly donated various e-courses and The Handbook of Gemmology.



Copper Mine in Kupferbergwerk

The first day, Sunday, was dedicated to the touristy part visiting old mines and the gemstone museum in Idar. The Edelsteinminen Steinkaulenberg is the only mine of its kind open to the public in Europe, and it is the site where agate and quartz mining started in the area in the 14th century. Idar-Oberstein is in a valley, formed by several villages such as Idar, Oberstein, Algenrodt and Tiefenstein comprising the main core of the town, along the river Nahe. It is on the Southern edge of the Hunsrück, which is South of the Eifel; the whole area was subject to volcanic activity during the Earth's formation and therefore a mineral rich area where quarries are still being used on a small scale to this day.

Now, only a small part of the original agate mine is open to the public, the visit is a very pleasant experience for everyone. The layman as well as the expert will understand how mining was carried out in the past, having the guide explain in detail what one is viewing and being shown some examples of rock crystal, agate and amethyst still embedded in the walls.

The hills surrounding the town are a miracle of geology; in spite of the many mines dug out for agates and copper creating a Swiss cheese effect, they don't form sinkholes or collapse. The next mine we visited was the Kupferbergwerk Fischbach, on the opposite side of the town. Copper was mined here for approximately 300 years until the last quarter of the 18th century; our knowledgeable guide explained the miner's life in those days, showed us the tools and mining methods used to extract the ore out of the rock, all this whilst inside the impressive mine. This is now a strikingly enormous man-made cave surrounded by various passageways, some open to the public and some not, with just a metal walkway at a staggering height joining some of the paths. It really is a beautiful site and worth a visit, I never tire of going back there.

Next we visited the Edelsteinmuseum Idar, which is full of gemstone specimens, synthetic examples, beautiful agate bowls from the area, lovely carvings by local engravers with names like Wild, Hahn, Dreher, all arranged over three floors

and a basement. Some attractions change monthly, some exhibits yearly, so it is always worth revisiting. In my opinion the best exhibit this year were two kaleidoscopes, made by Manfred Wild of Emil Becker, one with agate slices and the other with coloured stone slices, absolutely stunning! I was so engrossed I could have spent the whole day admiring them and I am sure I would never have seen a pattern repeating. Manfred is a very imaginative artist who creates gemstone pieces for wealthy clients, and has always inspired ideas whenever he sees a piece of rough.



Constantin Wild explaining his tools in the lapidary

The next two and a half days were a gem lover's delight, visiting the lapidary workshops on our program. We started out with the only diamond cutter in Idar-Oberstein, the company of Philipp Hahn Söhne. Who needs to go to Antwerp, Israel or New York if you can go to Idar-Oberstein? Herr Dieter Hahn himself did the honours, and after some history on the company and his family we went into the workshop. There we were shown the old and the new machines at work, one of them used by Herr Hahn Junior. He then showed us some incredible specimens, – yes! He has now four diamond spheres and could start playing marbles with them! -, and new cuts he deals with – alphabet letters in diamond - besides a computerised proportionscope which is far more precise than the human eye.

After this sparkly feast we had a more relaxing but energizing couple of hours at Constantin Wild's. There he fed us a delicious champagne brunch as we admired gemstones, we saw his lovely strong room full of gem delicacies, feasted on out of this world gem specimens in his show room; after this one understands why it's 'Gems Trust Wild'!

The first visit of the afternoon was to see opals at Emil Weis. After a very interesting time in the workshop led by Herr Weis, where we were shown first hand opal cutting and polishing, saw some gorgeous rough specimens and could have a try at fashioning ourselves, we saw the finished product in the showroom. There Frau Schütz and her daughter indulged our

thirst with coffee, chocolates and incredible fire opals, black opals, white opals, in different cuts and forms from all over the world.

After these three wonderful visits my fellow travellers felt sure we would never surpass these experiences, but there was more to come... I lived in this town for almost 30 years, and in that time never heard of Michael Peuster. I found him by chance on Facebook some months ago and decided to include a visit on this trip. This really paid off, I am so glad I did it because he is a hidden gem, the Fabergé of Idar-Oberstein! He managed to make time for our visit in his busy schedule, and impressed us with his creations and ideas, it is no surprise to me that he creates for one of the most iconic British Jewellers and has always shied away from the limelight.

We finished this day with a visit to the master himself: Tom Munsteiner welcomed us into his well-lit workshop and showroom with his wife Jutta and his son. He delighted us with his ideas and creative genius, all you need to know when you admire his pieces is that he 'works with nature, not against it'. Besides the gem-artworks he has on display, his wife exquisitely sets many in beautiful jewellery. Owning a Munsteiner, is a statement in itself.

Even though we were tired and exhausted, we were elated by our experiences, so started the evening with a wine tasting and ended it with the local delicacy, traditional Spiessbraten.



Dieter Hahn (owner of Philipp Hahn) demonstrating diamond cutting

The next morning we began by visiting Herbert Klein, another gifted gemstone carving workshop in the middle of Idar, on the side of the hill looking down on the town. Stefan Klein must undoubtedly get his inspiration from this lovely view, stimulating him and his colleagues to create beautiful small pieces of gemstone art that will later go into big name jewellery creations. He showed us his rough safe, where the most amazing pieces are kept waiting to be transformed on his wheel. He gave us each a chrysoberyl rough specimen;

mine is kept on my desk for inspiration. We finished off the morning with a visit to Friedrich August Becker, where after an incredible show and tell mineral and gemstone session with Herr Becker Senior, we roamed around the showrooms that resemble a museum, where one may pick up and examine the pieces or even buy them if one's finances allow. He has a prestigious collection of...everything one's gem-heart desires!

After a gem filled lunch, we started our afternoon with a quick visit to Schneider gemmological instruments, where between the immersion microscopes and the other gem testing equipment with Zeiss optics, we could admire – and in some cases purchase – the Rolls Royce of loupes, the Schneider loupe.



Various types of liddicoatite at the Edelsteinmuseum

We then hurried to Wild & Petsch and were shown by Herr Martin Alt what a modern lapidary looks like, in a building full of windows that let the natural light spill in. So different to Tavernier's times! We visited the showroom, and beautiful canary tourmalines competed for our attention, assaulting our senses, against Paraiba tourmalines, garnets, tanzanites and other beauties, all struggling for first place, a very difficult choice indeed. The day finished with a visit to Erwin Pauly and his wife, Erna, who gave us a lovely welcome. After an introduction to carving history and showing us his skill on his engraving machine, Mr Pauly entertained us, as in previous years it has become an institution, with his accordion whilst

we drank champagne. Our patient driver, Tony, was also graciously included. When one is having fun time seems to fly by, and that is what happened to us: suddenly it was Wednesday! We left for France after a very interesting and educational morning spent at the Deutsche Gemmologische Gesellschaft. Fabian Schmitz and Dr. Claudio Milisenda showed us how gemmology education and laboratory certifications are carried out in Germany, in one of the most prestigious laboratories of Europe.

So we spent the last two days of the trip at the gem and mineral show at St Marie Aux Mines in France, with hot weather and the sparkle of gemstones and minerals, and retired to a lovely quiet comfortable Hotel in Colmar, with good French food.

None of us had attended the show before, so we were excited about what we might see. This show definitely is the Tucson of France, or Europe; it is a phantasmagorical event where the gem-world, collectors, wannabes, lovers, hobbyists, aficionados and experts go to for a fun weekend amongst like-minded people, to trade information, gossip, news and specimens in glorious weather with French cuisine.

Those who haven't been need to go and see for themselves; those who have been know what I mean.

In the time I lived in Idar-Oberstein, I took the town and the gem world for granted. Only now, after years and distance, do I see it differently as an outsider, and understand the myth surrounding it for so many people in the trade. I appreciate the trust these companies have in me by opening the doors to their workshops, exclusively to the trades people I bring to admire their craftsmanship. I love bringing people to see these beautiful works of art, and have them forge new business contacts and find new friends.

These visits have proved so popular and fruitful for everyone involved. I hope to be able to inspire more people to visit this incredible place, as I am sure the magic of Idar-Oberstein will never die!



Idar Oberstein & Sainte Marie

June 17th to June 24th, 2017

If you would like to join Deborah in 2017, visit an iconic gemstone town and enjoy the gem and mineral show at Sainte-Marie, please contact her at deborah@laetherstone.com for more information



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Assorted Coral

Photo: Tino Hammid



CRISTINA RZEPKA DE LOMBAS is a geologist, gemmologist, appraiser of gemstones and jewellery, Director of Education for the Spanish, South American, Central American and Caribbean Gem Academies and serves on the Board of the Instituto Gemológico Español – IGE-Minas



Precious and Ornamental Coral in Jewelry and Decorative Objects

The importance of determining the type of coral to know if it is on the list of endangered species whose trade is regulated by CITES

Coral has traditionally been considered as a 'precious coral' when it possesses such gemmological characteristics that once cut and polished stands out for its beauty and attractiveness. This includes all corals belonging to the genus *Corallium*, particularly those occurring in reds and pinks. Today the term 'precious coral' extends to many other species used in jewelry, including those that mimic the most valuable species.

Certain authors (Grigg, 1984) refer to precious and semi-precious corals, with semi-precious applying to those that have higher levels of porosity and in order to obtain a good polish must undergo some form of treatment, such as resin filling. Some of the corals used in jewelry are included in the CITES international convention and may be protected by local laws, which may require import and export permits.

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. While many wildlife species in the trade are not endangered, the existence of this agreement ensures the sustainability of the trade and safeguards these resources for the future.

The text of the Convention was finally agreed at a meeting of representatives of 80 countries in Washington, D.C (U.S.A) on the 3rd of March 1973, and was implemented on the 1st of July 1975. The original Convention agreements were deposited with the Depositary Government translated into Chinese, English, French, Russian and Spanish, each version being equally authentic. Today 183 countries (Parties) have joined CITES voluntarily. Each country (State) has to adopt its own domestic legislation to ensure that CITES is implemented at the national level.

The species covered by CITES are listed in three Appendices, according to the degree of protection they require.

Appendix I

Includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.

Appendix II

Includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival. An export permit or re-export certificate issued by the Management Authority of the State of export or re-export is required. No import permit is needed unless required by national law.

Appendix III

Contains species that are protected in at least one country, and has asked other CITES Parties for assistance in controlling the trade. In the case of trade from a State that included the species in Appendix III, an export permit issued by the Management Authority of that State is required. In the case of export from any other State, a certificate of origin issued by its Management Authority is required. In the case of re-export, a re-export certificate issued by the State of re-export is required.

A specimen of a CITES-listed species may be imported into or exported (or re-exported) from a State party to the Convention only if the appropriate document has been obtained and presented for clearance at the port of entry or exit. There is some variation of the requirements from one country to another and it is always necessary to check on the national laws that may be stricter.

It is therefore necessary to be able to identify the main types of corals used in the trade.

Red and Pink Poral (Genera *Corallium* and *Paracorallium*)

All generally display fine parallel ridges spaced between 0.25 to 0.40mm apart and have a solid axial skeleton that is made primarily of calcium carbonate in the form of calcite.

Mediterranean Red Coral (*Corallium Rubrum*) ¹

A solid red colour, it is not regulated by CITES.

Pacific Red and Pink Coral (General *Corallium* and *Paracorallium*) ²

Occurs in several shades of red and pink with an interior core of white. Pink coral momo (*Corallium Elatius*) has been listed in CITES Appendix III since 2008.

Midway Coral (*Corallium Secundum*)

White, spotted pink or light pink. Midway coral has been listed in CITES Appendix III since 2008.

White Coral (*Corallium Konojoi*)

White, white with red or pink spotting, spotted pink or light pink. White coral has been listed in CITES Appendix III since 2008.

Red Coral (*Paracorallium Japonicum*)

Dark red with an interior core of white. Red coral (*Paracorallium Japonicum*) has been listed in CITES Appendix III since 2008.

Pink Coral (*Corallium Regale*)

Pink; may be streaked with white. Currently it is not regulated by CITES.

Midway Deep-Sea Coral (*Corallium* sp. nov.)

Bright pink with strong red markings. Currently it is not regulated by CITES.

Black Corals (*Antipatharia* spp.)

Dark brown to black. Skeletons of *Antipatharia* consisting of laminated composites and composed of protein. While they are flexible and thermoplastic, they are hard enough to be polished. The surface of the skeleton is characterized by the presence of small spines. Some species only have spines on the finer tips of the branches (genus *Leiophates*). Listed in CITES Appendix II since 1981.

Blue Coral (*Heliopora Coerulea*) ³

Grey-blue with a deep blue interior. The skeleton of *Heliopora* is composed of fibrous aragonite (calcium carbonate). Listed in CITES Appendix II since 1985. Fossil coral that belong to this genus is not subject to CITES.

Stony Coral (*Scleractinia* spp.)

A white skeleton composed of calcium carbonate in the form of aragonite. Skeletons may be porous or solid. Listed in CITES Appendix II since 1986. Fossil coral that belong to this order is not subject to CITES.

Organ-Pipe Coral (*Tubiporidae* spp.) ⁴

Characterized by a dark red coloured skeleton. The skeleton of calcium carbonate is composed of thin tubes or pipes (hence the name), which are two millimetres in diameter and cemented together by horizontal plates at intervals of several centimetres. Listed in CITES Appendix II since 1985. Fossil coral that belong to this order is not subject to CITES.

Lace Corals (*Stylasteridae* spp.)

Lace corals produce delicately branched calcified skeletons similar to corals but they are actually hydrozoan. Due to their porosity and overall fragility they are typically treated with resins or other fillers. Listed in CITES Appendix II since 1990. Fossil coral that belong to this order is not subject to CITES.

Stylaster Nobilis

Purple, red, orange, yellowish. Listed in CITES Appendix II but excludes fossils.

Stylaster Subviolaceus

Bluish, purple, violet. Listed in CITES Appendix II but excludes fossils.

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Gemmology Today Quiz #1

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All about inclusions in gemstones!



Photo: Tino Hammid

The name 'Apatite' is derived from the Greek word 'Apate' meaning to deceive. While this might seem a little unfair, it has proven entirely justifiable in recent times due to the astronomical prices being realised for Paraíba tourmaline and the propensity for unscrupulous dealers to sell apatite as Paraíba tourmaline or to use misleading terms such as 'Paraíba-like' to market it.

While apatite does appear in a wide range of colours with the blue-greens looking deceptively like Paraíba tourmaline, its softness (5 on the Moh's Hardness Scale) seriously undermines it, making it impractical to wear on a day to day basis.

That being said, the affordability of apatite along with an understanding of its fragility can make it a wonderful addition to any gem connoisseur's collection.

Physical & Optical Properties

Properties	Value
Crystal System	Hexagonal
Refractive Index	1.628 – 1.649
Birefringence	.002 – .006
Dispersion	.013
Optic Character & Sign	Uniaxial Negative
Specific Gravity	3.16 – 3.23
Hardness	5
Cleavage	Poor (Basal and Prismatic)
Fracture	Conchoidal, Brittle
Lustre	Vitreous
Transparency	Transparent

The apatite group consists of chlorapatite, fluorapatite, and hydroxylapatite. A calcium phosphate with fluorine and chlorine present, it has a chemical composition of $\text{Ca}(\text{F,Cl})\text{Ca}_4(\text{PO}_4)_3$ and occurs in a wide range of colours including blue, violet, purple, yellowish-green, bluish-green, colourless, and yellow.

