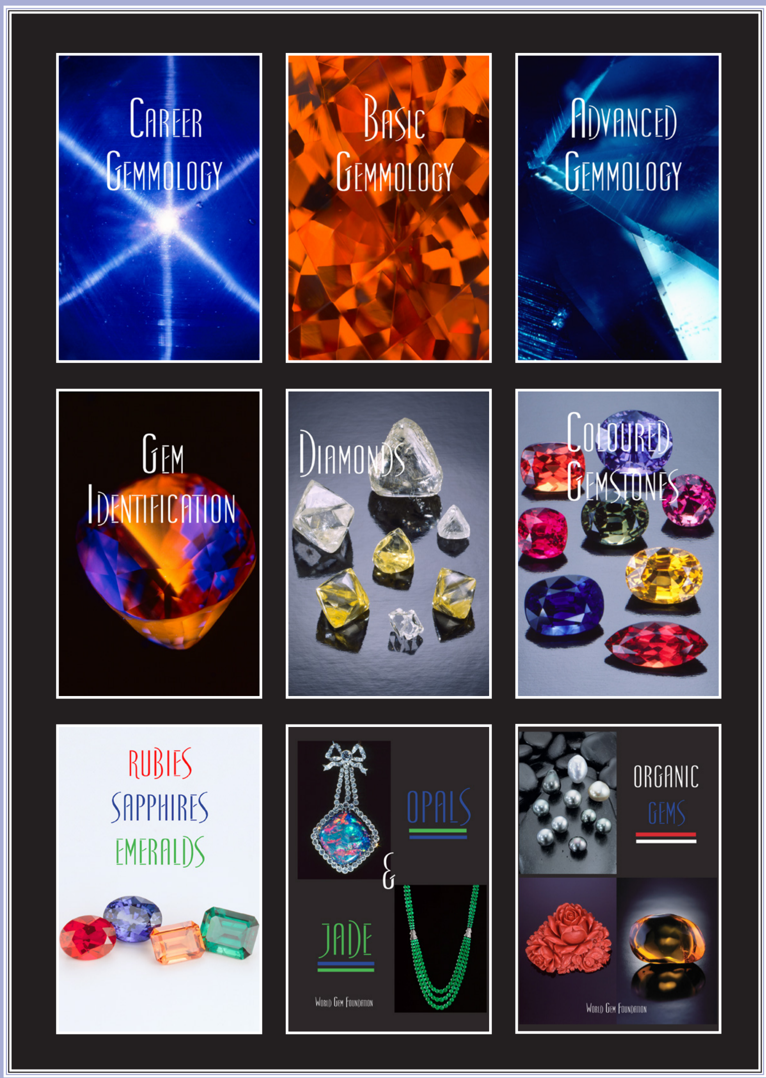
Gemmology Today

September 2018
Quarterly Publication

Where's my pot of gold?



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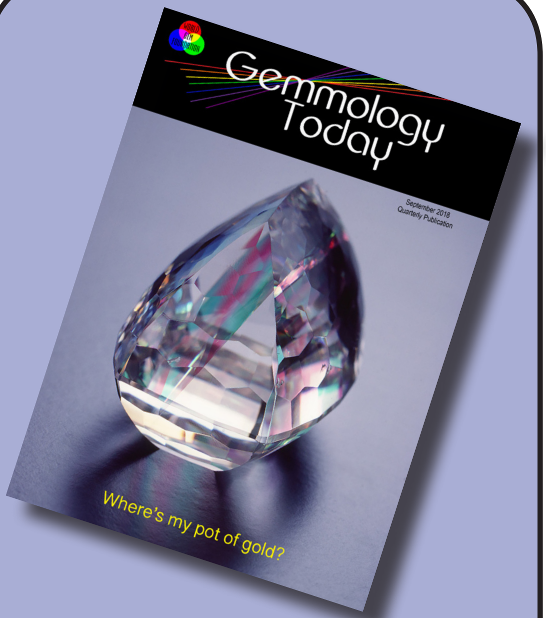
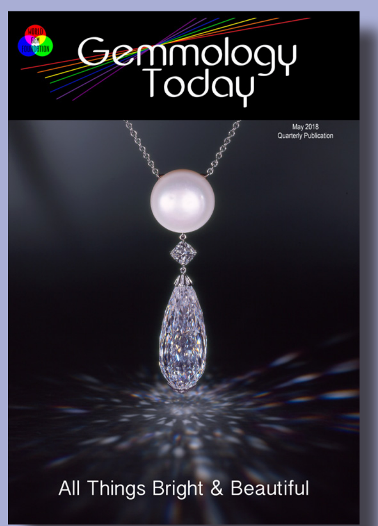


Cover Photograph by Tino Hammid

Published by The World Gem Foundation & Amazonas Gem Publications

Editor Geoffrey M. Dominy



May 2018 Issue

Editor at Work

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

The photo above was taken by Tino Hammid along with the cover image; same stone just a different angle. For those of you who are not familar with this gemstone it is called Rainbow Calcite; hence the cover title 'Where's My Pot of Gold?'. While it is not a gemstone suited for everyday wear, it is a stunning gemstone that should grace any serious gemstone connoisseur's collection.

You may be wondering why this issue is late. Well in reality it is not late, we have simply changed the publication dates because having issues published in mid-February and mid-May made it impossible to include reports on the Tucson and JCK Las Vegas Shows. We felt producing a report three months after the fact was somewhat redundant. August is also a tricky month to publish a trade magazine since the majority of people are in 'holiday mode' and perhaps not in the mood to read an industry publication. Having a December issue also provides the opportunity for people over the Christmas period to indulge in something a little less fattening.

This issue features an interview with Dalan Hargrave and an expanded section that includes some of his work. Typically we ask our interviewees for ten images but Dalan's wife Kathy was very kind to send us over 130 images and it seemed a shame not to share more of them with our readers. I think you will agree that Dalan has a very special talent, a talent shared by a growing number of artisans who have truly taken gem cutting to a whole new level. It is hard to think back to the 'Bad Old Days' when cutters thought that weight retention was the nirvana of every lapidary. Fortunately the industry is now embracing the artistic value of these gemstones and are willing to pay a higher price for them.

We are also including an expanded article by Michael D. Cowing about the evolution of the 'Ideal Cut'. I am not sure I have ever met anyone who is more passionate and dedicated to diamond cutting than Michael as he tries to change the way we look at diamond brilliance. The industry needs more people like Michael!

This issue also includes articles on 'Diamond Enlightenment' by Jan Asplund, the importance of iron as a transition element (Pumping Iron) and Turquoise - Persian Nights by myself, Kirk Feral's look at the Gemstone Viewer, Antoinette Matlin and the importance of UV light, Richard W. Wise's review of 'Stoned, Jewelry, Obsession, and How Desires Shapes the World' by Aja Raden, 'Spice of Life' where Leone Langeslag looks at a gemstone that is truly under-rated; Fire Agate and an article on Gold Sheen Corundum by Kyalo Kiilu.

Once again a big thank you to all our contributors and you, our readers, for making Gemmology Today such a success!

Kirk Feral is a man who is passionate about gemmology. He particularly likes to make it more accessible by getting back to basics. In a world of high-tech instrumentation, Captain Kirk brings us down to earth.

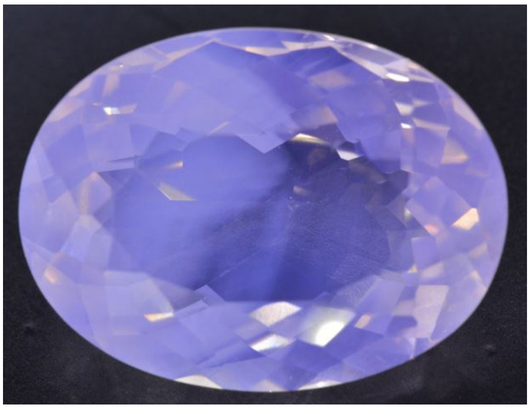
A Heavenly Light: The Gemstone Viewer

A Gemstone Viewer is one of the most effective lighting tools for viewing loose faceted gems with the naked eye. This tool can bring out the best in a gem, and many gems virtually burst with color and brilliance when placed within a Gemstone Viewer.

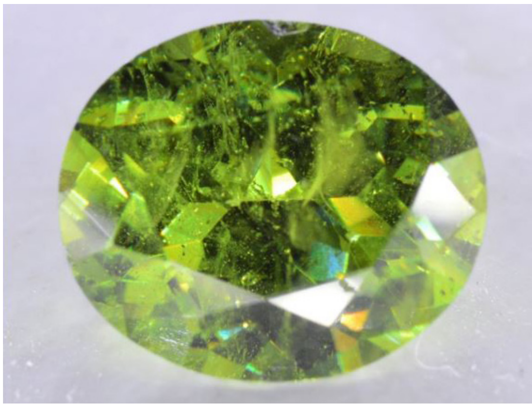
Uses: A Gemstone Viewer is a moderately bright LED light source that provides reflected light and transmitted light at the same time, with light coming from the sides rather than from overhead or below.