Apatite is found in Brazil, Myanmar (Burma), Canada, Mexico, Sri Lanka, the U.S, India, Kenya, Madagascar, Norway, Spain, Mozambique, Tanzania, Namibia, and South Africa and occurs in a wide range of geological environments from pegmatitic dykes to hydrothermal vugs and clefts, crystalline schists, metasomatic displacements, carbonites (limestones), and as secondary alluvial deposits.

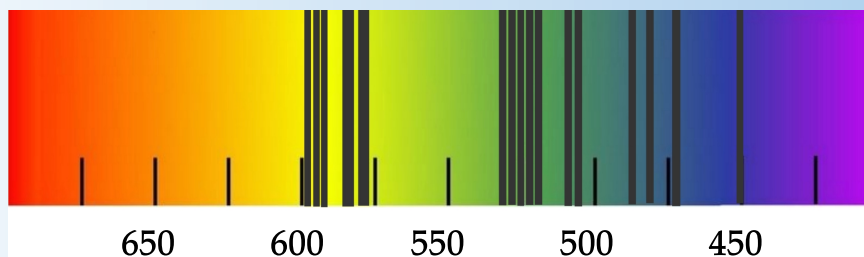


Apatite in an Untreated Mogok Ruby
(Photo: Peter Grumitt)

Apatite often occurs as a 'guest' inclusion in other gemstones including rubies from the Mogok region of Myanmar/Burma, chrysoberyl, andalusite, iolite, garnet, kornerupine, blue spinel, reddish-purple sapphire, blue topaz, and tourmaline.

Inclusions found in apatite include dark green tourmaline, glass globules with tiny seed-crystal protrudes, ribbon-like growth channels, cleavage-lamellae, negative crystals, secondary fluid and three-phase inclusions, and deep red hematite.

The absorption spectra of apatite can be quite striking due to the presence of rare-earth elements such as praseodymium (blue) and didymium (yellow-green) with the latter producing two groups of closely spaced lines in the yellow (strong) and green.



Yellow Apatite viewed through a Diffraction Grating Spectroscope

Pleochroism is distinct in blue apatite (blue, yellow) while under ultraviolet light, a variety of reactions can be expected ranging from lilac (LW) to lilac or pink (SW) for the yellow variety, dark blue to light blue (LW) and either inert or blue (SW) for the blue variety, mustard yellow (LW) to weak mustard yellow (SW) for the green variety and greenish-yellow to violet (LW) to pale mauve or yellow (SW) for the violet variety.

The following chart, based on GemGuide July/August 2016 illustrates the enormous price differentials, percentage wise, between apatite and Paraiba tourmaline and why it is crucial that we can separate the two.

Apatite vs Paraiba Tourmaline

Carat Weight	Commercial 4	Good 6	Fine 8	Extra Fine 10
1.00 - 2.99ct	6900% +	13650% +	23410% +	31900% +

Please note that for this price comparison, the per carat prices for Paraiba tourmaline have been averaged between the 1.00ct to 1.99ct and the 2.00ct to 2.99ct price categories since GemGuide only publish prices for apatite in the 1.00ct to 2.99ct range.

Gemstone	R.I. Range	D.R.	D	O/S	S.G. Range	H
Apatite	1.628 – 1.649	.002 – .006	.013	U-	3.16 – 3.23	5
Tourmaline	1.614 – 1.666	.014 – .032	.017	U-	3.01 – 3.11	7 – 7 ½

Although apatite and tourmaline are both uniaxial negative, have overlapping refractive indices and similar dispersion, tourmaline exhibits appreciable birefringence (double refraction) compared to apatite, a difference that is easily seen using a standard refractometer or when viewed under magnification.

Parcels of apatite and Paraiba tourmaline can be routinely separated using a solution of diiodomethane and i-bromonaphthalene or toluol diluted to 3.05. With a 'mean' S.G of 3.05, tourmaline will freely suspend while apatite will sink.

Although apatite is not produced synthetically it is routinely heat treated to improve the colour. Due to its somewhat fragile nature, stones should not be cleaned using steam or in an ultrasonic cleaner while goldsmiths should avoid any contact with sulfuric or hydrochloric acid.

Fluorescence

MICHAEL D. COWING is an educator, gemologist and appraiser operating an Accredited Gemologist Association (AGA) Certified Gem Laboratory. His career in the diamond, gem and jewelry business spans over 35 years.



Over Grading of Blue Fluorescent Diamonds Revisited

Nineteen years ago GIA published the results of a human experiment in the observation of diamonds with various amounts of blue fluorescence. An introductory editorial indicated that this study “should bring into question the trade’s lower ‘bid’ prices for moderate to highly fluorescent diamonds in the better colors”.

GIA was addressing the negative publicity concerning blue fluorescent diamonds, which began during the diamond investment craze of the late 70’s, early 80’s. Since then blue fluorescence has been an obstacle to marketing, leading to discounting compared to non-fluorescent diamonds of the same color grade.



Figure 1 - Diamond Data Base in Artificial Light

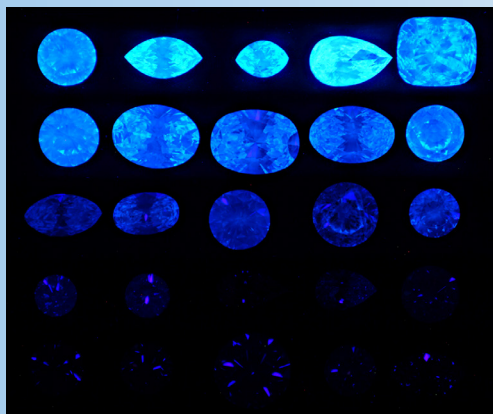


Figure 2 - Diamond Data Base in Long Wave U.V. Light with five fluorescent strengths of None, Faint, Medium, Strong, and Very Strong blue fluorescence.

There are several reasons for the concern and distrust by consumers and the trade of these gemstones that glow blue when excited in the dark by ultra violet (UV) radiation (Figure 2). The reasons are mostly due to misinformation and misguided publicity except for one valid concern. That is the overgrading of color that according to members of the diamond trade is too often observed. Overgrading results from the use of UV-containing, fluorescent lighting in color grading.

In reaction to the GIA study’s conclusions Martin Rapaport commented in the April 1998 issue of the ‘Rapaport Diamond Report’: “Unfortunately, the probability of a lab overgrading a fluorescent stone is much greater than a non-fluorescent stone and a large percentage of high color mistakes turn out to be fluorescent”. “Obviously from the market perspective there appears to be a reasonable basis for price discrimination against fluorescence. The labs are going to have to be very serious about not overgrading the color of fluorescent stones even though these stones tend to appear whiter than they are”.

Fast forward nineteen years to today. Gemologists are advised to use unfiltered UV-containing fluorescent lighting that approximates northern daylight as the standard for color grading. This requirement for UV in the lighting is an abandonment of the grading principles adhered to by the laboratories and the diamond trade up to and through the 90’s. In addition, the variability of UV in fluorescent lighting is a cause of inconsistent grading of fluorescent diamonds.

Graduates of the GIA in the 1960’s through the early 90’s were taught that “Fluorescent diamonds should be graded at their color in artificial light devoid of ultraviolet radiation, rather than at their daylight appearance”. They learned that grading in daylight or fluorescent light with the attendant UV radiation will result in overgrading a blue fluorescing diamond. Eric Bruton’s book, ‘Diamonds’, indicated that gemologists worldwide shared these views on illumination for diamond color grading. He said a “very important consideration is that any fluorescence in the stone must be suppressed”....“It is therefore important to grade stones in white light that is relatively free of ultra-violet”.

Nearly two decades have passed, and the problem remains due to the almost universal use of fluorescent lighting in diamond color grading. The result is continuing distrust of blue fluorescent diamonds with the consequent discounting required to sell them.

From Wade's time to this day gemologists and the trade often refer to the diamond's color unimproved by fluorescence as its 'true color'. It is the color commonly seen in a diamond at typical viewing distances from artificial illumination at night or indoors away from daylight. There the light at the diamond contains insufficient UV (less than one microwatt) to stimulate grade whitening fluorescence.

Restoration of grading for the diamond's true color can be accomplished by the use of polycarbonate plastic such as Lexan. Polycarbonate is an effective and inexpensive filter that blocks the UV in fluorescent lighting, removing its grade whitening effect on blue fluorescent diamonds. Another solution is the use of white LED technology. LED lighting provides inherently UV-free grading light avoiding noticeable stimulation of fluorescence.

The light yellowish tints in a type 1a diamond, which comprise 98% of gem quality diamonds, combine with the various amounts of blue fluorescence, excited by UV and Visible Violet (VV), to give blue-fluorescent diamonds a whiter 'perceived color' than is seen in lighting where fluorescence is not noticeably stimulated. Wade said "Some of these stones are inferior in beauty to pure white stones when viewed under a light which does not cause them to fluoresce."
[Wade, 1916]

Either solution is consistent with the trade's historical desire that diamonds be examined for their unenhanced 'true body color' in lighting largely free of UV.

A return to the practice of grading a diamond's true color rather than its fluorescence enhanced color would benefit the diamond industry in several ways.

First it would remove the distrust and stigma attached to fluorescent diamonds. Secondly, the rarer blue-fluorescent diamonds that hold their high-white color in the absence of fluorescence would be recognized for their superior beauty and rarity to diamonds that drop in color. Thirdly, blue-fluorescent diamonds could be shown to whiten from their graded color, and sometimes appear blue-white in natural daylight. Promoting this advantage in comparison with non-fluorescent diamonds of similar grade would return the marketing advantage to blue fluorescent diamonds that they once enjoyed.

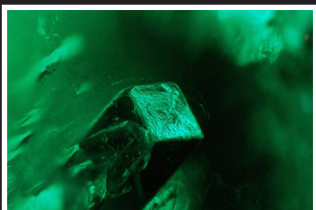
By grading in lighting that does not stimulate fluorescence, fairness and consistency can be achieved, restoring trust in and rekindling desire for this outstanding gemstone.

For more information, contact Michael Cowing at michaelgem@gmail.com

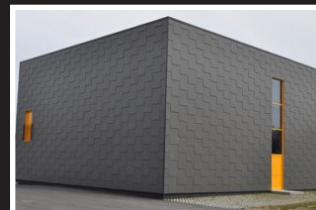
Read in more depth.... <http://acagemlab.com/wordpress/wp-content/uploads/2016/01/probproofsolu11.pdf>

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Scandinavian Gem Symposium
2017
June 17th & 18th
Kisa, Sweden



Photomicroscopy

Inclusions and Other Cool Stuff

EGOR GAVRILENKO is the current Director of the Gem Testing and Certification Laboratory of the Spanish Gemological Institute, holds a PhD in Geology and is a qualified and highly respected gemmologist. He is also an avid gem cutter and photomicrography enthusiast.



Photomicrography - a world within a gem

Inclusion photography is very important for gemological documentation and scientific investigation, allowing gemologists from all over the world to share their observations and experience. It can also transform the internal micro world of inclusions into spectacular and beautiful photographs that elevate photomicrography into a unique creative art form.

While the intention of this article is not to delve too deeply into the technical aspects of photomicrography (including the equipment and techniques used), I do hope to share some of the 'tricks' I have learned over the years photographing gemstone inclusions.

Basically, to take a photograph of a very small object we need:

- Photo camera
- Magnification system
- Illumination system

Additionally, some special accessories and techniques can be very useful, especially for inclusion photography, such as:

- An immersion cell and liquids
- Polarizing filters
- Hardware and software for image stacking

All of these photomicrography components are discussed below. For more in-depth information please follow the links at the end of this article.

Photo Camera and Magnification System

The advent of digital photography has certainly changed our lives, making it far more graphic. Prior to digital cameras, photographers had to wait several days for their film to be processed. Today, most people carry smartphones with high-resolution cameras in their pockets enabling them to share images, via social media, in a matter of seconds.

Digital cameras have also made photomicrography far easier and affordable, allowing the user the advantage of seeing on the screen the exact image that is being taken by the camera. Combined with the ability to edit the images digitally, it is now possible to produce images that do not carry any 'material' costs other than the equipment that is used to take them.

Today there is a wide variety of cameras that can be used for photomicrography ranging from high-end cameras that can cost thousands of euros to smartphones that can be adapted using either laser focus pointer lenses (see 'How to Build a Smartphone Microscope' in Smart Thinking), a 10X eye loupe or the magnification power of a standard microscope.

To overcome the problems of finding the correct distance from the ocular and ensuring that the camera remains stationary, as the image is being captured, special 'digiscoping adapters' can be used to fix a smartphone or a digital camera in the correct position in front of a microscope's ocular. This simple method can provide fast and decent inclusion pictures from a standard microscope without a special optical channel for fixed camera mounting.



Digiscoping adapter used with smartphone (left: Lozano Gemologos) and with compact digital camera (right: IGE)

Some microscopes are already designed with a photo camera incorporated inside the optical system. However, it is more common to use trinocular microscopes with a special optical channel for the camera mounting rather than the standard binocular microscopes with only two channels for your eyes.



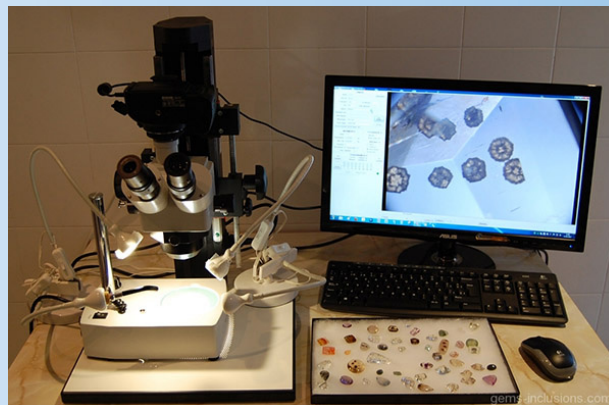
Gemmological Microscope BestScope with Digital Camera incorporated in Microscope's head (IGE)

Different types of cameras can be mounted on trinocular microscopes by taking out the camera lens and using special adapters. By doing this the whole microscope can be used as a camera lens. This allows not only special digital cameras to be used but also standard reflex and modern mirror less cameras. The 'live view' option is very convenient, allowing the user to see on a computer screen, rather than the optical visor or the digital screen of the digital camera, the exact image that will be captured by the camera. It also facilitates the ability to adjust the frame, focus and lighting before the image is taken.



Digital reflex cameras mounted on different trinocular microscopes. Left: Nikon SMZ 10 (IGE)
Right: B & Crown Head on Macrorail stage.

Another simple way to increase the magnification power of a standard camera lens is to position it at a greater distance from the camera. Special rings are available for this purpose, with the possibility of combining them in a different manner to get the required magnification. In this case, all lens



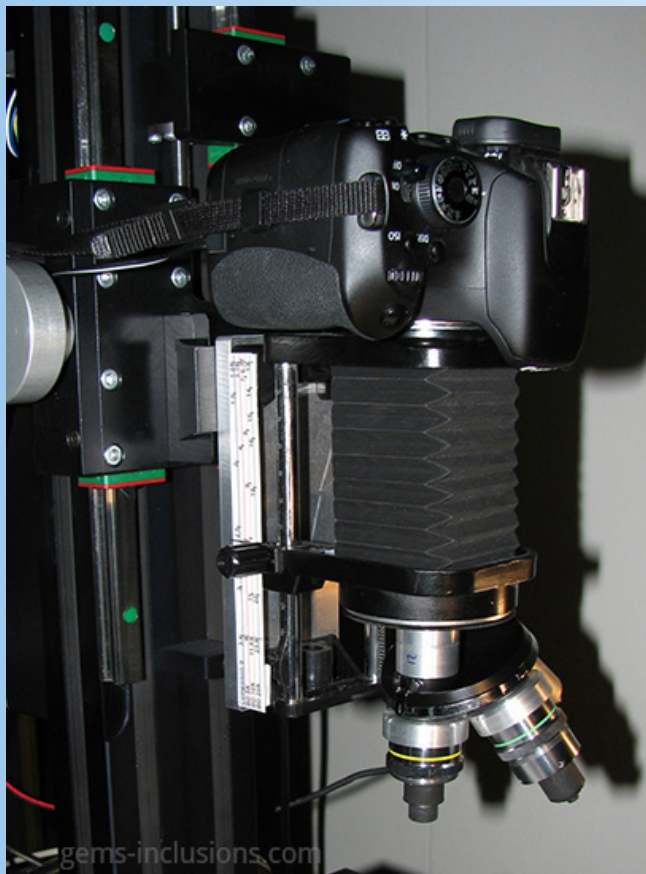
B & Crown trinocular head on Macrorail stage, with a digital reflex camera mounted that projects images on to the screen in 'Live View' mode. The base of the microscope is used for transmitted light illumination.

adjustments such as diaphragm and zoom will be conserved. This method, however, will not allow magnifications as high as those obtained using a microscope.

Finally, a magnification system consisting of a simple lens or microscope objective located at a greater distance from the camera can be employed. To change the magnification, the lens can be mounted on an adjustable 'accordion' mechanism (bellows) that is attached to the camera. The advantage of this system is that the objective directly projects the image to the camera sensor. However, in this case the observation and object finding can only be done on the computer screen, and at high magnification this can be difficult.



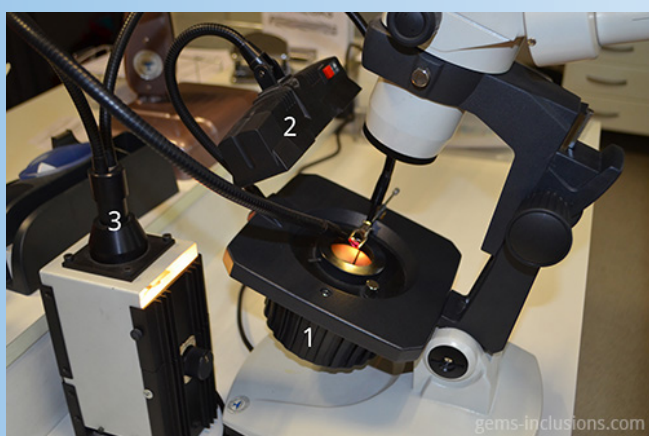
Left: Camera with extension rings, accordion bellows and Schneider Componon lens on Macrorail stage.
Right: Camera with accordion bellow and microscope objective (Macrorail.com)



Camera with accordion bellows and exchangeable microscope objectives (Macrorail.com)

The solution can be an additional accessory for changing different objectives, by using less magnification objectives to find the object and then higher ones for the final shooting. Other disadvantages of this system compared to using a trinocular microscope is its much reduced focal distance that makes appropriate lighting, use of immersion and other accessories needed for inclusions photography more difficult.

Illumination



Most common types of inclusions illumination.

1 – Module for dark field and bright field illumination; 2 – Diffused episcopic illumination; 3 – Fiber optic illuminator with dual light guides (IGE)

There are four types of illumination commonly used in gemology and while all of them can be used in photomicrography, their appropriateness is largely dependent on the image that is being taken and what the photographer is hoping to achieve.

- Transmitted light
- Dark field illumination
- Diffused episcopic light
- Punctual directed light (fiber optic)

Transmitted light is very convenient for observation of inclusions and color distribution, but in many cases it can be difficult to use because pavilion facets reflect the light and impede correct illumination of the stones interior. To overcome this problem, immersion liquids (see below) or dark field illumination that illuminates the lower part of the stone can be used. In this case, light enters into the stone perpendicular to the pavilion facets thereby avoiding reflections, and all internal inclusions can be easily detected and observed, highlighted against the dark field located below.

Diffused episcopic illumination is especially useful for observation of external characteristics and to assess the quality of the overall polish. By moving the stone and finding a position where the facets reflect light back to the objective, it is possible to locate scratches, polishing lines, superficial graining, cavities and other external characteristics.

In addition, strong punctual directed light supplied by a fiber optic illuminator is also widely used in gemology and photomicrography. This produces much stronger contrast than diffused light allowing certain types of inclusions, such as tiny exsolution rutile needles, to be detected. Fiber optic illumination also allows us to move the light source freely around the gem and play with subtle lighting angle changes for better photomicrographs.

Additional techniques of lighting can be used too, such as shadowing, UV lighting, and differential interference contrast. These are described in greater detail in the publications listed at the end of this article.

Immersion

To facilitate the passage of light through a faceted gemstone, immersion liquids are widely used in gemology. Liquid with a high refractive index, close to that of the observed gem, will help to avoid light refraction on the stone-air border, facilitating the observation of the stones internal characteristics. This method is especially useful for observing color zoning since it reveals true shapes and orientation of the color zones by minimizing distortions caused by light refractions on the stones surface.



Natural sapphire observed in air and in methylene iodide immersion.
Straight color zoning, typical for natural sapphires, is only visible in immersion.

Different immersion liquids are used in gemology. The choice of the liquid depends on the refractive index of the studied gem with the aim to employ a liquid that has the closest refractive index to the stone. However many of the immersion liquids are toxic and/or flammable and must be used with great caution. Some of most commonly used immersion liquids along with their refractive indexes (R.I.) are:

- Water, R.I. 1.33
- Alcohol, R.I. 1.36
- Glycerol, R.I. 1.47
- Toluene, R.I. 1.50
- Benzyl Benzoate, R.I. 1.57
- Bromoform, R.I. 1.595
- Methylene Iodide, R.I. 1.74

In the following example, the same faceted gem, natural chrysoberyl from Brazil, has been photographed in air and in two different immersion liquids. Note how the transparency of the gem improves as the R.I. of the liquid more closely approximates that of the chrysoberyl.

Different accessories can be used for the observation of gems while immersed under a microscope. In a standard 'vertical setup', a simple glass cell can be used where the stone is moved with a pair of tweezers. However since many internal and external characteristics (i.e. color zoning) rely on the proper orientation of the stone, this can be very challenging. To overcome this a special setup called a horizontal microscope or 'immerionscope' has been developed.



The simplest way to observe a gemstone in immersion, using a standard vertical microscope and glass cell and moving the stone with a pair of tweezers. (IGE)



Same stone (Natural Brazilian Alexandrite, RI 1.67, 0.11 ct) observed in air (left) and in two different immersion liquids: alcohol (center) and toluene (right).



Influence of orientation of the stone on the color zoning visibility. Natural Brazilian alexandrite (RI 1.67, 0.11 ct), toluene immersion.

Left: Casual orientation, uneven color distribution can be seen, but exact directions of color zoning are unclear.

Center: One direction of color zoning is defined, while the other still unclear.

Right: Two directions of color zoning are defined, forming sharp angle corresponding to natural stone's crystal faces.



Immersionscope Optika in Spanish Gemological Institute (IGE)
Gem Testing Laboratory.

For viewing gemstones in an immersion liquid using a standard 'vertical setup' microscope, a special magnetic immersion cell has been devised by the author and Anthony Cáceres that allows the stone to be rotated and viewed from different directions. For a complete explanation of how to make a magnetic immersion cell, please click on the following link <http://gems-inclusions.com/images/photomicrography/DIY-magnetic-immersion-cell.pdf>. It is important to remember that in this case the size of the immersion cell is larger than a standard immersion cell, so additional precautions must be taken while working with the toxic and flammable liquids!



Magnetic Immersion Cell by Egor Gavrilenko
and Anthony Cáceres.

Immersion liquids can also be applied directly to the surface of gemstones that have rough or poorly polished surfaces to improve their transparency and facilitate the observation of certain inclusions. This technique, described by John Koivula as a 'quick polish', offers an easy and nondestructive alternative to standard polishing and can be sufficient in many cases.

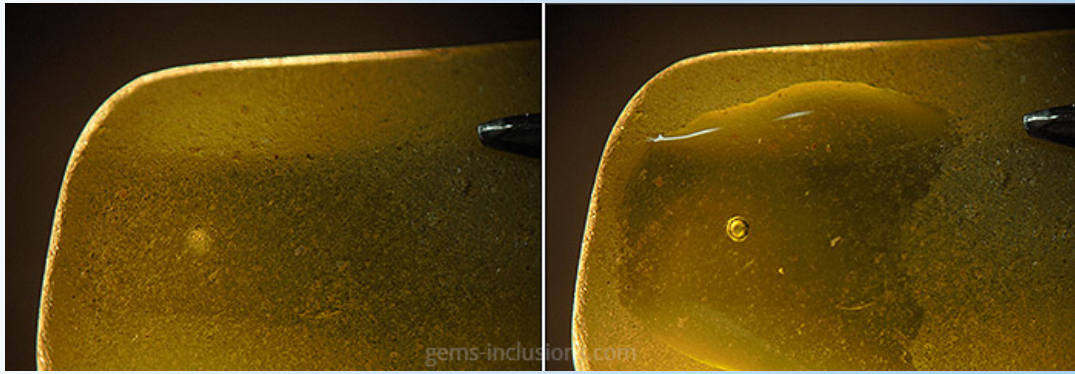
Polarizing filters

Most gemstones are optically anisotropic, meaning that they are doubly refractive. This can have a negative impact on the quality of the image being photographed since it will invariably make it less distinctive or even, based on where the inclusion is located, appear as a 'double' image. If on the other hand, an object is observed along an optic axis (a direction of single refraction in a doubly refractive gemstone) it will not appear fuzzy or indistinct.

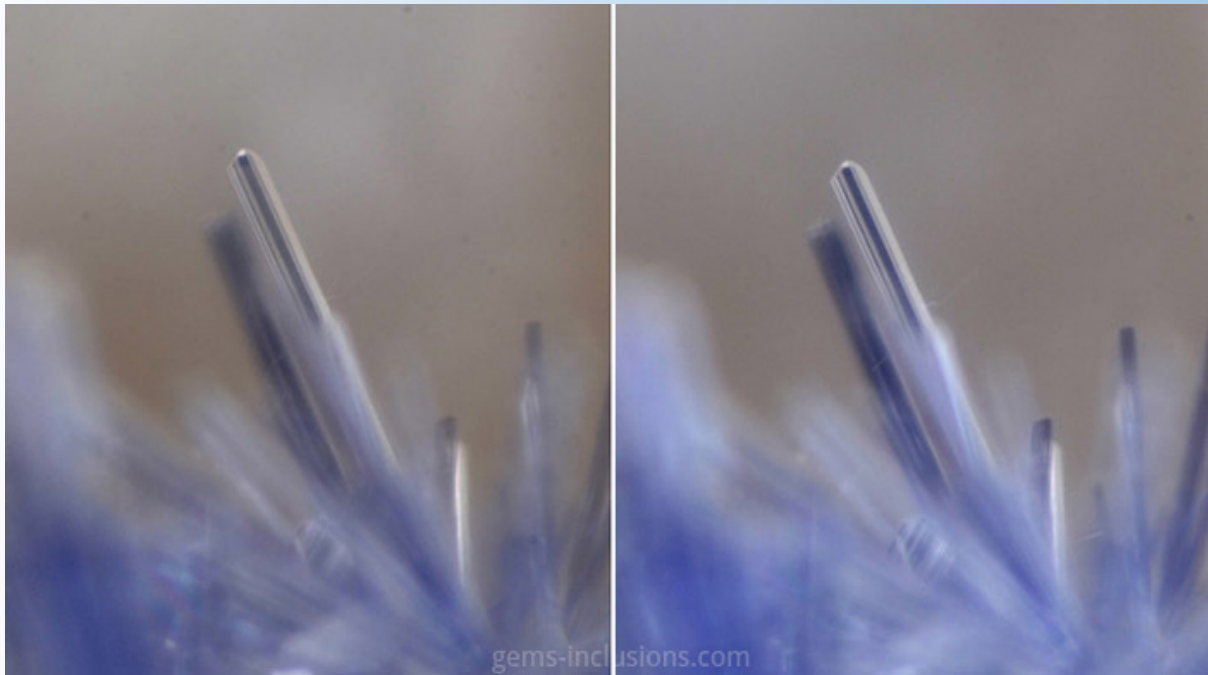


Plane-polarizing filter with additional adapter ring
for mounting on microscope.

However as discussed earlier, orientation is often crucial in order to capture an inclusion or unique characteristic and invariably this leaves the photographer very few options in terms of how to position the stone. To alleviate this problem and reduce the effects of double refraction, a plane-polarizing filter can be placed between the gemstone and the microscope objective and by rotating it the best position can be found for inclusion observation and photography.



This sample of green artificial glass was submitted to IGE gem testing lab as a supposed natural rough peridot from Africa. In normal observation conditions its inclusions cannot be seen clearly because of a very irregular unpolished surface. In contrast, a drop of cedarwood oil on its surface provides a 'quick polish' effect, so that spherical air bubbles can be clearly seen. Field of view 15 mm.



Same inclusion of dumortierite in quartz, without polarizing filter (left) and with polarizing filter (right). Both images have no additional post-processing. Field of view 1 mm..



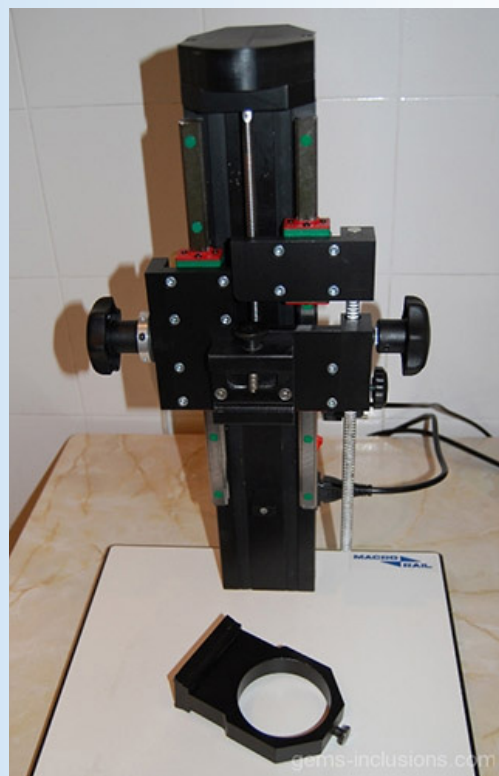
A pair of crossed polars to use with a microscope (left) and anomalous birefringence in natural type Ia diamond (right). Field of view 6 mm.

If an additional plane-polarizing filter is placed below the stone, in a position of polarization perpendicular to the upper one, a system of crossed polarizing filters can be created. In this position, optically isotropic inclusions can be detected and photographed. Anomalous double refraction can also be observed, which is especially important when distinguishing 'natural' from 'synthetic' HPHT grown diamonds.

Image Stacking

When a gemstone is observed under a microscope, there will be some objects that are in focus and others that are not. In photography, the depth of field (DOF) is the distance from the closest focused object to the farthest one. The DOF can vary for different optic systems and camera adjustments, but in general, when using a microscope, there will always be areas out of focus, and higher magnification corresponds to smaller DOF.