Lavender Quartz in Daylight

Demantoid Garnet in Daylight



Lavender Quartz in Gemstone Viewer

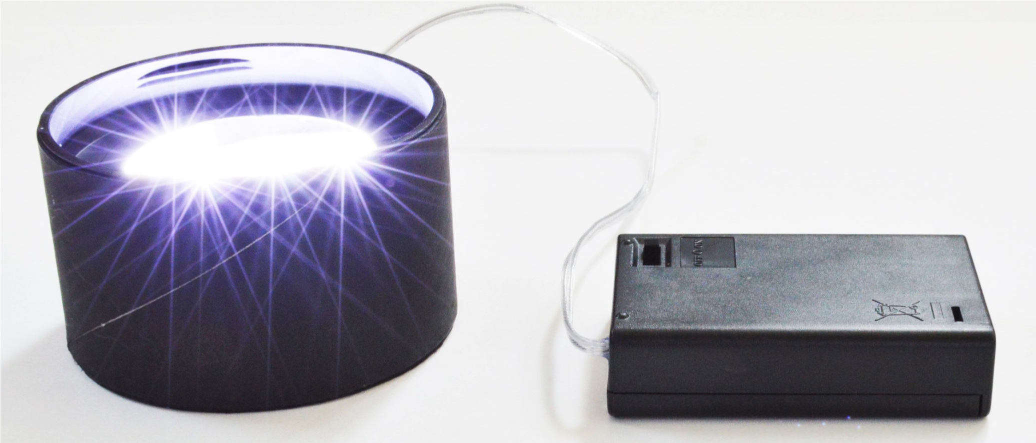


Demantoid Garnet in Gemstone Viewer

A Gemstone Viewer is the term I use for an inward facing LED ring light set within a black cylinder. Surprisingly, this type of light source is not commercially available. All commercially-made ring lights used in gemology face downward and are made for examining gems in reflected light.

My idea for this light source was inspired by the Ferrocell Magnetic Field Viewer developed by magnetics researcher Timm Vanderelli. You can purchase a Ferrocell Viewer for $100 online directly from Tim, or you can make your own Gemstone Viewer at home for under $20 (see page 7).

Magnetic Field Viewer



Gemstone Viewer

This arrangement highlights color, cut and clarity in faceted gems, and at the same time accentuates gem brilliance, luster and dispersion.

Unlike overhead lighting, the gemstone viewer keeps the glare of reflected light to a minimum. And because light is not transmitted from below the gem but rather from all sides, we are able to see the full fire of the gem.

We can choose to view gemstones through the Viewer on either a black or white background by placing interchangeable circles of black or white material (paper, plastic or fabric) at the bottom of the viewer. Generally, dark stones are best viewed on a white background, and light stones are best viewed on a contrasting black background.

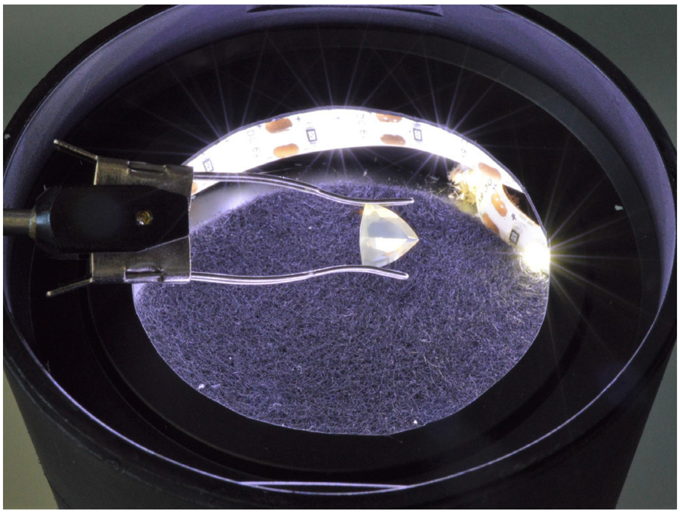
The Gemstone Viewer can also serve as a darkfield for magnified viewing through a microscope or a loupe. It reduces the glare that we sometimes encounter with traditional darkfield condensers that have high-intensity lights. However, because the gemstone viewer is not a high-intensity light, it's not suited for viewing dark stones under magnification.

We can also use a Gemstone Viewer as the light source for an immersion cell. Just place a plastic gem jar filled with water at the bottom of the Viewer. Immersion cells are normally backlit, but the sidelighting of the Gemstone Viewer works equally well. The advantage here is that we don't have backlighting shining into our eyes.

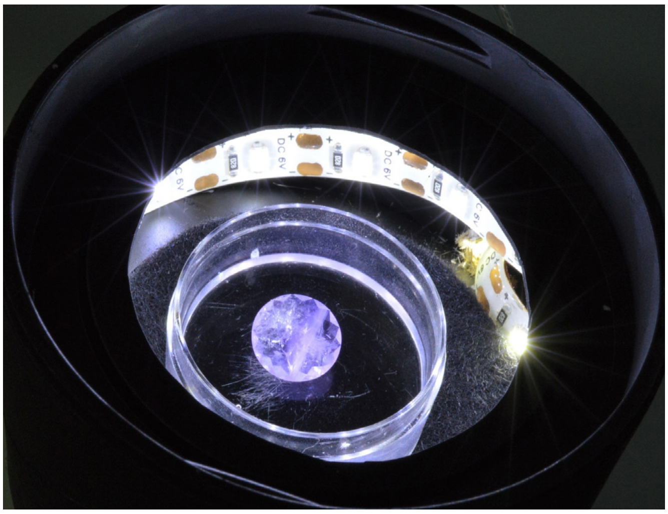
Limitations: Gem Viewers don't always provide the best light source for viewing gems. They are not quite as good as bright overhead LED lighting for viewing brilliance and dispersion in adamantine gems such as diamonds and cubic zirconia. Gemstone Viewers are also not suited for viewing very dark transparent stones, which require strong backlighting to reveal the body color.

Gem phenomena such as stars also cannot be seen with a Gemstone Viewer. Due to excessive light reflection, gems mounted in jewelry and gems cut in cabochon are also not suited to the Gemstone Viewer.

Also, the LED light in a Gemstone Viewer tends to emphasize cool (violet and blue) gem colors over warm colors (orange and red), even when 'warm white' LED light is used. Red gems appear more intensely red when incandescent light is used as opposed to the Gemstone Viewer's LED light.



Darkfield



Immersion Cell

Make Your Own Gemstone Viewer

You can buy a pre-fabricated Magnetic Field Viewer that works extremely well as a Gemstone Viewer from http://www.ferrocell.us/buy%20complete%20systems.html.

This is the 62mm Handheld Viewer sold by Ferrocell USA for $99.90. Or you can also make your own Gemstone Viewer that's nearly as effective by lining the inside of a black cylinder with a strip of LED lights. The cost of components is under $20.

Components

1. A 3" diameter x 36" long mailing tube with standard plastic endcaps (Amazon.com, $9)
2. A flexible LED light strip kit with battery-operated light switch (Amazon.com, $10). Product Description: MOMO 6.6ft LED Flexible Strip Lights 120 Units cool white SMD 3528 LEDs Battery Operated. Choose from either cool white or warm white.
3. Three AA batteries

Instructions for Assembly

Cut a 1 ¾" diameter cross section from the end of the mailing tube. Then spray paint the caps and the tube cross-section black, inside and out. Let dry and insert one of the endcaps back into one end of the black tube cross-section to serve as the base of the Viewer.

Cut out the center of the remaining endcap, leaving just a ½" plastic outer ring. The plastic endcap ring or rim will serve as a light shade that sits on the top of the Gemstone Viewer. This will help shade your eyes from the bright LED lights that you'll place inside.

Punch a small hole into the side of the tube cross-section at the bottom, just above the base endcap. Now you're ready to line the inside of the tube cross-section with the LED strip lights.

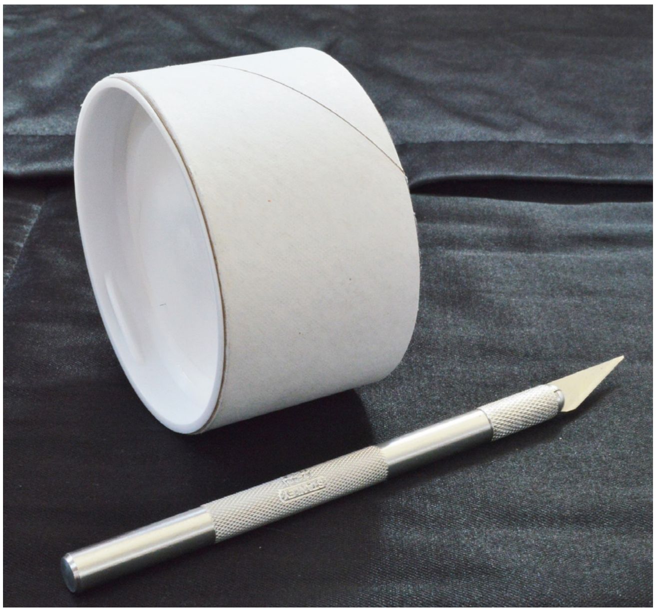
First, uncoil the strip lights and remove from the reel completely. Measure off an 18" section starting from the end of the wire that connects to the battery pack. Use scissors to cut the strip at the nearest cut point, represented by 2 gold ovals. Insert the batteries into the battery pack and turn on the lights to make sure all the diodes are working properly.