To avoid this problem, special post processing software products are often used in photomicrography, based on the so called 'photo stacking technique', where instead of taking one shot, a sequence of photographs are taken, with certain displacement of the camera or microscope head. The



Automated Macrorail Stage for camera or microscope head mounting.



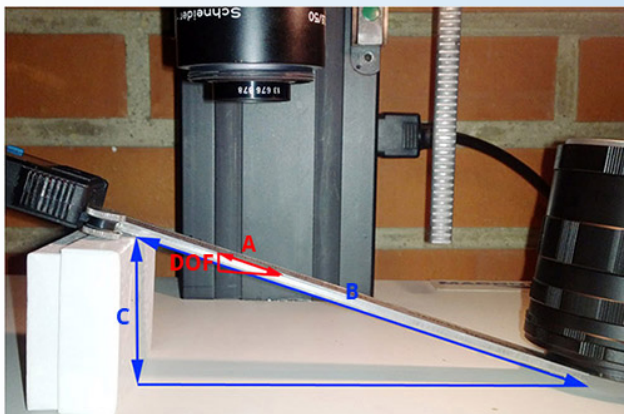
Nice etching figures on the surface of a Colombian emerald. Note the narrow focused zone in the middle part of the upper image (single shot) and completely focused image composed as a result of stacking 12 shots (lower image). Field of view 6 mm.

software analyses all the images of the sequence digitally and selects for the final image only the 'focused' area to reconstruct the resulting image, focused in a complete area or at least on the object of interest. Some of the most advanced programs especially designed for image stacking are Helicon Focus, Zerene Z Stacker and Combine ZP.

Sequences of images for stacking can be taken manually, simply by moving the camera or microscope head or by using special automated devices, such as a Macrorail stage, on which the microscope head or photo camera (with other magnification systems) can be mounted.

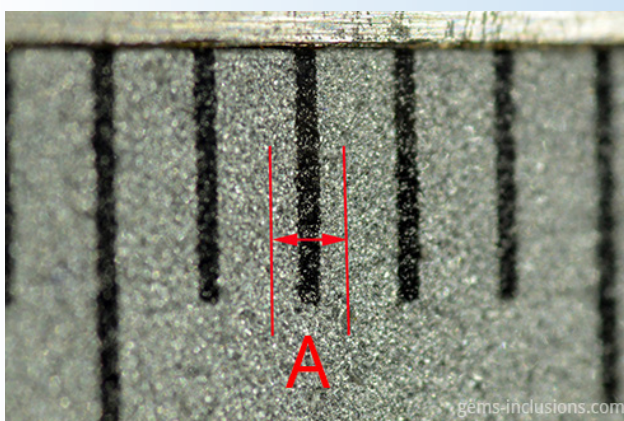
With Macrorail software the procedure is quite straightforward with the same computer program controlling the stage that moves the camera (or microscope head) and also the camera. After the sequence of images is taken, Macrorail software uses separately installed stacking programs for image processing within the same interface.

To know how many photographs should be taken, the depth of field of the optical system should be measured. This can be achieved by means of direct measurement of the focused area on a ruler, located under the microscope, with the known tilt angle, as shown below. A simple calculation provides the DOF value, and it can be done for different magnifications of the microscope.



Ruler length (from base to support in mm)	144,0	Focused Area in mm	0,5
Height of Support in mm	41,8	Depth of Field in mm	0,15
$DOF = A \times C/B$			

Ruler position and calculation of the Depth of Field (DOF) value. The width of the focused area (A) is measured as shown below.



Observation and measurement of focused area width ('A' value in previous figure) for DOF calculation, for tilted ruler shown above.

When shooting inclusions inside gemstones or minerals, one has to take into account that the 'DOF' values will increase due to the host gemstone or minerals higher refractive index compared to air. To calculate the 'DOF' inside gemstones or minerals, values of 'DOF' measured in the air must be multiplied by the host minerals refractive index. Also, if the optical system has zoom, the DOF value should be calculated for different magnifications.

Some gemologists argue that the use of stacking techniques for inclusion photomicrography artificially amplifies the depth of field producing unreal pictures that are impossible to see under a microscope.

In my opinion it is a very powerful tool that naturally should be used with good judgment, so as to avoid exaggerated and unrealistic-looking results. After all, when observing inclusions in practical gemological work we usually move the stone continuously, 'scanning' the complete volume of the gemstone with the microscopes focal plane and reconstructing 3D picture of the inclusions in our brain, producing a result quite similar to what 'stacking' software can provide. In contrast, in a static photograph we cannot visually follow the same inclusion in depth.

Perhaps the use of 'image stacking' can be compared to the 'high dynamic range technique' that is used to reproduce a greater dynamic range of luminosity and also produces unrealistic-looking images. However, if well used, it can greatly improve the quality of the images and create fantastic photographs that standard photographic techniques simply cannot produce.

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- Photomicrography using a Smartphone Camera, by E. Boehm. The Journal of Gemmology, 2014, Vol. 34, No. 1, pp. 6-7
- Digital Photomicrography for Gemologists, by Nathan Renfro. Gems & Gemology, Summer 2015, Vol. 51, No. 2.
- Lotus Gemology bibliography list, including many references on photomicrography techniques.
- Gemstone Photomicrography and Inclusion Photography by Danny J. Sanchez
- Smartphone & Gemmology, by Gagan Choudhary

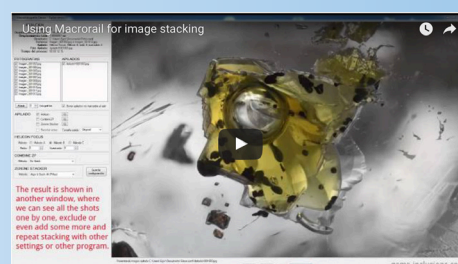
Videos



Same fluid inclusion recorded in transmitted, episcopic and ultraviolet illumination.



Magnetic immersion cell, by Egor Gavrilenko and Anthony Cáceres.



Using Macrorail.com software and hardware for image stacking.

News from Down Under

JENNI BRAMMALL is a Vertebrate Palaeontologist and the manager of the Australian Opal Centre planned for Lightning Ridge in Australia



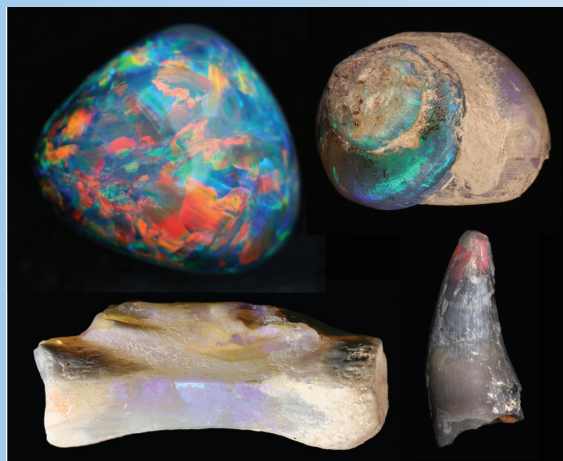
The Australian Opal Centre - Long-awaited Centre for a Magnificent Gemstone

Abstract: The Australian Opal Centre (AOC) is a not-for-profit facility dedicated to opal-related scientific research, education, training, heritage, arts, travel, cultural and economic development. Based in the classic opal mining locality of Lightning Ridge, Australia, the AOC has developed its public collection and programs since 2004, while working towards construction of an innovative building that will be an international hub for opal-related knowledge and activity.



Australian Opal Centre Building - Architects: Glenn Murcutt and Wendy Lewin (Drawing: Candalepas Associates)

In the space of a decade, the Australian Opal Centre at Lightning Ridge has assembled the world's premier public collection of opalised fossils from the Age of Dinosaurs. It has become a leading repository for relics of the history and heritage of Australia's outback opal fields; has acquired one



Black Opal and Opalised Fossils from Lightning Ridge

of the world's most complete collections of opal-related publications; and become a key provider of opal-related knowledge services.

It has well-advanced plans to construct a building that will be a 21st century architectural icon and a long-awaited palace for the Queen of Gems – Opal.

This article looks at the Australian Opal Centre story so far, an overview of current activities, and its plans for the future.

In the beginning...

It began in 1997 as an economic development project at Lightning Ridge, led by community members seeking to diversify a local economy reliant upon opal mining. A high quality, high profile attraction with education, research and community functions would bolster tourism, create new opportunities and buffer against regional and global economic impacts.

What could be offered at Lightning Ridge and nowhere else? The answer was clear: Lightning Ridge's black opal and opalised fossils, which originated in an ancient terrestrial environment unknown from any other opal deposit. And so began Lightning Ridge Opal and Fossil Centre, managed by the not-for-profit incorporated body LROFC Inc.

A scoping study was commissioned, funded by Walgett Shire Council, NSW Ministry for the Arts and Lightning Ridge District Bowling Club. Richard Wesley (now Director of Hong Kong Maritime Museum) provided guidance through the Regional Museums Advisor program of Museums & Galleries NSW.



Murcutt & Lewin with LROFC Inc Committee at Lightning Ridge



Geotechnical Engineer David Murray on site in 2004 with driller Len Butts and SES volunteers

Advice was provided by the Australian Museum, under then-director Dr. Michael Archer. Public consultations were conducted, development sites assessed and expressions of interest invited for a building design, resulting in the appointment of esteemed Australian architects Glenn Murcutt and Wendy Lewin. Murcutt is the only Australian to have been awarded the Pritzker Prize, known colloquially as the 'Nobel Prize for Architecture'; a building by Murcutt and Lewin in an Australian opal field would become a 21st century architectural icon.

In 2004 Lightning Ridge Opal and Fossil Centre received seed funding from its local government, Walgett Shire Council. It employed a project manager and established Australia's first dedicated public collection of opal and opal-related items. It obtained accreditation as a public museum, endorsement as a recipient of tax-deductible donations, and began building its collection.

It acquired a 3.1 hectare site on the historic Three Mile opal field, conducted surveys and geotechnical studies, and developed a functional brief. A design and engineering team (Geotech) was assembled and began work. Development consent was sought and obtained. A business plan was developed.

Membership grew from a handful of local residents to hundreds of individuals and businesses across Australia and the world. They included opal buyers, sellers, processors, wholesalers, retailers, jewellers, writers, photographers, designers, scientists, educators and promoters; residents of opal mining communities; and hundreds of others inspired by the concept.

Miners brought in opalised fossils and oddities for identification. Donations to the collection came in from around Australia and overseas: opalised fossils, opal specimens, books, artworks, historical materials.

Schools and tour groups asked to visit the Centre. Networks expanded; partnerships were forged. Journalists, publishers, professional bodies, film crews, authors and designers started to get in touch, seeking education, information, images and expertise.

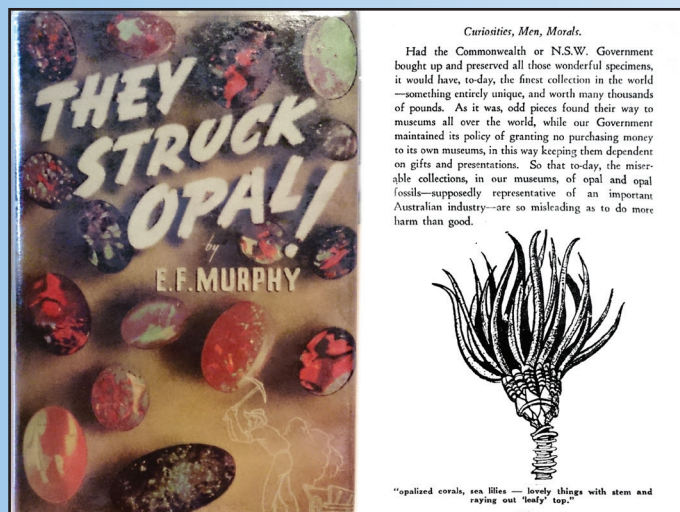
From Regional to National

In 1948, Edmund Francis Murphy, pioneering opal buyer, wrote:

"...had the Commonwealth of NSW Government bought up and preserved all these wonderful specimens, it would have today the finest collection in the world..... today, the miserable collections in our museums of opal and opal fossils – supposedly representative of an important Australian industry – are so misleading as to do more harm than good."

Half a century later, Murphy's words still rang true, despite hard work by many in the opal industry.

It was clear that the need, demand and opportunity for a public institution dedicated to opal reached far beyond Lightning Ridge. Opal was an Australian national icon, yet there was no place in Australia dedicated to opal science, art, heritage and culture; no centre for opal-related education, training or industry development; no public collection of the country's national gemstone. The neglect was preposterous; the needs and opportunities enormous.



Highlighted passage from 'They Struck Opal' - E.F. Murphy 1948



Building Model

In 2007, Lightning Ridge Opal and Fossil Centre became the Australian Opal Centre. The new name reflected the national significance of the Centre's collections, themes and purpose – on a par with major Australian collections such as the National Gallery, National Archives and National Library. A business and strategic plan was developed.

In 2010, with Australian Government funding and pro bono contributions from the design and engineering team, the building concept was progressed. A scale model and architectural rendering were commissioned, the business model was refined and cash flow projections developed for the new centre.



Her Excellency Professor Marie Bashir opening the showroom in December 2008; visitors to the new centre; author Di Morrissey with the AOC's Dr Elizabeth Smith

With seed funding nearing an end, the Centre had embraced a major expansion: the project would increase many-fold in scope and funding requirements. Raising funds for the new building was clearly going to be a long haul, but the Australian Opal Centre was already a busy 'museum without walls'. Demand and opportunities grew.

In 2008, a small exhibition space was fitted out in rented premises. It featured pieces from the Centre's collection (including the now famous opal denture once worn by Lightning Ridge identity Harold Hodges). The AOC's Morilla Street showroom was opened in December 2008 by the Governor of NSW, Her Excellency Professor Marie Bashir, and is open to the public six days per week. It is the AOC's main point of public contact and generates income through sales, membership recruitment and donations.

In 2011, needing space to host larger groups, hold events and diversify revenue generation, the AOC built the Black Opal Heritage Shed on a corner of its Three Mile opal field site. The shed contains vintage opal mining machinery, a gallery wall for exhibitions, and space for lectures, school activities and other group visits, fossil work, AOC and community events. Construction and fit out were achieved through Australian Government and NSW Government funds and masses of donated time, labour, equipment and expertise. Additional facilities were added later with further government, corporate and community support. Building and sharing a unique collection

The Australian Opal Centre's collection contains thousands of opalised fossils, including many that have, or will, change scientific understanding about the evolution of plants, animals, habitats and climates.



Examples from the AOC Collection including opalised fossil belemnites, boulder opal, Harold Hodge's opal denture, opalised sauropod dinosaur tooth, boulder opal with pine cones in cross section, pendant/brooch with Andamooka opal and holotype of the extinct freshwater snail species *Suratia marilynae*.

Opal and opal-related geological items in the collection are a valuable resource for geological and gemmological research as well as public exhibition, display and promotion. The Centre is preparing to receive major donations of precious opal for Australia's first major public collection of its national gemstone: a high-profile showcase of the remarkable gemstones produced by all Australian opal fields – long overdue – and a tribute to those who discover, fashion, buy, sell, collect and cherish these national treasures.

An outstanding opal book collection – reportedly one of the two most complete in the world – is augmented by publications from other generous donors to form the foundation of a research library. These materials are in storage until construction of the AOC's new premises, as are artworks, artifacts and archival materials already accessioned into the collection. Other major collections have been committed for donation once the Centre has facilities for their preservation and display.