Now insert the end of the light strip into the hole you punched into the bottom of the black tube, and string the light strip all the way through the hole and out the top of the tube. The light strip has a self-adhesive backing. Remove the paper strip covering the adhesive, and begin pressing the self-adhering strip in spiral fashion around the inside of tube, starting at the hole in the bottom.

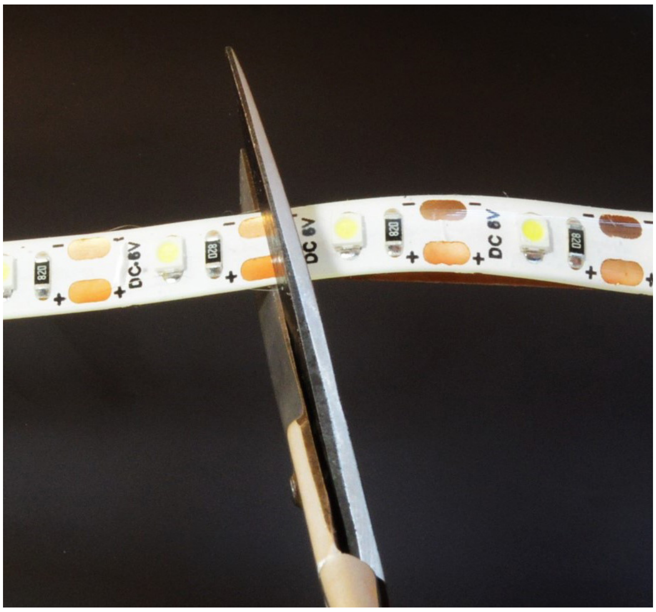
The 18" strip is long enough to tightly spiral around the inside of the tube 3 times. Leave a ¾" high space above the last light strip near the top of the tube so that the top endcap ring can be inserted. Insert the black end cap ring into the top of your Gemstone Viewer.

LED Strip Lights with Battery Pack

Finally, line the bottom of the tube with a circle of black paper, plastic or fabric. For darker gems, use a white background instead of black. Place a gemstone in the bottom of the viewer and switch on the lights. Viola, a great way to view the beauty of a faceted gem!



Cutting the Mailing Tube



Cutting the Strip Lights

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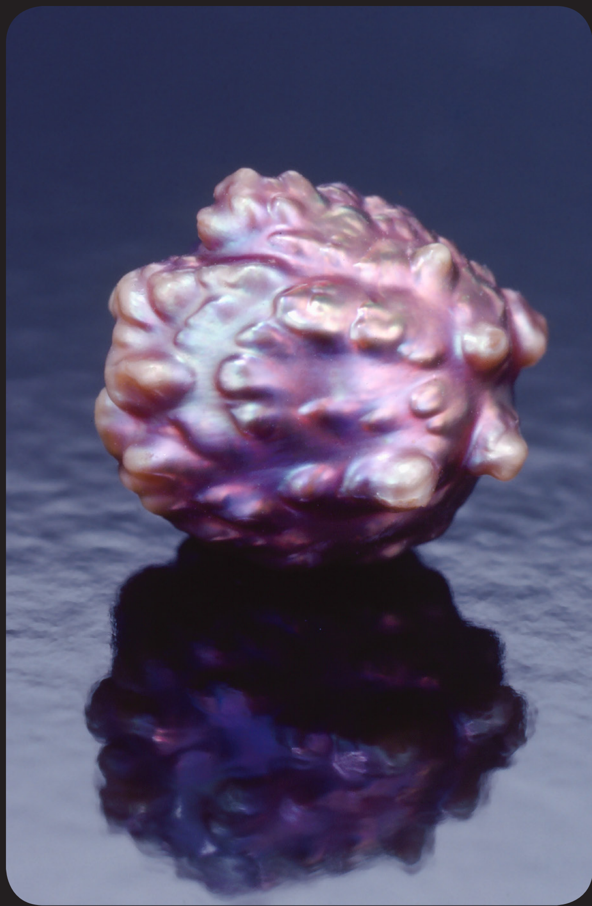
Gemmology Today Quiz #9



All things ORGANIC!

Twenty-Five Questions

Let's see how much you know!

Click Here to Start

JAN ASPLUND is the joint CEO of the Scandinavian Gem Academy. He received his FGA (Diploma in Gemmology) and 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).

Diamond Enlightenment

From the time diamonds were first known to man, fanciful theories on their origin have been told. Many myths and misconceptions about diamonds originating in antiquity and medieval times are still, from time to time, encountered today, usually in magazines with a superficial character and among people believing in the various powers gemstones possess. Among many reoccurring myths, some of the most stubborn ones suggest that Alexander the Great brought diamonds to Europe from India and that Plato had an idea that diamonds were related to gold. Of course most of the surviving myths concern diamonds supposed powers to heal or protect its owner and the misuse of different words, related to diamond and other gemstone names, in translations of various religious text throughout the two last millennia.

A more modern and scientific approach to investigating diamonds began in the late 16th century. During the 17th and 18th centuries the more developed scientific approaches used for investigating diamonds led to an increased understanding on their origin and composition. This knowledge eventually led to the ability to make synthetic diamonds and their production on a commercial scale.

Sir Isaac Newton (1642-1727), one of history's most known and respected scientists investigated the optical properties of diamonds in the 17th century. Newton was fascinated by diamonds ability to disperse white light. In Newton's opinion it was oils that possessed the greatest light dispersing powers of all substances. This opinion led him to suggest that diamonds were solidified oil, a conclusion he drew from the way diamonds broke white light into the colours of the rainbow. Newton also drew the conclusion from the presumed relation between diamonds and oil that diamonds would be combustible, something that later would be proven to be a correct assumption, though not because of any relation between diamonds and oil (Hazem 1993 p 19).

Today it is general knowledge that diamonds consist of carbon. A fact that was not understood until the late 18th century. The French chemist Antoine-Laurent Lavoisier (1743-1794) had experimented with diamonds as part of his main scientific interest: combustion. Lavoisier heated diamonds to extreme temperatures by focusing sunlight through a prism and directed the beam onto a diamond kept in a sealed glass container. Lavoisier observed diamonds turned into gas without leaving any ash. Lavoisier discovered the similarities between the gas from burned charcoal and diamond and stated that it indicated that diamonds consisted of the same element as charcoal. Lavoisier did not continue to investigate diamonds any further; the reasons may be that his discovery contradicted his earlier theory that all crystals were formed with water. Another reason might be that his main focus was not diamonds but the role of oxygen in combustion. If he had plans to take up his investigation on diamonds later in life he did not get the opportunity to do so as he was executed in 1794 during the French Revolution (Hazem 1993).

Lavoisier was not the first scientist who heated diamonds and observed them turn into gas. In 1694 the Italians Averani and Targioni at the Accademio del Cimento in Florence made made an experiment by focusing sunlight through a lens onto a diamond. The diamond vaporised, however Averani and Targioni did not continue any further with their investigations. (Davies 1984 p 12-15). Lavoisier discovered that diamonds burn and convert into carbon CO and CO_2 in air at temperatures between 700 and 900 Centigrade depending on the individual stone (Bruton 1978 p 421).

Neither Lavoisier, Averani or Targioni are credited with the discovery that diamonds consist of carbon. Instead it is the Englishman Smithson Tennant (1761-1815) who is usually credited with this discovery. Tennant built his research on Lavoisier's work by burning diamonds in a vessel made out of gold and then comparing the weight of the resulting gas with the weight of the original diamond. The resulting weights were identical (Bruton 1978 p 421). Still Lavoisier is usually mentioned when the discovery is discussed and in some occasions Lavoisier is mentioned as the discoverer that diamonds consist of carbon (Barnard 2000 p 3; Hazen 1993 p 19).

It was known that charcoal as well as graphite consisted of carbon so the discovery that diamonds consisted of the same element caused some doubt and resulted in new questions. Apart from the obvious optical and physical differences, diamonds also have a much higher density than charcoal so how could it be the same element?

In the eighteenth century it was still thought that molybdenum sulphide and graphite were the same material causing further confusion as to the properties of carbon in the form of diamonds. When the Swedish chemist Carl Wilhelm Scheele separated molybdenum and graphite in 1779 more was understood on the relationship between diamonds and graphite. Still the misconception that graphite was a carbide of iron caused confusion and theories on the subject failed. It was not until the 1850s that Englishman B C Brodie demonstrated that graphite was a genuine allotropic form of carbon, a very important discovery for the understanding of the other allotropic form of carbon; diamond (Broadie 1859).

The discoveries by Newton, Lavoisier, Tennant and others formed the foundations that allowed understandings of what diamonds were made from and how they were formed. When it was understood that diamonds consisted of the same element as charcoal and graphite but with a much higher density, theories on the role of pressure emerged.

From the early 19th century there is a long list of people claiming to have succeeded in making synthetic diamonds. One of the first to claim success in growing diamonds was the Frenchman C. Caginard who in 1828 had grown crystals from a solution. These crystals turned out to be aluminium and magnesium oxides, a product that fooled many later diamond makers since the crystals were hard and often have an octahedron shape (Hazen 1993 p 25).

It was not until around 1870 that diamonds were found in their mother rock. Previously an unknown rock, it was named Kimberlite after the area in South Africa where it was first found. The discovery of diamonds host rock gave clues to diamonds origin deep within the earth's crust and eventually led to an understanding of the importance of extreme temperatures and pressure in their creation.

When diamonds were first discovered in South Africa they were found in similar alluvial deposits as the diamonds in India and Brazil. After a few years, prospectors started to discover concentrations of diamonds in a yellowish rock that until then was unknown to geologists. The yellowish rock was weathered Kimberlite and is today known as 'yellow ground' while un-weathered kimberlite is referred to as 'blue ground' (Hart 2001 p 39-40).

Once the relationship between high pressure and the formation of diamonds was discovered, serious attempts to synthesise diamonds began. From the late 19th century many brilliant minds, as well as some not so brilliant minds, were posed the question on how to make artificial diamonds. It would take until the 1950s before anyone succeeded in synthesising diamonds but the experimentation carried out during the first half of the 20th century resulted in the development of high-pressure physics, a subject pioneered by the American Percy Bridgeman. These have had a profound effect on science and its technical development in all parts of modern society.

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De Beers Synthetic Diamonds (Photo by Tino Hammid)

'It's my opinion that all true artists are more concerned with the art itself, rather than the value. To be prudent any artist needs to be conscious of the time investment verses return. At the end of the day, I spend whatever amount of time necessary to feel good about the finished artwork.' **Dalan Hargrave**

Meet Dalan Hargrave

Dalan Hargrave

Dalan Hargrave has been a career goldsmith and lapidary for 40 years with his current focus on developing new gemstone cuts as works of art.

He has received numerous awards over the years for his distinctive and innovative gem cutting.

Currently he operates GemStarz Jewelry, in Texas, USA, a custom design studio specializing in custom mountings and gemstone cutting. Signature gemstone cuts are GemHeartz and GemStarz, the latter featuring a star cut internally and isolated in the stone's centre by a ring of brilliance. Other gemstone cuts he specializes in are Spirographic cuts, compound concave cut and 3-D Illusion series. He had once planned to study math and physics in college and said that his mathematical mind helped him apply this technique and develop a new method to create compound concave facets, which curve in both directions on a longer radius.

Hargrave's pieces are a harmonious fusion between methodical calculations and genius artistry. 'Gemstones are defined by light. Colour, reflections and the physical properties of gem materiel effects our perception of gems. With an understanding of the physical properties of gems we can begin to manipulate light and reflections in an effort to express our creativeness as an artist.' he said.

When you meet Dalan he is larger than life, both in physical stature and character. Yet you soon realise that he is incredibly understated about the sheer brilliance of his work. 'I'm very grateful and humbled by recent success and consider it a privilege to work with such a wonderful medium' he said.

Even more inspiring is insight into the real world of designers where he reveals that he too has challenging days. 'Not every design works out but if we keep trying eventually we will succeed.' A reminder to us all that even the most gifted of artists is still human.

He currently teaches classes in the lapidary arts as a way of passing on the knowledge he has gained to the next generation of artisans.

GT: Artist or Gem Cutter; Gemstone or Art?

DH: Goldsmith and lapidary artist.

GT: What is the most challenging gemstone you have ever cut?

DH: Kunzite presents a couple of problems in cutting. First, because it has perfect cleavage in two directions, it has a tendency to splinter and separate along the cleavage planes. Secondly, like wood grain that is harder on the end than it is on the side, Kunzite, likewise, has directional hardness. The end grain can be difficult to cut while the side grain cuts rather easily. As you facet a conventional gemstone pattern the cutter needs to take care not to overcut on the soft areas. I suppose a third reason frequently encountered is, cutting Kunzite evokes an excessive use of profanity.

GT: What is the most enjoyable gemstone you have ever cut?

DH: Sunstone comes in such a wide variety of colors and combinations of colors along with the presence of schiller or not, making each stone have its own unique look and charm. It cuts easily and polishes up well with minimal effort making it ideal for faceted or carved stones.

GT: Talk us through the artistic process from the initial concept and design to the finished gemstone.

DH: Each piece starts with an initial evaluation of rough to determine the maximum yield. From that point on the design can change with the wind. Some clients have specific requests while others allow for great artistic license.

GT: Art and economics don't always work hand in hand. There is often a fine line between the two. How do you approach it?

DH: It's my opinion that all true artists are more concerned with the art itself, rather than the value. To be prudent any artist needs to be conscious of the time investment verses return. At the end of the day, I spend whatever amount of time necessary to feel good about the finished artwork.

GT: What was the defining moment when you decided to cut gemstones?

DH: As a career goldsmith of 43 years, I've always known the basics of gem cutting since taking a college course in cutting cabs. When the fantasy cut gemstone movement began to take hold, I was naturally intrigued by the endless possibilities.

GT: Natural artistic ability or a learned skill?

DH: I have my father to thank for a good working knowledge of tools and my mother to thank for a natural artistic ability.

GT: Compared to when you started cutting, is there more awareness and acceptance now for what you are doing?

DH: Today more than ever before, specialty cut gemstones are more widely accepted and appreciated.

GT: What advice can you give to somebody who wants to start cutting gemstones?

DH: Where would they begin? Even the most complicated cut gemstone is still done one step at a time. Learn the basics of cabbing and faceting and build on that with each new thing you learn. Natural progression will take you where your interests lie.

GT: If we were sitting down one year from now, what would you say constituted a good year for Dalan Hargrave?

DH: A good year for me is defined by the successful completion of projects whether great or small. I'm very blessed to have those who appreciate my work.

Reference: www.iojdaa.com.au

Copyright

Ametrine (22.9 carats)

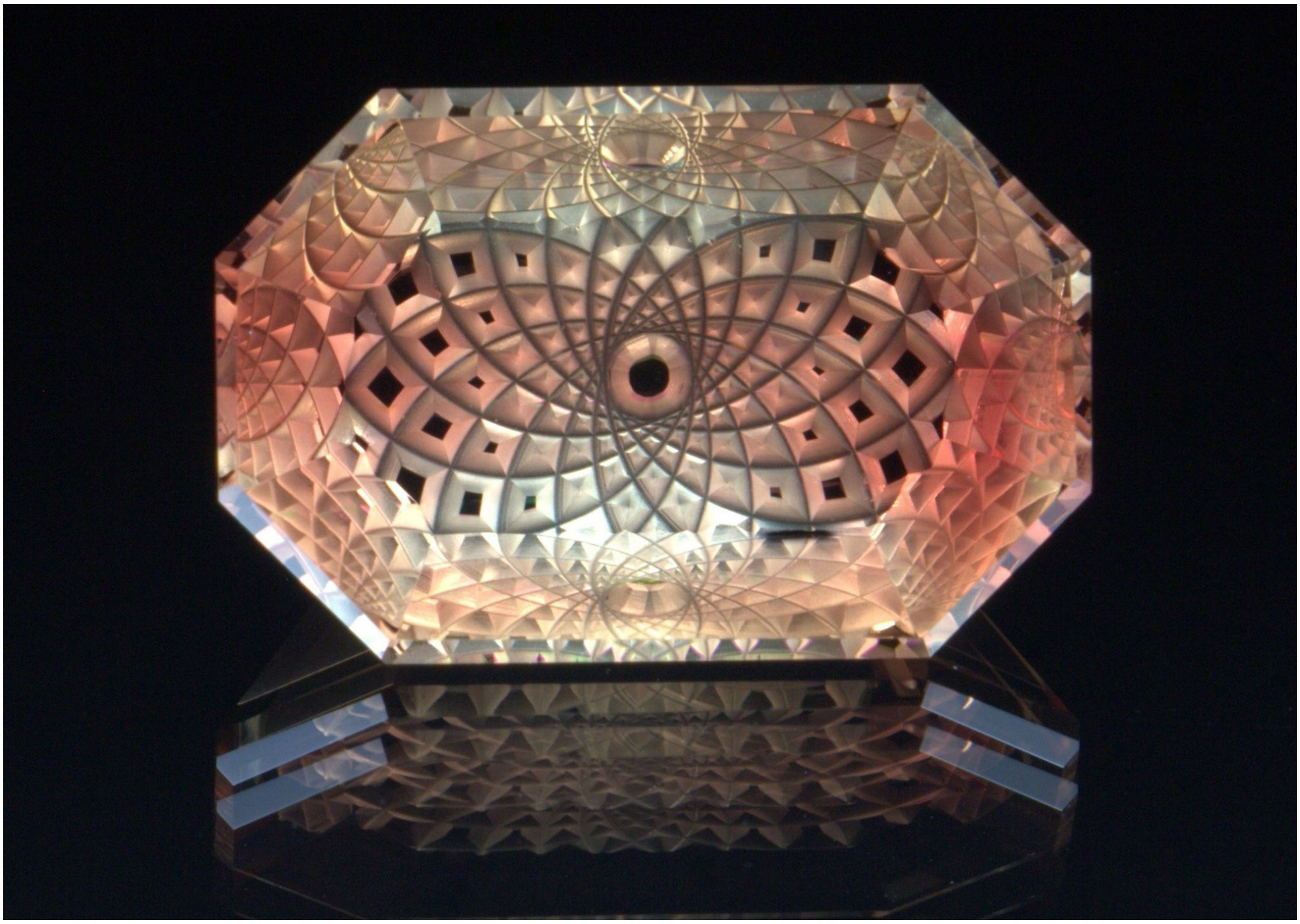
Sunstone and Diamond Necklace

Green Tourmaline Orions Belt (Maine, USA)