The Australian Opal Centre collection is a gift to the world from the many donors who have given these treasured items to the Centre, to be protected and shared in perpetuity. Some items are donated through the Australian Government's Cultural

Gifts Program. The collection continues to grow in size and significance.

Education and Training

School groups visit the Australian Opal Centre from nearby and up to hundreds of kilometres away, to learn about opal, opal mining, opalised fossils, Australian prehistory and the environment. Programs emphasise hands on discovery: students search tailings for opal and fossils, learn that Lightning Ridge was once home to dinosaurs, look at natural history items with microscopes and magnifying visors, examine and draw bones, rocks and fossils, and talk about the plants, rocks, landforms, built environments and opal mining machinery they see on the opal fields. Every child receives a little piece of rough opal with play of colour – seeds sown in the minds and imaginations of a new generation.

The AOC provides opportunities for students from the University of New England (UNE), Armidale, to gain work experience in its fossil collection. UNE runs its annual vertebrate palaeontology intensive school in Lightning Ridge, at the AOC's Black Opal Heritage Shed. Architecture students from the University of New South Wales have visited Lightning Ridge twice to undertake studio projects in the environment and cultural setting that has inspired the new AOC building.

Lectures and educational tours are provided for special interest groups including fossil enthusiasts, jewellers, gemmologists, valuers, historians, engineers and others.

Consumer education about opal and opalised fossils is provided daily in the AOC's public exhibition space. The AOC is developing educational materials about opal and courses in the identification of opalised fossils. The AOC and the Gemmological Association of Australia are cooperating to develop opal courses for both online and face-to-face delivery. Opal carving classes were run successfully at Lightning Ridge in 2016 and will be offered in 2017. The Australian Opal Centre is becoming a hub for education and training in opal science, art and industry skills.



School Students at the Australian Opal Centre

Public Programs

Australian Opal Centre public programs include lectures, exhibitions, fundraisers and other social events.

AOC-hosted lectures by visiting gemmologists, palaeontologists, geologists, jewelers and photographers provide opportunities not usually available in regional centres, and always receive enthusiastic attendances.

Exhibitions of artworks inspired by opal, the opal fields and opal people have included the inaugural Cody Australian Opal Centre Photographic Prize, vibrant showings of paintings, photographs and object d'art, and exhibitions of 'opal clay' pottery made using clay from the opal mines.



Guest Lecturers: Vincent Pardieu, Jack Ogden, Geoff Dominy, Tino Hammid and Scott Sucher

The AOC contributed to Migration Memories, an Australian National University and National Museum of Australia research project and exhibition. An opal cutting machine dating back to the 1890s, unearthed for Migration Memories, is now on exhibit at the AOC.

In 2013, the project 'Brilliant Ideas' documented invention and adaptation of opal mining machinery by miners, engineers and fabricators. 'Brilliant Ideas' was led by the Australian Society for the History of Engineering and Technology (ASHET), funded by the Australian Government's Your Community Heritage program and supported by the AOC and Lightning Ridge Historical Society. It produced a permanent display at the AOC's Black Opal Heritage Shed, an exhibition booklet, and a portable exhibition available on loan from the AOC.

In 2015, the AOC contributed to OPALessence (play.with.colour), an opal-based light installation produced by Olivia Deskoski for the world-famous Vivid Sydney festival.

In 2016 it produced SPARK, funded by Arts NSW, the AOC and 18 wonderful sponsors. SPARK culminated in a cinematographic artwork celebrating Lightning Ridge, its opal, landscapes, people, ancient and recent histories. It was about the nature, culture, technology and sheer wonder of an elusive gemstone formed in the darkness, yet blazing with light and

colour. SPARK was presented under the stars on the historic Three Mile opal field for three months, then at Artlands national regional arts festival; an online screening is planned.

Scientific Research

The Australian Opal Centre fosters scientific research through collaboration with researchers at other institutions. The AOC's collection of opal-related specimens is accessed by researchers with geological, gemmological and palaeontological interests.

The AOC has participated in an Australian Research Council (ARC) Linkage Grant scientific research project involving several institutions in Australia and Sweden, and assisted the ARC-funded Opal Project at the University of Sydney. Through manager Jenni Brammall and committee member Dr. Elizabeth Smith, both vertebrate palaeontologists, the Centre has strong ties with the University of NSW in Sydney. Ongoing collaboration with dinosaur specialist Dr. Phil Bell of the University of New England at Armidale, NSW, is producing exciting new discoveries such as the megaraptorid Lightning Claw, the largest carnivorous dinosaur found in Australia – known from bones preserved in blue-grey common opal.

During the Australian Opal Centre's Lightning Ridge Fossil Dig, run annually since 2014, members of the public pay to join scientists from the AOC and University of New England to search for opalised fossils and experience the opal fields. New fossils are added to the AOC collection; participant fees provided an important income stream; media coverage increases public awareness of opal and opalised fossils; and dig participants become AOC members, champions and volunteers, contributing a range of professional skills. The Australian Geographic Society has been a partner in the Lightning Ridge Fossil Dig since 2015.



2014 Lightning Ridge Dinosaur & Fossil Dig



SPARK screening under the stars at Lightning Ridge in 2016. Inset: promotional flyer for SPARK

Information Services

The Australian Opal Centre is called upon daily for information about opal, opalised fossils, the opal industry and related subjects.

A free fossil identification service is provided for opal miners. Inquiries are received from members of the public, journalists, publishers, filmmakers, educators, government and other organisations. The Centre provides information and images for books, newspaper, magazine and journal articles, and television and film productions. AOC representatives are regularly invited to present at conferences in Australia and abroad.

Opal Field Heritage

“...the remnants of the hundreds of miners’ dreams...make Lightning Ridge a truly living historic village, the likes of which councils spend millions of dollars trying to recreate.” (Bob Pelchen, plein air painter, Morwell, Victoria.)

Australia’s opal fields are living tapestries of natural, cultural and industrial heritage. The Australian Opal Centre campaigns

to protect opal field heritage, often in collaboration with Lightning Ridge’s Miners’ Association, Tourism Association and Historical Society. It has acquired two historic miners’ camps and supports practical initiatives to preserve and provide access to on-field heritage.

Pressure to ‘tidy up’ historic opals fields has resulted in destruction of sites of historic, cultural and scientific significance, and loss of authentic mining landscapes essential for mining activity, community resilience and economic viability. The AOC has prepared submissions and reports identifying sites and objects on the Lightning Ridge opal fields that warrant preservation and protection for their historic, scientific, cultural, aesthetic, educational and/or tourism values, and long-term economic and cultural benefits.

The living heritage of the opal fields and industry includes the stories of their culturally diverse people.

The new AOC building will provide archival storage - a ‘keeping place’ – for organisations with valuable collections and archives. Individuals and organisations wishing to make the Centre custodian of such items are invited to submit inquiries or expressions of interest.



Her Excellency Marie Bashir and Sir Nicholas Shehadie at Fred Bodel’s Camp, Elizabeth Smith (AOC), Bronwyn Hanna (NSW Heritage Office) and Barbara Moritz (Lightning Ridge Historical Society)

Industry Development

The AOC supports initiatives to foster a sustainable opal industry.

It increases public awareness of opal and the opal industry through publications, public programs, and work with journalists, filmmakers and others. It makes submissions to government and supports lobbying by opal miners' associations and other industry bodies. It seeks to inspire young people to pursue opportunities in the opal industry. It participates in the National Opal Symposium and supports opal-related initiatives of organisations such as the National Opal Miners' Association (NOMA), the Japan Opal Association and the Gemmological Association Australia (GAA), for example contributing to a presentation on Australian opal for the Gemstone Industry Laboratory Conference at Tucson in 2014, providing images and information for papers published in *InColor* and *The Australian Gemmologist*, and providing design services and educational seminars for the GAA and NOMA's highly successful Great Australian Opal Tour in 2014.



Shiro Murata, president of the Japan Opal Association, at AOC Morilla St with Rebel Black, president of the Australian Opal Centre.

In 2013 AOC manager Jenni Brammall attended the 1st Changsha Mineral and Gem Show to support the Australian Pavilion coordinated by the National Opal Collection, give presentations about opalised fossils and Australian opal to the public, and as a keynote speaker on opalised fossils. In 2015, the AOC-supported OPALessence (play.with.colour) shared opal colour and pattern with up to 1.5 million festivalgoers and 1.2 billion people worldwide.

The AOC seeks to commission a State of the Industry Report to redress lack of basic information about the nature, extent and value of the opal industry in Australia, for use in planning, lobbying and benchmarking. Excellent work conducted previously by other industry bodies must be updated to provide current data and benchmarks for future industry analysis. Funding is needed for this work.

Educational materials about opal are being developed by the AOC for use at trade shows and by opal sellers. Future plans include a certification service for opal, further collaboration with other industry organisations, and leadership and support for industry coordination, development, training, marketing and promotion.

Membership

LROFC Inc currently has about 800 members. Members contribute to the vitality of the organisation and are part of its growth and future. Members receive a quarterly newsletter, advance notice of AOC programs and events, and a discount on purchases. Higher levels of membership receive additional recognition.

Fundraising

The Australian Opal Centre is a self-funded not-for-profit enterprise. Fundraising is a core activity. Operations are funded by business activity, fundraising initiatives, membership fees and donations; grants are sought from time to time to enable projects.

Cost of construction and fit out of the new AOC building is estimated at A\$30 million, providing excellent value for a development of this scale, significance and impact.

Fundraising for the building takes many forms. Perhaps the most heroic to date was a walk from White Cliffs to Lightning Ridge – 686 kilometres – retracing the footsteps of opal industry pioneers, raising funds for the AOC building and reinvigorating friendships between the two opal mining towns. Major benefaction and bequests are needed and welcomed.

The AOC grows and flourishes because of the conviction and generosity of its supporters. Large financial contributions to the Building Fund are sought to augment this 'people's project'. Every contribution counts: to date the AOC has raised over \$1.1 million in grants and donations.

To ensure ongoing financial sustainability the AOC is expanding its business activities, with a focus on developing, marketing and selling opal-themed merchandise, education programs and other value-added products, services and experiences.

The Future

To achieve its full potential, the Australian Opal Centre must realise the extraordinary two-storey underground building designed for it by world-renowned architects Glenn Murcutt and Wendy Lewin. Insulated by the earth, ventilated passively, generating 100% of its own power and collecting its own water, the innovative building, its remarkable contents and programs will be famed worldwide.



OPALessence at the Vivid Sydney Festival. Inset: information about opal was accessible via QR code at the OPALessence installation.

The new Australian Opal Centre will contain:

- The world's premiere public collection of Australian opal, opalised fossils and related materials
- Spectacular permanent and temporary exhibitions
- Scientific testing and research laboratory, including fossil preparation facilities
- Research library and archives
- Collection storage and curatorial facilities
- Space and facilities for conferences, exhibitions and events
- Lapidary and jewellery teaching workshop
- Discovery room for education programs
- Commercial spaces including gift shop and café
- High security vault for high-end Australian opal
- Underground courtyards and gardens, including a two-storey Gondwanan garden
- Offices and amenities

The AOC is already producing economic outcomes, generating and injecting money into the local economy. Construction and ongoing operations will produce substantial outcomes for employment, training and economic development. The project has been lauded by high-profile supporters such as Dame Marie Bashir, former Governor of NSW, who in 2011 hosted a reception at Government House in Sydney in support of Australian Opal Centre and celebrating Black Opal as the gemstone emblem of NSW.

A major milestone was reached in 2013, when the building site was prepared and excavated. The resulting construction pit, 100 metres long, 30 metres wide and 11 metres deep, instantly conveys the scale and significance of the project. Overburden from the excavation was used to fill three disused open cut mines, creating multiple community and environmental benefits; select excavated materials were stockpiled for future beneficial use.



Bill Murray, Kevin Humphries, Her Excellency Professor Marie Bashir (Governor of NSW); Maxine O'Brien and Vicki Bokros

(For those wondering whether there was opal in the hole: we don't know yet! The excavation, conducted to engineering and development specifications, stopped just short of the opal-bearing levels. The site will be over-excavated and refilled prior to construction.)

Individual and corporate benefactors are sought to collectively contribute A\$10 million towards construct the new Australian Opal Centre – an extraordinary legacy, and illustrious company, for those who participate. A further \$10 million is being sought from the Australian Government and \$10 from the NSW Government.

Dependent on funding, construction proper will commence in 2018 for an opening in early 2021.

The story of the Australian Opal Centre continues to be written. The new AOC will be a place of dazzling treasures, knowledge, learning, discovery, creativity, community, enterprise, economic and cultural development. The Australian Opal Centre welcomes readers to make contact to discuss membership, partnership, collaboration or major benefaction in this history-making project.

Visit www.australianopalcentre.com or email us at contact@australianopalcentre.com.

Acknowledgements

Photos by Jenni Brammall, Robert A. Smith, Penelope Clay, Barbara Gasch, Andrew Kemeny, Viki Murray and Maxine O'Brien.

The author thanks all Australian Opal Centre members, committee members (past and present), volunteers, advisers, donors, granting bodies, member organisations and other supporters; the AOC design and engineering team; the miners, cutters, carvers, designers, jewellers, buyers, sellers, collectors, artists, writers and opal addicts who bring opal to the world; and Gemmology Today for the opportunity to share this story.

This article is adapted from J. Brammall, 'Australian Opal Centre: a glittering palace for the Queen of Gems', *The Australian Gemmologist* 25(9), 304-315, with kind permission.



Len Cram (founding patron) and Rebel Black (president) within the site of the future Australian Opal Centre building



In 2017, the World Gem Foundation will award five scholarships allowing deserving students to take the World Gem Foundation theoretical 'Career Gemmology' course.

Tino Hammid Memorial Gemmological Scholarship



In every industry there are iconic individuals, giants who stand head and shoulders above the rest. In the field of jewellery and gemstone photography, there is little debate that Tino Hammid was a visionary, a rare talent who possessed the unique ability to capture the true beauty of gemstones. For almost forty years his photography adorned the pages of every important publication around the world, showcasing his unrivalled ability to inject realism into his work.

Tino started his career as a staff gem photographer at the Gemological Institute of America (GIA) in Santa Monica, California (1980 to 1982). In 1983 he started his freelance career in gem and jewellery photography and began a 25-year association with David Federman providing photographs for Modern Jeweler's monthly Gem Profile column. During this period they jointly won two Jesse H. Neal awards from the Association of Business Publishers. In 1987 he acquired Christie's Auction house as a client and photographed more than a hundred of their jewellery sales catalogues.

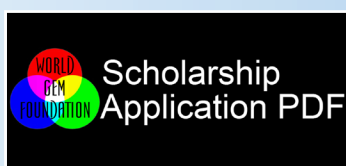
In 2012, Tino joined forces with gemmologist Geoffrey M. Dominy and provided the exquisite photographs for The Handbook of Gemmology, the first digitized gemmological textbook released in 2013.

Sadly, Tino passed away in 2015 after a two-year battle with cancer, however through the Handbook of Gemmology and now the World Gem Foundation courses, his legacy and monumental contribution to our industry will live on for future generations to appreciate and admire.

In 2017, the World Gem Foundation will award five scholarships allowing deserving students to take the World Gem Foundation theoretical 'Career Gemmology' course.