Lepidolite with Seal Skin Obsidian and Rutilated Quartz

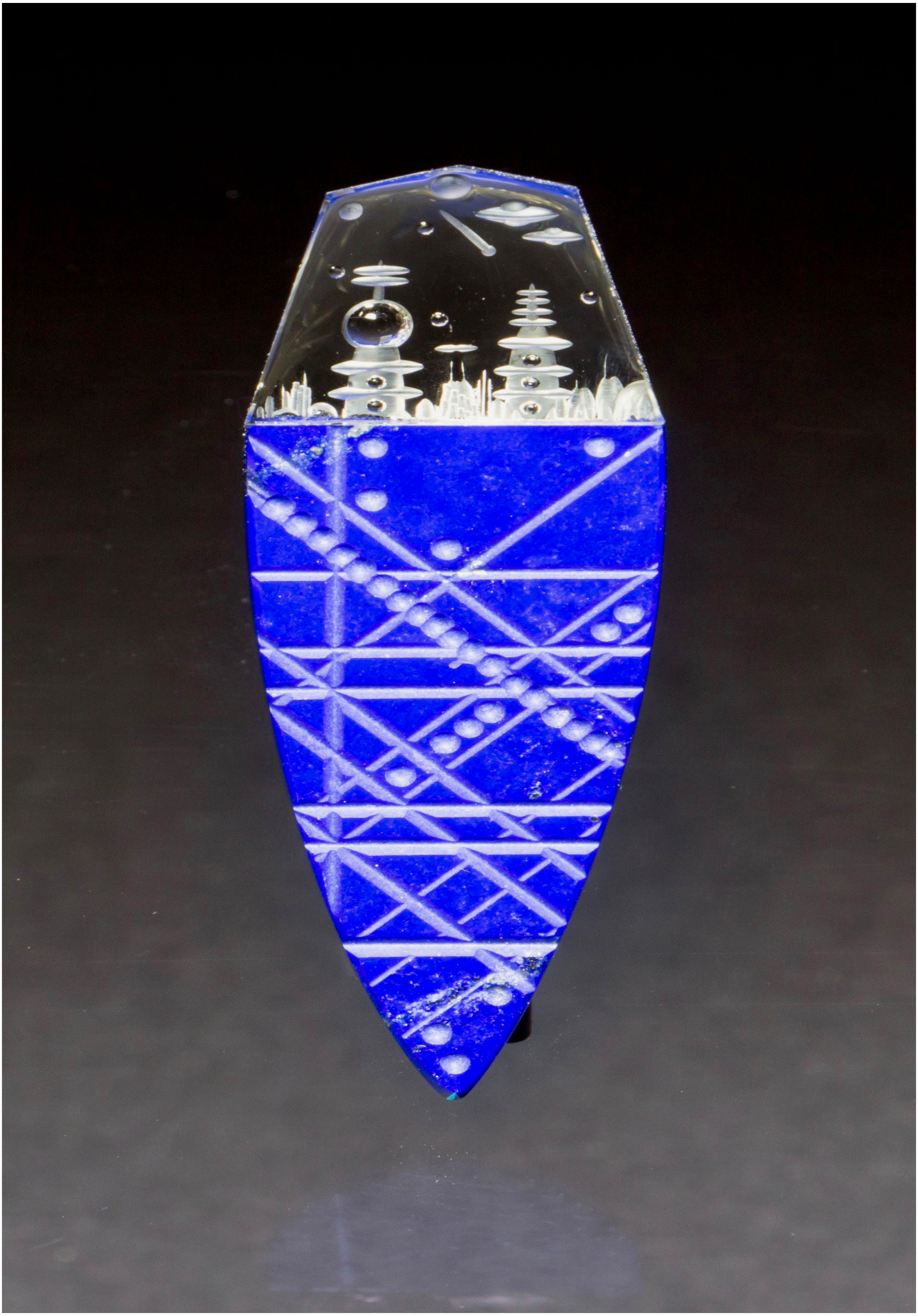
Iolite StarLight Cut

Pass the Torch (Photo by John Parrish)

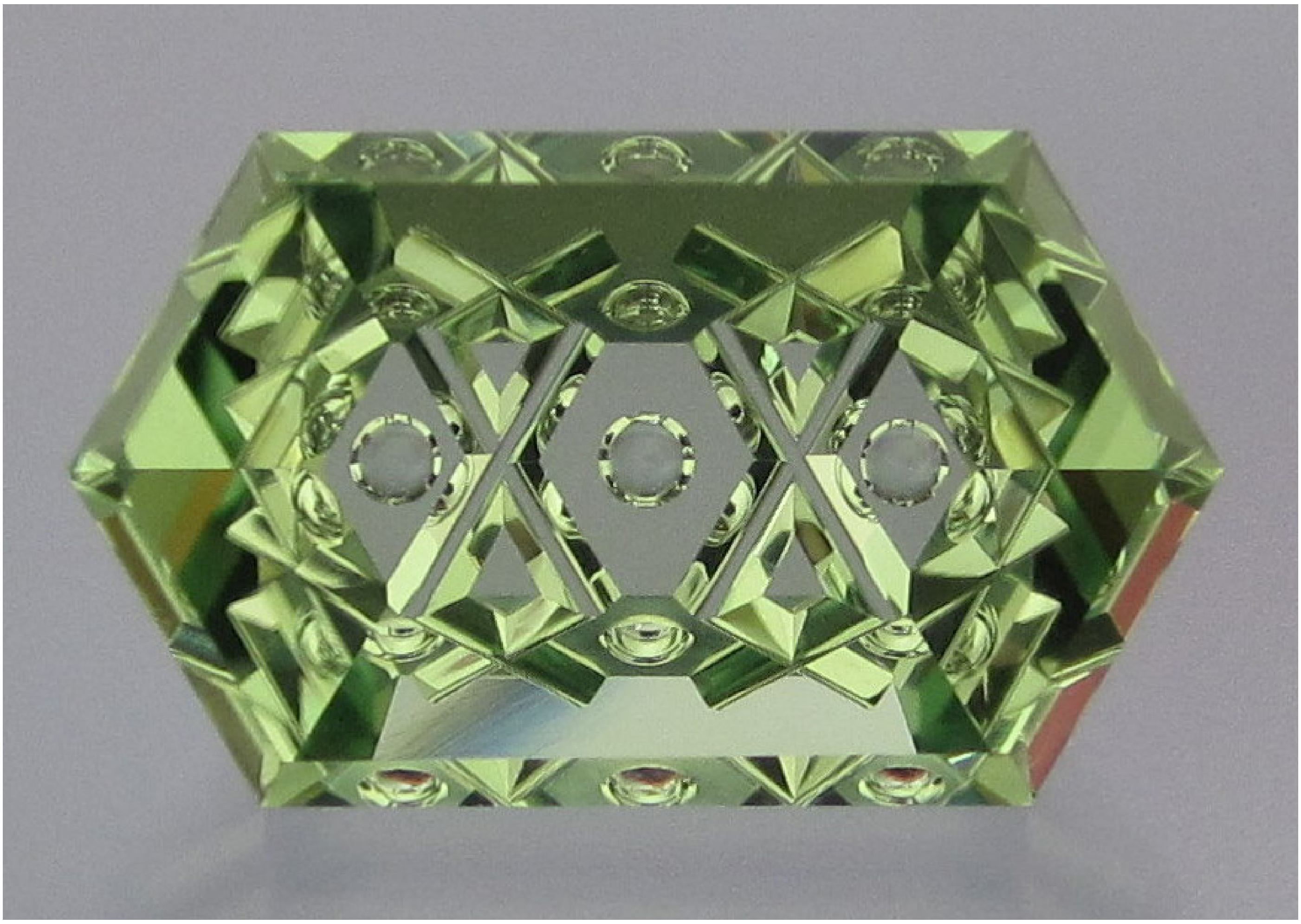


Sunstone American Brilliant Series (23 carats)

Oregon Fire Opal Butterfly



Lapis Lazuli and Quartz Celestial City Carving



Prasiolite (Green Quartz) Hugs and Kisses Cut

Ametrine with Spirographic Cut

Oregon Fire Opal Flame

Golden Beryl (17.62 carats)

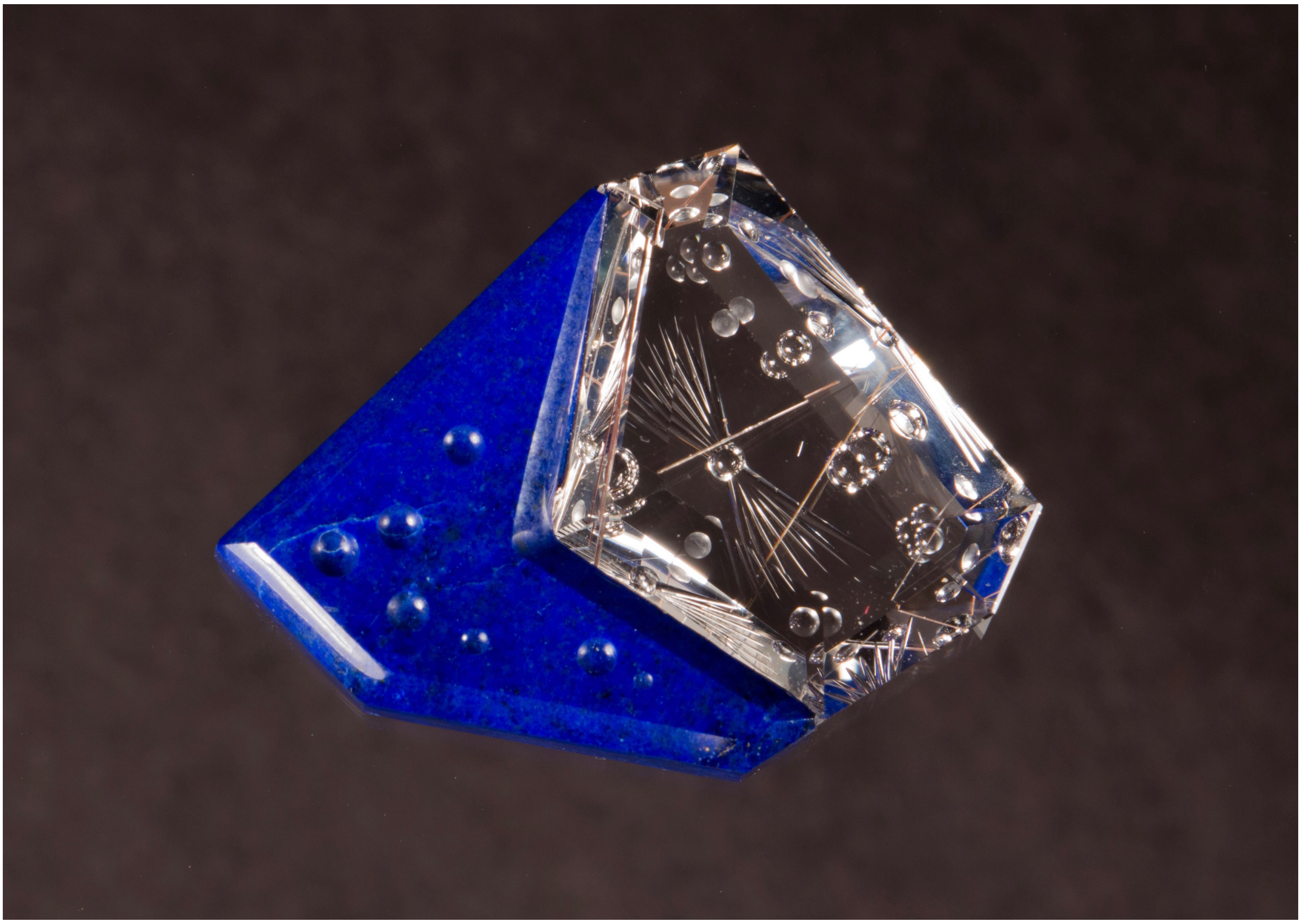
Arkansas Quartz, Opal and Turquoise Celestial City Carving