The deadline for submitting your application is December 31st, 2016. All applications will be judged by Tino's wife Petra and his oldest daughter Evelyn with the mandate to select those five candidates who, in their opinion, best epitomize the spirit of Tino.

To download the application form, please click on the image below:



Today women are playing an integral role in the jewellery and gemstone industry from the store front to the classroom. Here we look at the women who are making a difference.



Donna Hawrelko is a well known and respected gemmologist who is the current President of the Canadian Gemmological Association, former President of the Accredited Gemologists Association (USA) (2008 to 2014) and has facilitated and taught the gemmology program at Vancouver Community College for over twenty years.

A Fellow of Canadian Gemmological Association (FCGmA), passing her examinations with distinction and a Fellow of Gemmological Association of Great Britain (FGA), Donna also contributed to the Canadian Diamond Cutting & Polishing course and program, producing a comprehensive diamond cutting manual, which was the first of its kind in the world, and is also a frequent gemmological and jewellery guest speaker on radio and television programs as well as news broadcasts.

From 1997 to 2007, Donna was the Chief Examiner for the Canadian Gemmological Association, preparing, arranging invigilation, and assigning final marks for Canadian Gemmological Association exams and prior to becoming CGA's President, was their Director of Education for seven years overseeing all aspects of the CGA educational program.

Gemmology Today: If we were sitting here a year from now celebrating what a great year it's been for the Canadian Gemmological Association, what would you say was the reason?

Donna Hawrelko: The reasons any reputable gemmological organization could say they've had a good year would be that

their educational goals have been met or exceeded, their affiliations with other likeminded gemmological organizations have expanded, and their membership numbers have grown.

GT: What do you find most challenging about your position with the CGA?

DH: My greatest challenges regarding my presidency, have of course been the time challenges, as there never seem to be enough hours in a day to reach your daily goals. Second to that, the CGA's biggest challenge has come from our technical end, and our website and website servers. I know we are not alone in facing these challenges, but we must all remember that this is now the way of the world, and we must all constantly change thinks, and adapt to accommodate and incorporate the thinking of the times.

GT: What do feel is the biggest challenge facing the CGA and other institutions that offer education to the trade?

DH: An educational organization is always facing the challenge of providing the latest, credible and most current information available, on so many various topics, to our members in a clear and timely manner.

GT: How can we resolve the natural conflict that always exists between science and commerce?

DH: We (all educational organizations) must all work together, rather than working apart, so we are able to provide honest and transparent information to everyone, in all of our organizations!! We must all support rather than compete with one another, so we all become stronger, and more credible to the young people today.

GT: Where do you see the future of gemmology ten years from now?

DH: As the future of gemmological education becomes more challenging, we must understand and support research, and development, and align ourselves not only more closely with gemmological laboratories, universities, equipment developers and manufactures, but as well as our stone dealers, so the bonds and trust is there among all of us. If the bond and trust is strong among all of us, we can instill trust in the public, who currently, look upon many in the trade as being cheats and robbers. The trust within the trade must

be there so the public in turn, can trust the trade, rather than walk away from it. We must all not only support, but promote honesty and ethical behavior in all aspects of the trade.

GT: Do you feel there is equality for women in the jewellery and gem industry?

DH: Equality for women in the trade is slowly evolving, but I say slowly because we have a long way to go before women are looked upon in the same light as the men in the trade. There are still far too few women CEOs in the trade, but we are moving ahead, all be it a glacial speed.

GT: How have the roles played by women in our industry changed over the last thirty years?

DH: I am thrilled to see that women, are not solely in the role of 'sales staff', but are now occupying the chairs as

presidents, directors, CEOs, CFOs and board members of many modern thinking organizations, whether they be educational, non-profit, or for profit.

GT: What advice would you offer to a woman thinking of studying gemmology and entering our industry?

DH: All women regardless of age, race, or marital status, can play an important in our industry!

We have made incredible headway over the last few years, and we must continue to do so if we wanted to be recognized as having an influential role in moving forward. We all only get stronger by supporting one another and by adhering to the strictest moral and ethical standards, regardless of the pressures put on us by others. We want the public to have someone trustworthy to turn to within the trade, who they can rely on, or they will go spend their money on electronics rather than on jewellery.

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PETER GRUMITT owns and operates Apsara, a London based gem wholesale company that started in 1987. He is a respected member of the gem industry, is renowned for his colourful shirts, great sense of humour and his passion for gemstones and gemmology.



A conundrum this corundum

The coloured gem market in Thailand has taken a few knocks over the years but has always managed to bounce back by adapting to new demands and new emerging markets.

In the past the main important job for the buyer was to separate the synthetics, doublets and imitations from natural stones. Flame fusion synthetic rubies and sapphires were quite common but fairly easy to spot with their distinctive curved striae and gas bubbles.



Thai Ruby

Photo: Tino Hamid

During the 80's Thai/Cambodian rubies were prevalent in the market with most stones needing heat treatment to improve their colour by removing brownish or purplish overtones. The main sources for blue sapphires during the 80's were dark inky stones from Australia and milky geuda crystals from Sri Lanka. The Australian sapphires were routinely heated to improve their colour. The milky geuda sapphires were rich in titanium and with high temperature heat treatment these stones were transformed into beautiful bright cornflower-blue sapphires.

In the early 90's the ruby deposits at Bo Rai became less productive. The Thai government also introduced restrictions on mining methods and banned the use of bull-dozers & mining close to the Cambodian border. The Thai mining companies moved their operations over the border to Pailin and began digging for sapphires. Around the same time there was a major discovery of ruby at Mong Hsu in the Shan State,

Burma. Virtually all these rubies needed heat treatment to remove a blue core. Fluxes were also used to 'heal' fractures. These deposits dominated the market for many years.

Towards the end of the decade there was a decline in production from Pailin & Mong Hsu. At the same time there were major ruby & sapphire discoveries in Madagascar. Sapphires began to flood the market in a variety of colours including blue, pink, purple, yellow and green. The pastel colours soon became very popular with many jewellers.

One of the biggest challenges gemmologists and gem dealers faced was the arrival of beryllium-diffusion treatments. In 2002 the Thai market became flooded with sapphires in a variety of new colours including the rare and highly sought after padparadscha. Initially some dealers invested heavily in these new colours until it became apparent that the new colours were artificially induced into the gems by beryllium diffusion. These treatments were to make the biggest impact in the gem market I have witnessed in my career.

The Beryllium treatment was notoriously hard to detect and often required expensive testing. This opened a very large can of worms. At prices in the region of \$500 per stone, testing was more expensive than many commercial stones. After the discovery of beryllium diffusion, treaters began experimenting with new heating processes. A few years on and large quantities of dull looking rubies began to flood the market. Unlike the beryllium treatments the Thai treaters & dealers sold these stones with full disclosure. They became known as 'pao-mai' or new-burn in English. Previous more traditional heat treatments became known as 'pao-gao' or old-burn. Untreated stones were referred to as 'ploi-deep' translating to raw-gem. As time has moved on pao-mai has become a generic term used for any kind of new treatment that has evolved since. Imitations & synthetics are still a problem but the detection of treated stones is now the main challenge to gemmologists, gem dealers & jewellers.

Consumer laws are sparse in Thailand so the bottom line is 'Buyer Beware'. Once the transaction has taken place and money has changed hands there are often no more comebacks, the deal is done. Great care must be taken and each stone should be thoroughly examined, a simple


mistake can prove very expensive. Some treatments have become more acceptable to the trade than others with a variety of price differences but the biggest difference is between treated and untreated. A fine untreated ruby can fetch more than double the price of a comparable heat-treated stone. Lead glass-filled rubies are available for a few pounds per carat but the treatment is not stable or durable. A simple ultra-sonic bath or soaking in jewellers 'pickle' will remove the glass filling.

It is not uncommon to find treated rubies and sapphires being offered as un-treated. This can sometimes be deliberate but often can be a case of ignorance from the broker or dealer selling the stone. Many stones can change hands numerous times before they are used in jewellery. Careful examination of the inclusions is imperative since in the majority of cases they will betray if the stone has been treated. This task however should be bestowed on somebody with considerable experience to ensure that expensive mistakes are not made.

In recent years the increase in demand from new emerging markets and a shortage of fine stones has led to sharp rises in prices of both treated and un-treated stones. Notably blue sapphire prices have risen quite dramatically. I was recently shown two beryllium-treated blue sapphires of 10+ carats in weight. The sapphires were bright, clean, bright blue and showed superb brilliance. The asking price of these stones was in the region of \$3000 per carat! There was no deception from the vendor and the stones were being offered as beryllium-treated sapphires. Untreated blue sapphires were available from both Madagascar and Sri Lanka. Burmese blues are very scarce as much of the material is being sold directly to the Chinese markets.

More recently the falling value of the pound has added to price rises. Worldwide economic and political instability will lead to price fluctuations for the time being.

Mozambique is still the most dominant source of rubies in the gem markets. Many of these rubies are of fine colour needing no treatment to enhance their beauty. Some Mozambique ruby rough can contain fractures or fissures, which treaters will fill with lead-glass. The price difference between a glass-filled ruby and an untreated ruby can be enormous so careful examination is essential when purchasing these stones. The Mozambique deposits have produced some fine 5ct + sized stones with excellent colour and clarity. Fine quality large sizes continue to be in strong demand and prices remain high.



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Let there be light

JOEL DYER is a Canadian currently living in Finland whose greatest satisfaction comes from studying, experimentation and writing articles.



Light and Gemstones - Spectrometric Identification Tools

The Nature and Importance of Light

Many of our readers are well acquainted with the nature and importance of light, since without light and radiated heat there would hardly be any life on earth. Yet perhaps it still would be useful to repeat some facts about the components of light, and above all, the role of light pertaining to the colours and identification of gemstones and minerals.

Light is a form of electromagnetic radiation made up of various components. The 'white light' that we see daily is not truly a white stream of brightness, but consists of a range of energy radiating at different wavelengths. It was the famous 17th century English scientist Isaac Newton who stumbled upon the true nature of light. Newton used a prism to break up light into its differently coloured components, and another prism to recompose the rays back into white light, to prove his point.

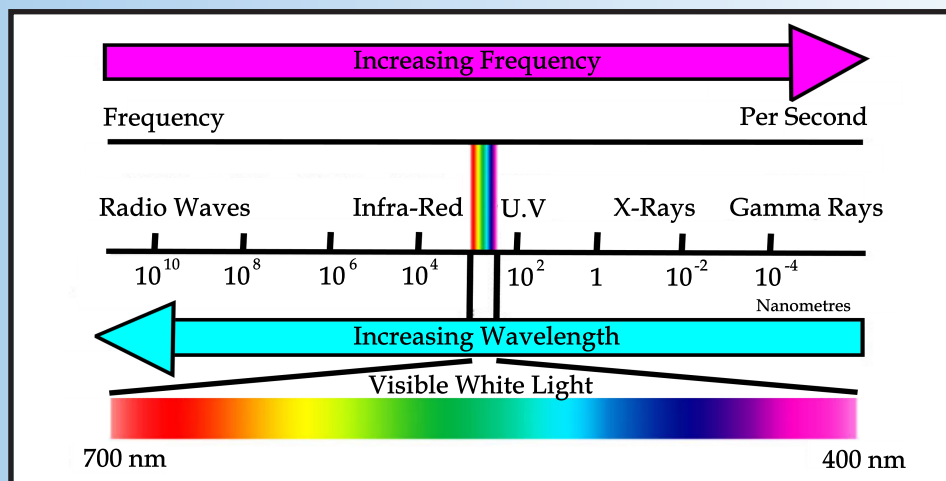
*Wake, the sky is light!
Let's take up the road again
colourful butterfly as a companion*

*Matsuo Basho (1644-1694)
[Author's Adaptation]*

Some insects and animals, for instance, can actually detect light in the UV and Near Infrared (NIR) area, and use this capability for navigation and in searching for nutrition.

Light and Gemstone Colours

Countless articles and many books have been written about the causes of colours in gemstones and minerals, so I shall just briefly discuss the matter here.



The Electromagnetic Spectrum

Every time we see a beautiful rainbow, we're reminded of the fact that light is composed of rays of different colours or wavelengths. Northern lights are often of a more limited colour range, thus they display light of limited colour ranges or spectral bands.

Light visible to humans is located between 400 and 700 nm (nanometer = 1 billionth of a meter) or from violet to red. Outside of that area or spectrum of visible light there is ultraviolet (UV) below 400 nm, and a very broad area of infrared (IR) light starting above 700 nm, where radiation turns, at least partially, into heat.

If all minerals and gemstones transmitted all of the wavelengths equally, they would be colourless and transparent in 'white light'. This would create a rather bland situation, and identifying gemstones by using a majority of the standard testing procedures would be very difficult.

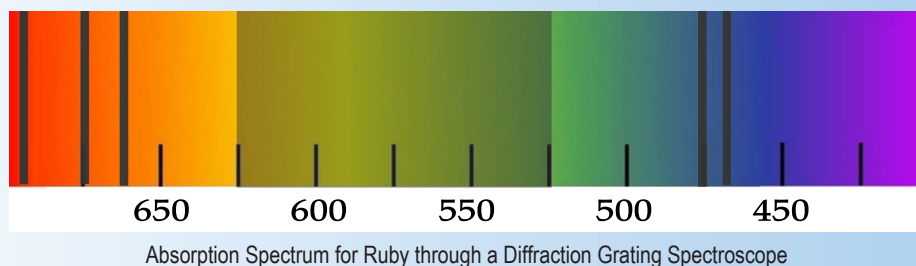
The colours of gemstones are made possible by the very fact that they absorb certain light wavelengths while transmitting others. For example, a ruby is red or purplish red, because most of the green and some of the blue wavelengths are



Natural Ruby & Diamond Ring Photo: Tino Hammid

absorbed. Emeralds, on the other hand, are lusciously deep green because they transmit mostly green light and only a small amount of the blue and red light.

Why some gemstones absorb certain light and transmit or emit light of other colours, is due to their chemical composition and bonding and to their physical, crystallographic structure. Furthermore, in a very large percentage of natural gemstones, there are always imperfections in their structure and impurities in their compositions, such as transition elements or inclusions of other minerals. Add to this radiation in ancient times, and you have yet more reasons for the birth of colour in gems.



Because of well-documented differences in the absorption and transmission of light of varying wavelengths, many spectrometric and other analytical tools are available for the instrumental identification of gemstones.

How can Gemstones be identified with the help of Light?

As every experienced gemmologist or collector of gemstones and minerals knows, gemstones can be accurately identified by a combination of their physical appearance (colour and perhaps

even crystal shape) and their physical and optical properties including their refractive index, birefringence, hardness, specific gravity, colour streak, magnetism, cleavage, presence or absence of dichroism, inclusions (i.e. trigons in diamond), and reaction under colour filters and ultraviolet light.

While identification based on colour alone is impossible without the aid of instrumentation, a vast majority of gemstones possess a unique spectrometric 'fingerprint', resulting from their chemical composition, structure and impurities that makes this possible.

Spectrometry or the Interaction between Matter and Energy

Over the years, gemmologists have used a variety of optical tools to identify gemstones. One of these tools being the spectroscope, first developed by the German optician Joseph von Fraunhofer, at the beginning of the 19th century.

The purpose of the hand-held spectroscope and the more exact spectrometric devices is to split light rays into the different wavelengths, usually onto a horizontal 'map'. While it is often impossible for humans to discern subtle nuances in white light produced by differing light sources, each produces unique 'spectral fingerprints'.