Sunstone, Quartz and Black Jade

Aquamarine Carving

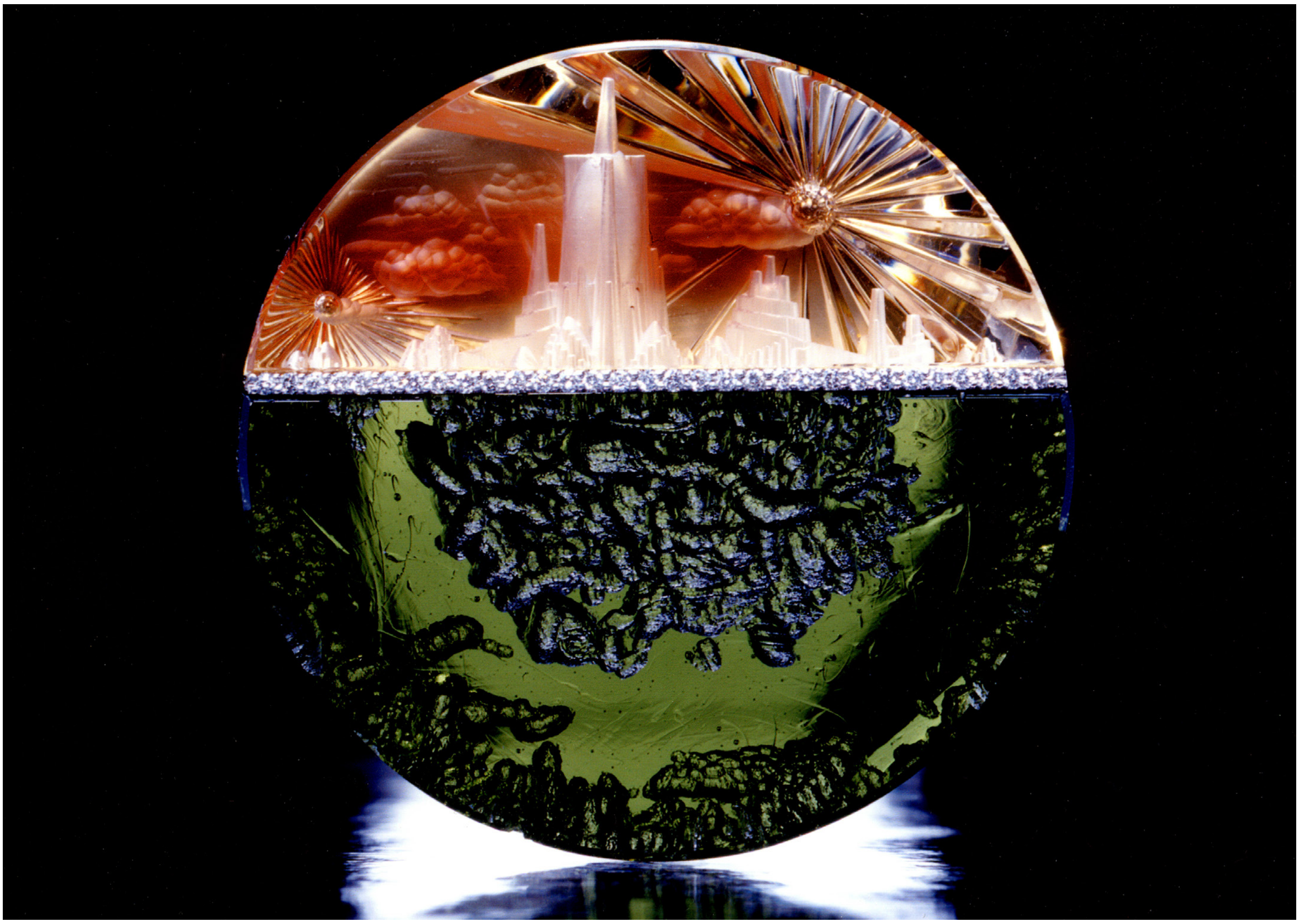
Blue Topaz Celestial Series

Natural Blue Topaz & Petrified Wood Carving

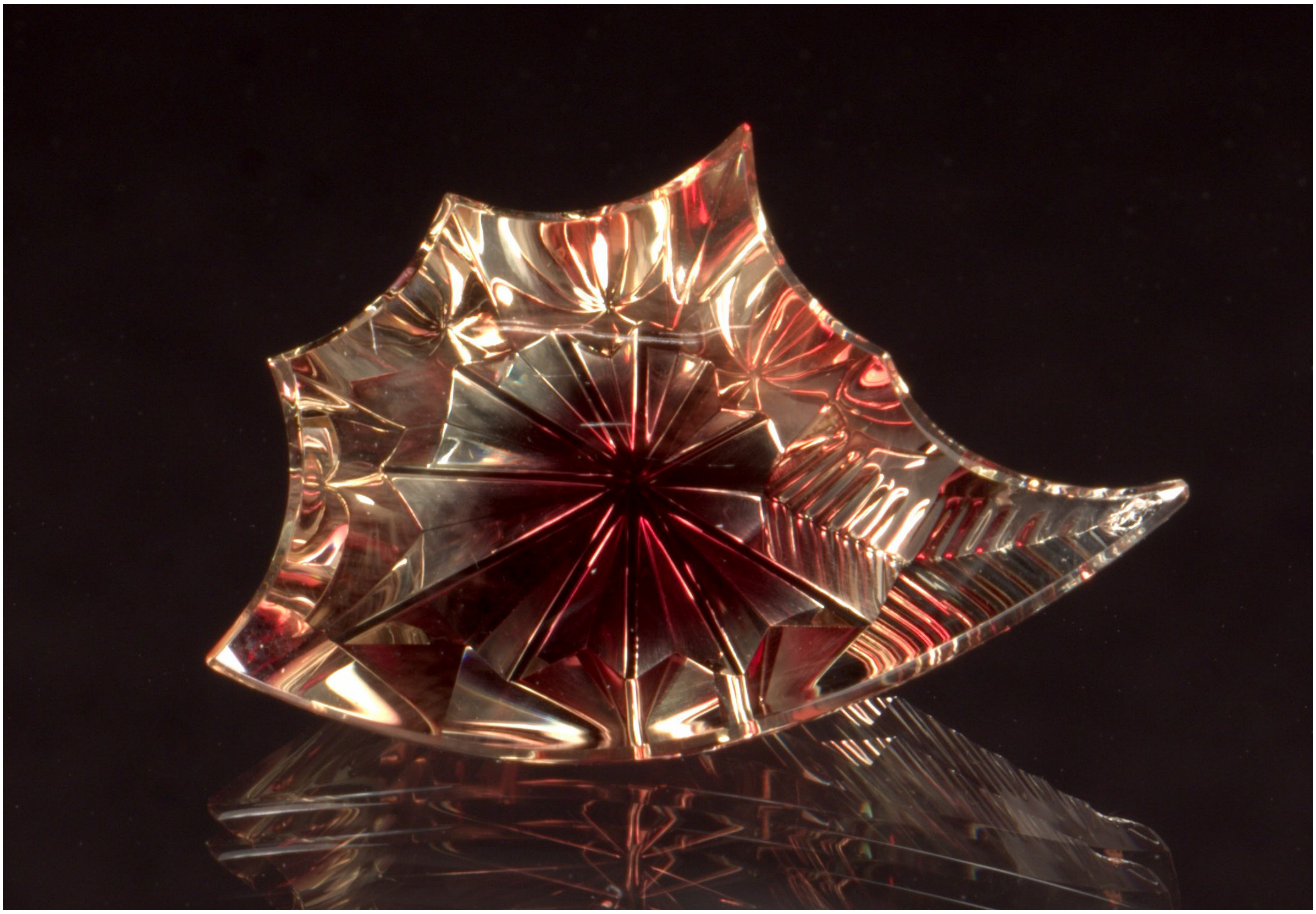


Lapis Lazuli & Rutilated Quartz

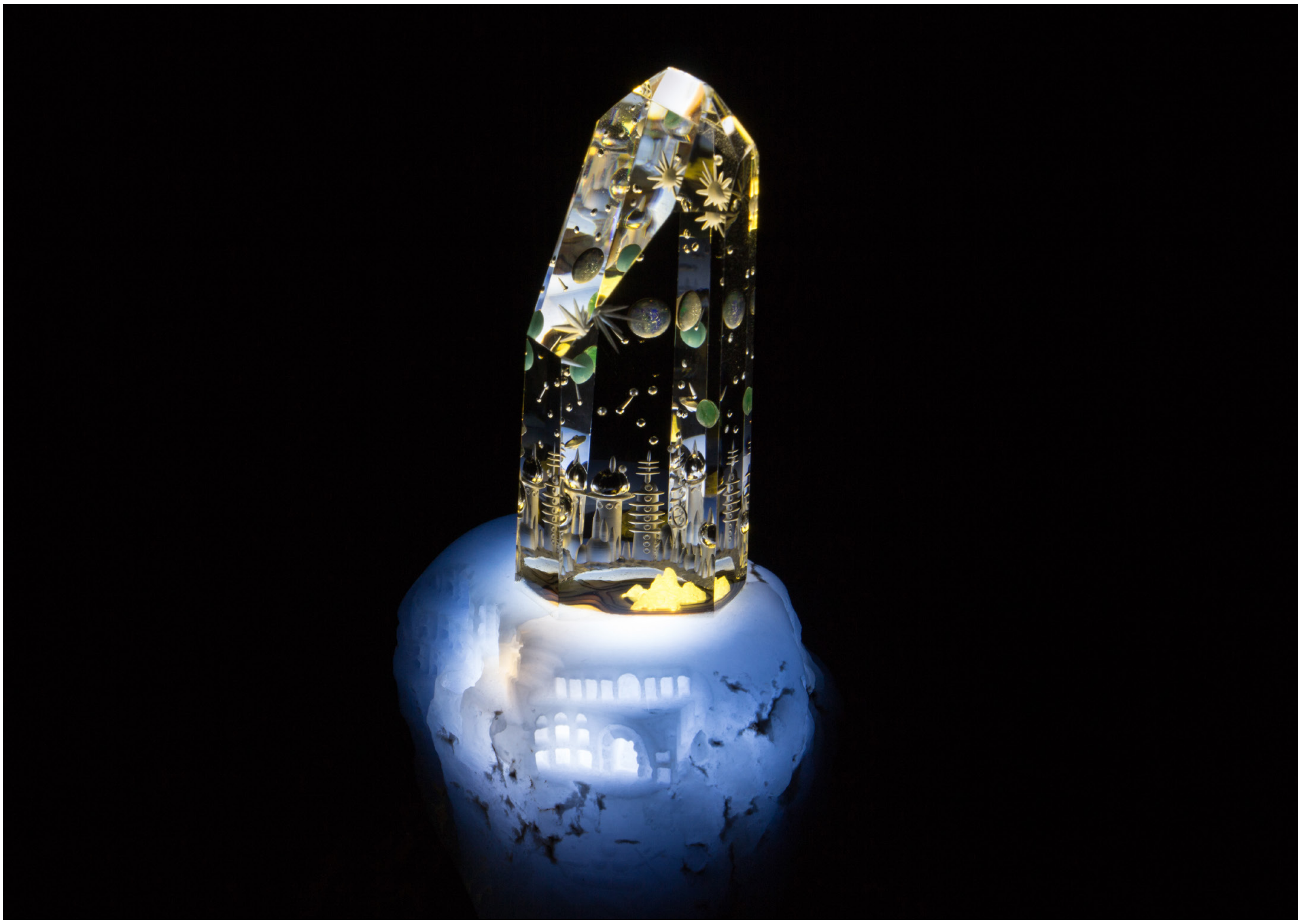
Ametrine Matched Butterfly Wings



Sunstone, Moldavite and Diamonds (Photo by John Parrish)



Sunstone Carving



Arkansas Quartz, Angelite with inset Black Opal, Turquoise and Emerald Planets (Celestial City Series)