If you point a spectroscope obliquely at the Sun (never directly at it!) you will often see certain dark lines or bands. These dark lines or bands are bandwidths ('colours') at which light is not being transmitted, or have been absorbed by the atmosphere before it reaches the Earth. In a similar way, light reflected from, or having passed through a gemstone will display typical, telltale absorption lines or bands that allow us to separate them from other gemstones.

Gemstones and Scientific Identification Methods

When gemstones, minerals, pharmaceutical products and other materials need to be reliably identified, various technical instruments and scientific methods are used. Among these, we could list SEM-EDS (Scanning Electron Microscope connected to an Energy Dispersive Spectroscope), Microprobe and XRD or X-ray Diffraction.

But other spectrometric methods are available, and are widely used today. In addition to the gemmologist's spectroscope, computer-connected fluorescence or photoluminescence, Raman and Fourier-Transformation spectrometers are increasingly being used. When correctly applied, these spectrometric methods are equally reliable, and in some cases, even more reliable than standard EDS and XRD analysis. For example, gemstones that are partially altered into a glassy semi-crystalline state (i.e. 'metamict') are often easier to investigate using Raman microscopy than the workhorse method XRD.

Inside a Spectrometer

The spectrometer is a device that splits light entering it into different components and usually contains an imaging device, such as a cooled CCD camera, to capture the 'spectral image'.

First the light hits a sub-mm entry slit that is usually vertically oriented, and in this way the 'grouping' of different light rays can be pre-focused prior to being sent forward. Mirrors and / or focusing lenses are then used to direct the rays onto a micro-grooved grating. The grating is responsible for the very important task of spreading the rays of different wavelengths into an array that can ultimately be captured by the digital camera sensor. Usually cooled black and white CCD sensors capture the vertical bars or bands that correspond to the more or less intensively lit areas of the sensor.

Captured image files are then converted into a numerical format. Many astrocameras suitable for spectrometry can save the images directly as suitable FITS files. The converted files are then opened in a spectral computer program, where the line or band positions are located on the horizontal X-axis and the intensity (or brightness) values are shown on the vertically oriented Y-axis.

Hobbyists and professional astronomers have long connected spectrometers to their telescopes that allow them to capture the well-documented patterns and spectra produced by the gases and other elements contained in the planets and suns. These radiate valuable information regarding their former or current composition by using light and other electromagnetic radiations.

Gemstones and Modern Spectrometric Methods

In the emission-transmission spectroscopy of gemstones, usually a strong halogen lamp or a xenon lamp is used since these transmit the necessary broad range of wavelengths. For fluorescence measurements a UV lamp, or more precisely, a UV Laser or UV LED, is frequently used. Raman spectroscopy, which is becoming more popular in the field of gemmology, requires the use of very narrow band or 'monochrome' light. Common Raman illumination (i.e. 'Excitation') sources include 532nm green or red lasers in the range of 630-660nm but also UV and Near-Infrared (NIR) wavelengths such as 785nm are

popular. Lasers have the benefit of bending and concentrating focusable energy in a very small area. Laser beams are usually limited to power levels of 30-300mW, so as not to damage sensitive materials, including certain gemstones or minerals.

Emission-transmission spectrometry is often sufficient for identifying many gemstones, and the addition of UV fluorescence spectrometry will give further information on the nature of the investigated sample. These methods will show typical bands and lines in spectra, due to impurity elements contained in the gemstones or other factors that give rise to their colour and light behaviour.

Raman-spectroscopy has become a very important non-invasive, or non-destructive, analytical technique in a vast range of disciplines. When a strong monochromatic excitation source such as a laser is aimed at substances, molecular bonds and atoms scatter backlight mostly of the same wavelength (Rayleigh scattering). But at the same time, a million or even a smaller part of the scattering is of wavelength-shifted Raman type, which tells us a lot about the chemical structure and bonds of the material under investigation. This technology opens up vast new possibilities.

The uses of Raman Spectroscopy

As mentioned above, Raman spectroscopy aims at capturing very weak scattered light that gives us well-researched, reliable information about an investigated material's nature. Shorter excitation wavelengths give a much stronger signal, but can be affected by fluorescence effects. Near-Infrared beams suffer less from fluorescence, but the Raman signal is very much weaker and can produce more background noise versus signal.

Raman spectrometers or probes are used for a variety of purposes including airport or customs officials who will scan a person's bag or bottle of liquid for possible drugs, explosives or other illegal substances. In these instances, mostly Raman probing, or at least some sort of spectroscopic method, is used for identifying even minute traces of chemicals.

Archaeologists, art historians or auction houses can also use safe, non-destructive Raman spectroscopy to differentiate fakes from the authentic article by comparing paints and pigments against databases of known spectra. Modern biology, pharmacology and planetary research would be far more difficult without the possibilities offered by Raman and other specialized spectroscopic methods, as would criminal investigations.

The main drawback with Raman spectroscopy has always been the high cost of the equipment. Portable or compact sized Raman devices currently cost anywhere from 10.000 to 50.000€ while research level microscopes range in price from 100.000 to 250.000€ with the cheapest basic Raman microscope costing 30.000€ plus taxes. Compare this to an

ordinary spectroscope costing around 100€ and it is not hard to see why these advanced instruments are beyond the reach of many people....but for how long? That is another matter.

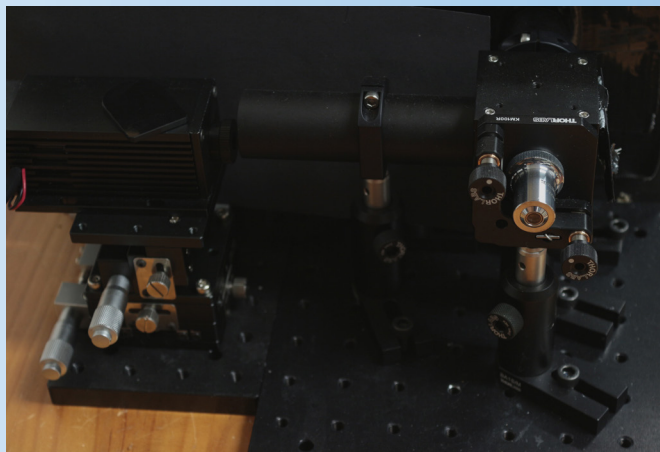
The Author's own Raman Project

After attending the well-organised Scandinavian Gem Symposium in Kisa, Sweden this June, I became more and more interested in the spectroscopic identification of minerals, especially after seeing the demonstrations at the conference. Gemstone and mineral analysis is expensive and time-consuming with prices ranging from 100 to 200€ in Finland per sample for an XRD or EDS analysis and this does not include the cost of any preparation work required.

It occurred to me that by utilising my own microscopes including a Jena trinocular stereoscope, a Lomo Min-8 polarised petrological microscope (with polarisation, colour filter, waveplate retarder slots, a Bertrand lense for conoscopy and a special Lomo photographic adapter) and an inverted microscope for metallography (with a Zeiss Jena Epityp-2 with built-in photoport and 4x-50x infinity objectives), macro and photomicrography possibilities, equipment for making polished sections and even epoxy preparates for analysis that I could carry out my own analysis of minerals and gemstones.

I was encouraged by a professor at the Geological Survey of Finland to build my own Raman Microscope. GSF do not currently have their own Raman equipment, due to the high cost of the research models, and I felt they could benefit from this 'don't break my bank account' technology.

While the original plan involved the use of cheaper lasers to create a high-resolution system, it is now apparent that this is not feasible. With a critical filter alone costing approximately 700€ tax-free, the need to replace the DIY spectrometer housing with the proper Thorlabs Laser Protective Shielding, a



Microscope unit waiting for laboratory laser and ocular focus block

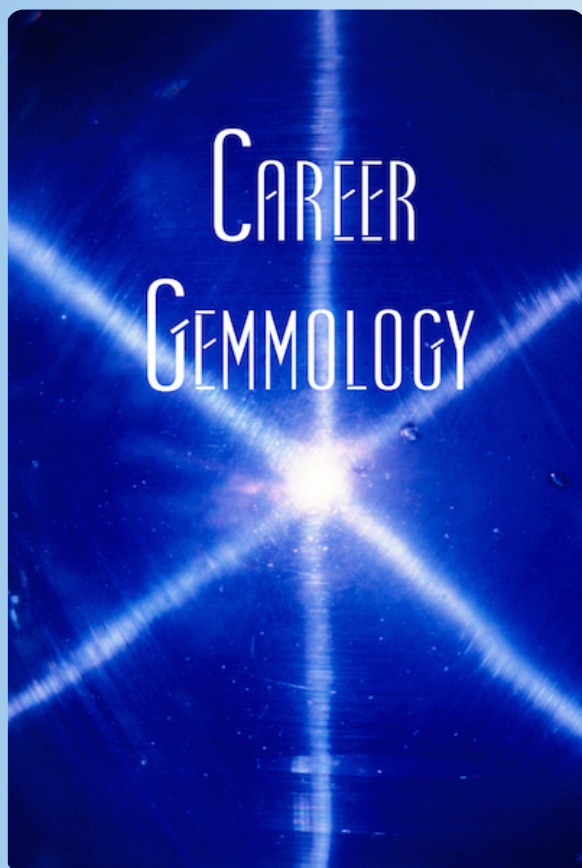


Part of the high-resolution spectrometer adapted after a Belgian Model

laboratory class laser (3000€ investment) and an ocular focus system for the microscope unit, the original 'Project Budget' has more than doubled.

Thankfully, however, the proverbial 'light' is now visible at the end of the tunnel as the project enters the final stages of completion.





Prerequisites

None

Lessons

Seventy-Eight

Course Objectives

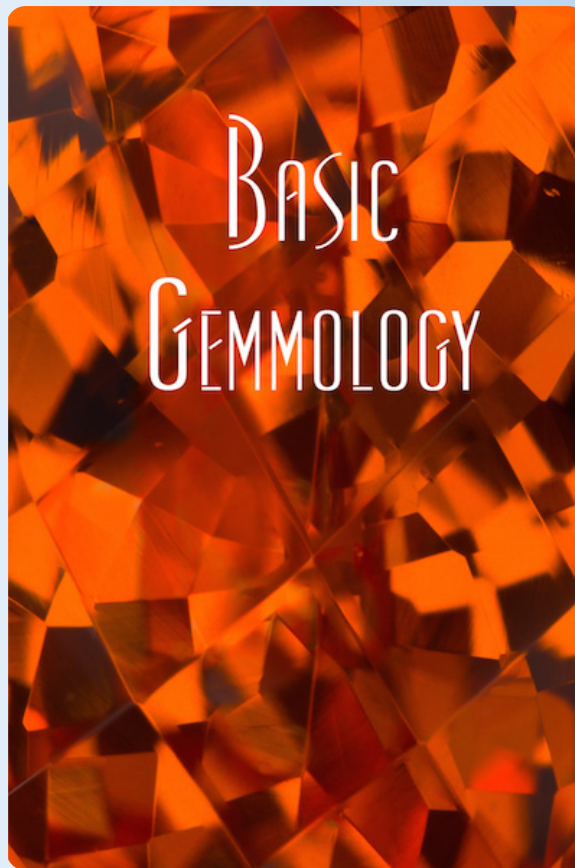
Interested in becoming a professional gemmologist? In this course you will learn all about the various instruments used to identify gemstones, the scientific principles they are based upon, how to distinguish imitation and lab-created gemstones from their natural counterparts, how to detect the various treatments used to improve the appearance and/or value of gemstones, how gemstones are mined and cut, the grading procedures for diamonds and coloured gemstones, the identification of gemstones, advanced gem testing techniques and a comprehensive overview of twenty-seven of the most popular gem species found in the gem and jewellery industry.

Topics Covered Include

The chemical nature of gemstones, their physical and optical properties, basic crystallography, the absorption of light, the spectroscope, refraction, reflection and the refractometer, polarized light, the polariscope, pleochroism, the dichroscope, colour filters, specific gravity, luminescence, magnification, thermal conductivity, imitation, assembled and lab-created gemstones, the methods used to manufacture lab-created gemstones including Verneuil, Czochralski, flux melt, hydrothermal, skull crucible, zone melt, horizontally oriented crystallization, high pressure, high temperature (HPHT), chemical vapour deposition (CVD), detonation, ultrasonic cavitation, sublimation method, and modified Stober method, their unique identifying features, treatments and enhancements including heat treatment, surface and sub-surface diffusion, lead glass fracture filling, flux assisted partial fissure healing, glass fracture filling, cobalt doped glass filled sapphires, clarity enhanced diamonds, high pressure, high temperature (HPHT), quench-crackling, surface modifications, coatings and foil backs, laser drilling, and irradiation, gem mining and cutting, diamond and coloured gemstone grading, gem identification by colour and transparency, advanced gem testing techniques and a comprehensive overview of the twenty-seven most common groups, species and varieties including diamonds, corundum (rubies and sapphires), beryl (emeralds, aquamarines and other precious beryls), chrysoberyl (alexandrite and other chrysoberyl), spinel, zircon, topaz, tourmaline, peridot, quartz, garnet, tanzanite, lapis lazuli, turquoise, opal, jadeite, kunzite and hiddenite, feldspars, iolite, andalusite, diopside, apatite, pearls, coral, jet, ivory and amber.

Digital Course Cost: 1400 Euros / 1100 Pounds Sterling / 1600 USD / 105000 Indian Rupees / 159600 Kenyan Shillings

Please Note: Course fees include VAT where applicable



Prerequisites

None

Lessons

Ten

Course Objective

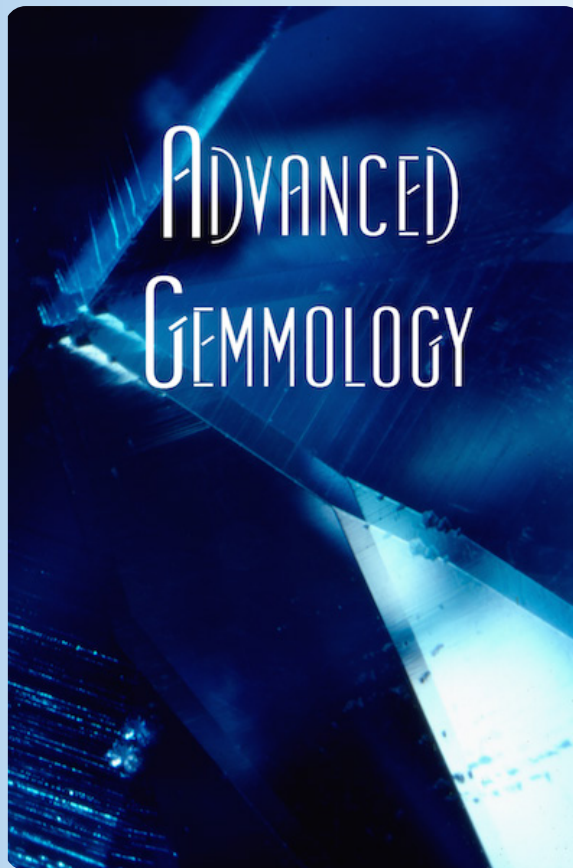
You will learn about the various instruments used to identify gemstones, and the scientific principles they are based upon.

Topics Covered Include

The chemical nature of gemstones, physical and optical properties, basic crystallography, the absorption of light, the spectroscope, refraction and reflection, the refractometer, optical character and sign, dispersion, reflectivity meters, polarized light, the polariscope, pleochroism, the dichroscope, colour filters, specific gravity, luminescence, magnification and thermal conductivity.

Digital Course Cost: 200 Euros / 150 Pounds Sterling / 225 USD / 15000 Indian Rupees / 22800 Kenyan Shillings

Please Note: Course fees include VAT where applicable



Prerequisites

Basic Gemmology

Lessons

Twenty-Two

Course Objective

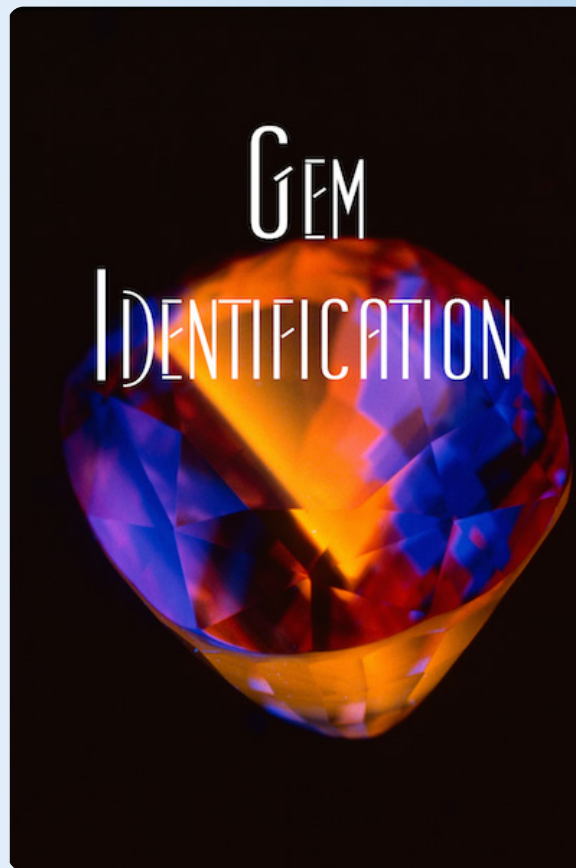
In this course you will learn about imitation gemstones, the different methods used to manufacture lab-created gemstones, how to distinguish them from their natural counterparts, and how to detect the various treatments used to improve the appearance and/or value of gemstones.

Topics Covered Include

Imitation and composite gemstones, methods used to manufacture lab-created gemstones including Verneuil, Czochralski, Flux Melt, Hydrothermal, Skull Crucible, Zone Melt, Horizontally Oriented Crystallization, HPHT, CVD, Detonation, Ultrasonic Cavitation, Sublimation Method, and Modified Stober Method, their unique identifying features, treatments and enhancements including heat treatment, surface and sub-surface diffusion, lead glass fracture filling, flux assisted partial fissure healing, glass fracture filling, cobalt doped glass filled sapphires, clarity enhanced diamonds, HPHT, quench-crackling, surface modifications, coatings and foil backs, laser drilling, irradiation, and advanced gem testing techniques.

Digital Course Cost: 400 Euros / 300 Pounds Sterling / 450 USD / 30000 Indian Rupees / 45600 Kenyan Shillings

Please Note: Course fees include VAT where applicable



Prerequisites

Basic & Advanced Gemmology or equivalent

Lessons

Twelve

Course Objective

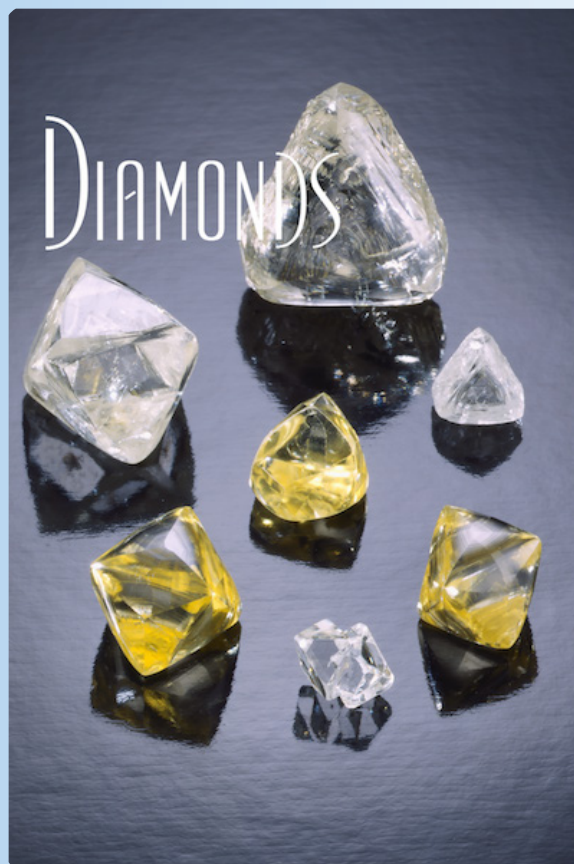
Unlike other programs, this course takes a more practical look at the identification of gemstones based on colour and transparency. Each colour grouping is further divided into gemstones that fall above or below the range of the refractometer, are singly or doubly refractive, uniaxial, biaxial or non-crystalline, and phenomenal or unusual in appearance.

Topics Covered Include

Introduction to gem identification and the tests that are commonly used to identify gemstones. An in-depth look at each of the ten colour groupings (colourless or white, red, pink, orange, yellow, blue, green, violet or purple, brown, black or grey) plus phenomenal or unusual gemstones. Important varieties and species of gemstones that commonly occur within each colour grouping. How to distinguish gemstones that are commonly confused with each other (i.e. aquamarine and blue topaz, emerald and chrome tourmaline, diamond and lab-created moissanite) or have physical and optical properties that are similar (i.e. amethyst quartz and purple scapolite). All lab-created, imitation, treated and enhanced gemstones that are found in each colour grouping.

Digital Course Cost: 225 Euros / 175 Pounds Sterling / 250 USD / 16875 Indian Rupees / 25650 Kenyan Shillings

Please Note: Course fees include VAT where applicable



Prerequisites

None

Lessons

Eight

Course Objective

Upon completion of this course, students will have a comprehensive understanding of the chemical nature of diamonds, how they are formed, classified (colourless and fancy coloured), mined, processed and cut, the unique properties that allow them to be separated from other colourless gemstones, and how they are graded.

Topics Covered Include

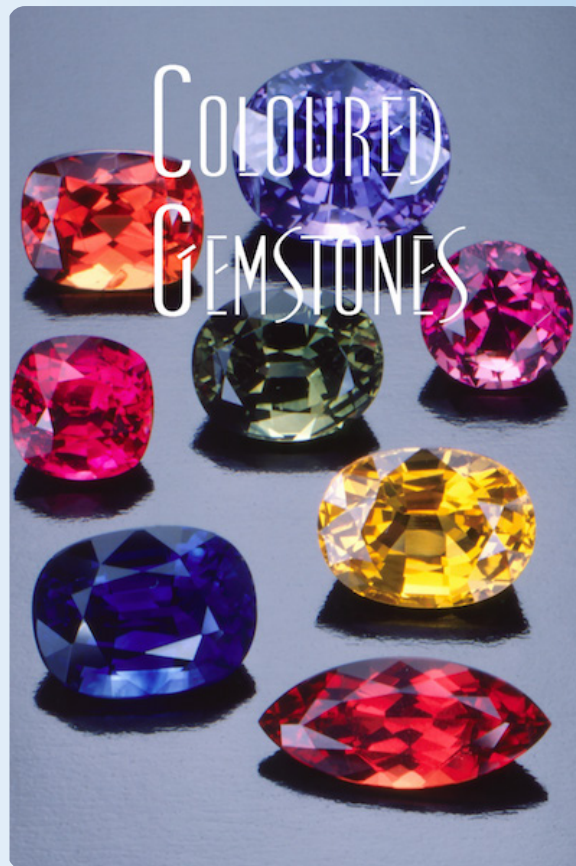
Physical properties, geology, localities, principle mines, crystal system, chemical composition and classification, fancy colours, causes of colour, absorption spectra, pleochroism, inclusions, fluorescence, mining, gem identification, methods of synthesis, common treatments and enhancements.

Diamond Grading

You will learn all about the 4 C's (colour, clarity, cut and carat weight) and how they are measured and assessed. We will also compare the various 'Cut' criteria for the Gemological Institute of America (GIA), the American Gem Society (AGS), Hoge Raad Diamant (HRD), International Gemological Institute (IGI), the European Gemological Laboratory (EGL), and Accredited Gem Appraisers (AGA) and explain how the estimated weight of a 'mounted' gemstone is calculated.

Digital Course Cost: 225 Euros / 175 Pounds Sterling / 250 USD / 16875 Indian Rupees / 25650 Kenyan Shillings

Please Note: Course fees include VAT where applicable



Prerequisites

None

Lessons

Twenty-Nine

Course Objective

This course concentrates on the twenty-six most common groups, species and varieties of coloured gemstones giving a comprehensive overview of their physical and optical properties, their unique identifying features, and how they are graded.

Topics Covered Include

Physical properties, geology, localities, crystal system, chemical composition and causes of colour, varieties, absorption spectra, pleochroism, inclusions, fluorescence, gem identification, synthesis, common treatments and enhancements, and care guidelines. Gemstones covered in this course include corundum (rubies and sapphires), beryl (emeralds, aquamarines and other precious beryl), chrysoberyl (alexandrite and other chrysoberyl), spinel, zircon, topaz, tourmaline, peridot, quartz, garnet, tanzanite, lapis lazuli, turquoise, spodumene (kunzite and hiddenite), feldspars, iolite, andalusite, diopside, apatite, and organic gems (pearls, coral, jet, ivory, and amber).

Coloured Gemstone Grading

You will learn how to accurately describe colour based on hue, tone and saturation, the various colour grading systems currently used by professionals, the clarity classification of gemstones based on their geological environments, how cut is assessed, opal, jadeite and pearl grading, and how weight is assessed in a 'mounted' coloured gemstone.

Digital Course Cost: 500 Euros / 400 Pounds Sterling / 550 USD / 37500 Indian Rupees / 57000 Kenyan Shillings

Please Note: Course fees include VAT where applicable



General Interest

Opals

From the origins of the name, to their formation within the earth's crust, to the mistaken belief that they are purveyors of bad luck to the optical phenomenon that produces such a mesmerizing and tantalizing array of spectral colours and patterns, opal is indeed a 'stone of mystery'.

Jade

Jade, on the other hand, is not only desired and valued for its beauty but also for the unique and venerable position it has held in the cultural fabric of many great and storied civilizations, from the Chinese empire, where it was once considered its most valuable commodity, to the pre-Columbian civilizations of the Olmec, Maya, and Aztec of Central America (Mesoamerica), who valued it more than gold, to the Maoris of New Zealand.

Topics Covered Include

Topics covered in the course include their physical and optical properties, geological formation, crystal systems, chemical composition, varieties and classification, cause of colour, absorption spectra, common inclusions, fluorescence, mining, grading criteria, methods of synthesis, gem identification, common treatments and enhancements, cleaning and care instructions, and pricing.

Digital Course Cost: 75 Euros / 60 Pounds Sterling / 85 USD / 5625 Indian Rupees / 8550 Kenyan Shillings

Please Note: Course fees include VAT where applicable



General Interest

Course Objective

The science of gemmology is still relatively young, a hybrid of many different scientific disciplines including not only geology, mineralogy, physics and chemistry but also biology, zoology and botany. This course explores a very select group of gemstones (coral, jet, amber, ivory and pearls), formed through organic processes rather than through geological forces deep within the earth's surface.

Topics Covered Include

Topics covered include their physical and optical properties, geological formation, crystal systems, chemical composition, varieties and classification, cause of colour, common inclusions and internal characteristics, fluorescence, pearl grading criteria, methods of synthesis, gem identification, common treatments and enhancements, and cleaning and care instructions.

Digital Course Cost: 50 Euros / 40Pounds Sterling / 55 USD / 3750 Indian Rupees / 5700 Kenyan Shillings

Please Note: Course fees include VAT where applicable

Practical Workshops

Diamond Grading & Lab-created Diamonds (8 Days)

This workshop includes practical instruction on how to clarity and colour grade diamonds, techniques to determine table percentage, crown angle, girdle thickness and pavilion depth percentage, how to access polish and symmetry and the identification of lab-created and treated diamonds.

Course Cost: 1,750 Euros / 1,400 Pounds Sterling / 2,000 USD / 199,500 Kenyan Shillings

Coloured Gemstone Grading #1 (5 Days)

This workshop includes practical instruction on how to access the hue, tone and saturation of coloured gemstones and how to grade pearls, jadeite and opals. During this practical class three colour grading systems; GIA, GemDialogue and World of Color will be discussed.

Course Cost: 500 Euros / 400 Pounds Sterling / 550 USD / 57,000 Kenyan Shillings

Coloured Gemstone Grading #2 (100 Hours Online)

This online coloured gemstone course consists of a comprehensive overview of the GemWizard Colour Grading System and includes practical exercises that are completed online and a six month subscription to their program.

Course Cost: 1000 Euros / 800 Pounds Sterling / 1,150 USD / 114,000 Kenyan Shillings

Gemstone Identification #1 (5 Days)

This workshop covers the identification of red, pink, orange, yellow and green gemstones plus a section on crystallography.

Course Cost: 500 Euros / 400 Pounds Sterling / 550 USD / 57,000 Kenyan Shillings

Gemstone Identification #2 (5 Days)

This workshop covers the identification of blue, violet/purple, brown, black and phenomenal/unusual stones.

Course Cost: 500 Euros / 400 Pounds Sterling / 550 USD / 57,000 Kenyan Shillings

Lab-created and Treated Gemstones (5 Days)

This workshop focuses on coloured gemstones produced synthetically or treated to improve their appearance.

Course Cost: 500 Euros / 400 Pounds Sterling / 550 USD / 57,000 Kenyan Shillings

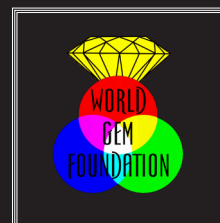
Sessions

Classes run from 9.00am to 12.30pm and 1.30pm to 4.30pm with scheduled coffee/tea breaks of 15 minutes. Students are required to supply their own 10X loupe and polishing cloth. All other equipment will be provided by the 'Host' Gem Academy.

Please Note: To complete the 'Career Gemmology' program and receive the diploma, students must complete the 'Career Gemmology' theory course or the five component courses (Basic Gemmology, Advanced Gemmology, Gem Identification, Diamonds and Coloured Gemstones) plus all of the aforementioned practical workshops and the online Coloured Gemstone Grading course.



Academy Directory & Contact Information



Academy Name	Address	Tel. No	E-mail Addresses
World Gem Foundation	Plaça de Quadrado 1, 4B, Palma, Mallorca, 07001 España	+34 871904592	Information@worldgemfoundation.com
British	Strensham Court Mews, Strensham, Worcester, WR8 9LR, United Kingdom	+44 7931744139	information@britishgemacademy.com
Caribbean	Calle de Alenza, 1, Madrid, 28003 España	+34 914 414 300 or +34 682 096 757	latinamerica-ga@ige.org
Central American	Calle de Alenza, 1, Madrid, 28003 España	+34 914 414 300 or +34 682 096 757	latinamerica-ga@ige.org
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SRDC World Gem	9 / 211, Suratwala Bldg, Prarthna Samaj, Near Opera House, Mumbai - 4. India	+91 22 2382 3412 +91 22 2382 4471 (Telefax) +91 93222 62357 / +91 98202 17183 (Mobile)	info@srdcindia.com