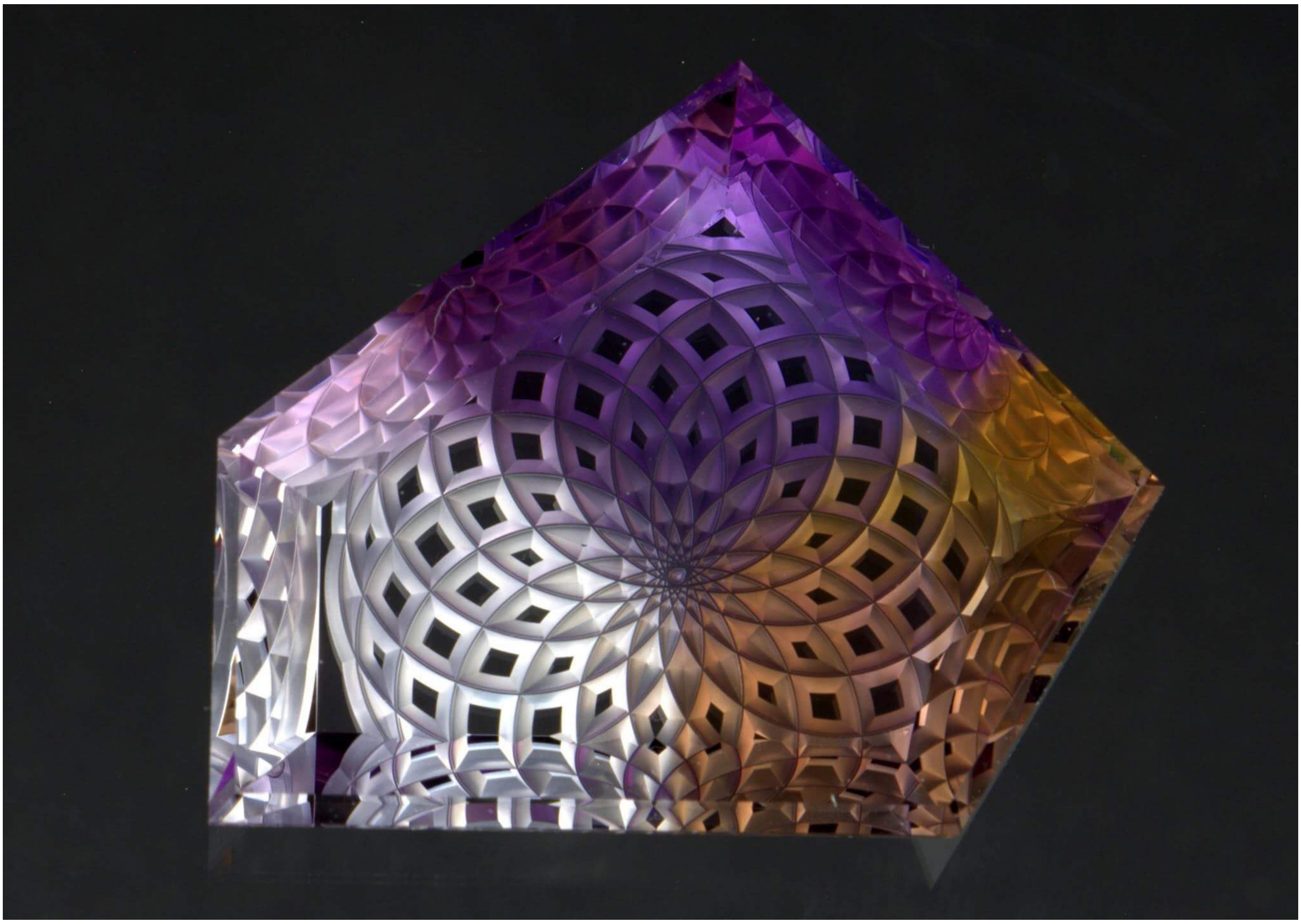
Lapis Lazuli Skateboard

Ametrine 3-D Reverse Intaglio Carving

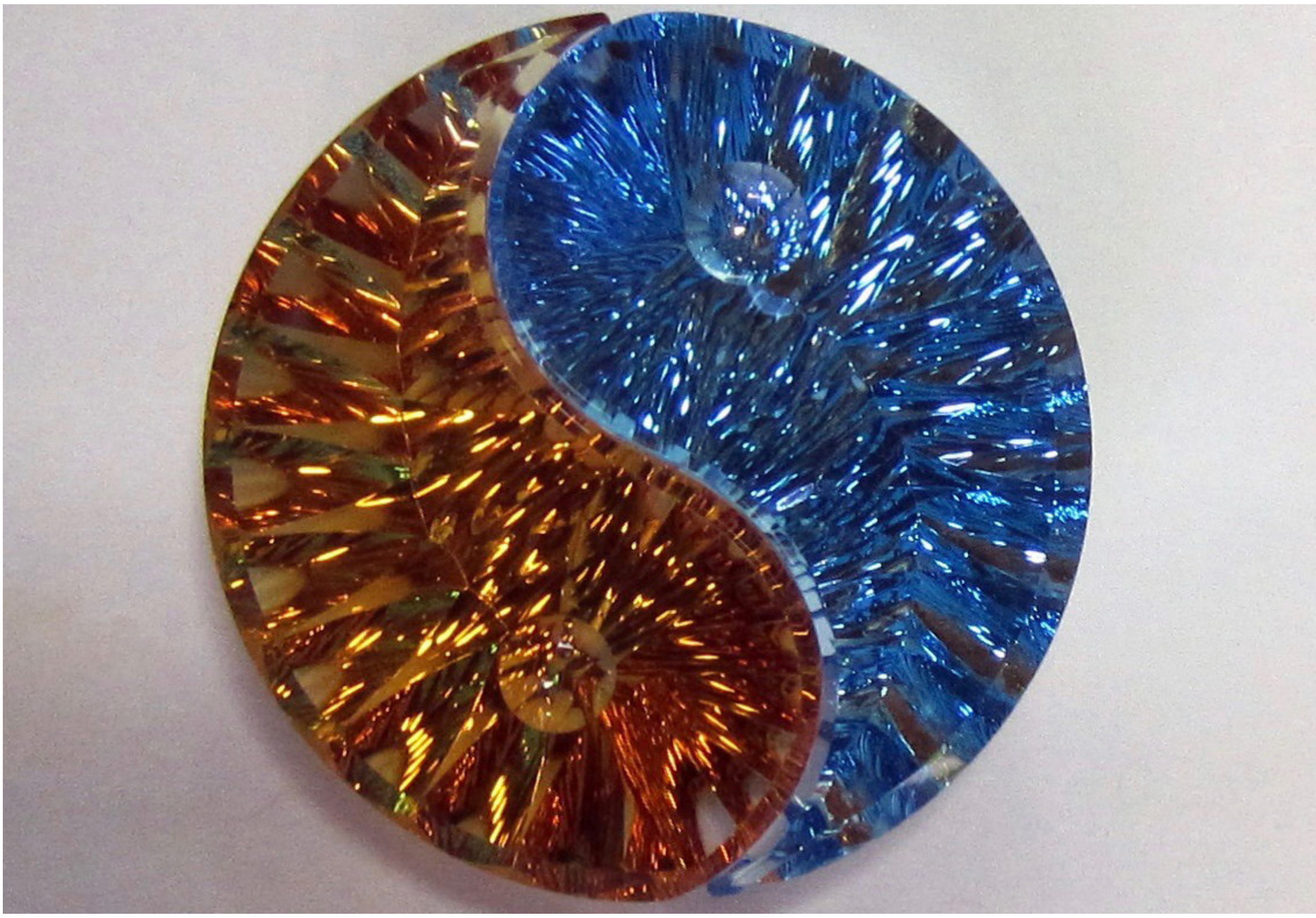
Quartz StarLight Cut

Topaz from Colorado (1470 carats)

Ametrine & Green Diamond Necklace



Ametrine (49.6 carats)



Citrine Quartz and Blue Topaz Yin & Yang Carving

Money Cent$

Economics for Non-Economists

GEOFF DOMINY is an author, independent gemmologist and founder of the World Gem Foundation. He received his F.G.A through the Gemmological Association of Great Britain (Gem-A) in 1987 passing the diploma examinations with distinction.

Pumping Iron

Natural Padparadscha Sapphire (Photo by Tino Hammid)

Natural Yellow Sapphire (Photo by Tino Hammid)

While iron is perhaps not as ‘sexy’ as chromium in terms of the eight metallic transition elements, unlike chromium, iron is far more versatile; allowing through the application of heat or irradiation, dramatic changes in the appearance (and consequently the value) of certain coloured gemstones. The presence or absence of iron will also affect fluorescence, can be helpful in terms of gem identification (through it’s magnetic properties and absorption lines) and, in the case of peridot, can change the optic sign if it is present in sufficient quantities.

Iron has a chemical symbol of Fe (from the Latin: Ferrum) and an atomic number of 26. It is the most common element on Earth, by mass, forming much of the Earth’s inner and outer cores and is the fourth commonest element in the Earth’s crust. It is therefore not be surprising that it is found in a host of coloured gemstones, including amethyst, blue or green sapphire, peridot, aquamarine, green tourmaline and almandine garnet.

While the colours admittedly are not as brilliant as those attributed to chromium, it’s ability to change from ferric to ferrous or vice-versa is of key importance to those involved in the treatment of gemstones. You see, chemistry not only explains how gemstones are formed, through their chemical interactions but also how we can manipulate their colour through exposure to heat or irradiation to change their valence state. The same is true from the standpoint of magnetism.

In the case of ‘Sea Foam’ aquamarine, if we heat it to 400 degrees Celsius in an oxygen-free environment, we can change the valence state of ferric oxide (Fe^{3+}) to ferrous oxide (Fe^{2+}). This removes the yellowish component (blue and yellow makes green) and makes the stone bluer. It also changes the magnetic susceptibility of the aquamarine since ferrous oxide is more magnetic than ferric oxide. If we then irradiate the heat-treated aquamarine, it is possible to change the colour to yellow (yellow beryl), which results in the ferrous oxide (Fe^{2+}) reverting back to ferric oxide (Fe^{3+}) and a loss in magnetic susceptibility.

In the case of inter-valence charge transfers, a charge transfer between ferrous oxide and ferric oxide, iron and titanium or manganese and titanium will alter the magnetic susceptibility of the gemstone since ferric oxide and titanium are less magnetic.

The chart below shows just how useful the addition of iron can be from an identification standpoint and how valuable a simple N-52 grade neodymium magnet can be.

Key Separations Using Paramagnetism

Rhodolite Garnet from Purple Sapphire
Chrome Pyrope Garnet from Ruby
Aquamarine from Blue Topaz
Spessartite Garnet from Orange Sapphire
Yellow Orthoclase from Citrine Quartz
Green Tourmaline from Chrome Green Tourmaline
Green Jadeite from Dyed Chalcedony Quartz
Iolite from Tanzanite
Hessonite Garnet from Orange Tourmaline
Natural Spinel from Lab-created Spinel
Lab-created Diamond (HPHT) from Natural Diamond
Demantoid Garnet from Lab-created YAG
Tsavorite Garnet from Green Glass (Man-Made)
Malaya Garnet from Red Spinel

You may wonder why practically all rubies are heat-treated. The primary objective is to remove the bluish component caused by the presence of ferrous oxide (Fe^{2+}) that gives the stones a purplish colouration. This requires temperatures in the 700 to 1200 degree Celsius range in an oxidizing environment that changes the ferrous oxide to ferric oxide (Fe^{3+})(Hughes).

In the case of blue sapphire, the presence and interaction of titanium, iron and magnesium play a crucial part in the overall colour. By heating stones in a reducing (oxygen-free) environment, at temperatures ranging from 1500 to 1800 degrees Celsius, it is possible to convert the ferric oxide (Fe^{3+}) to ferrous oxide (Fe^{2+}) causing a deepening of the colour. Conversely, if the stones are heated in an oxidized (oxygen-rich) environment, the ferrous oxide (Fe^{2+}) converts to ferric oxide (Fe^{3+}) causing a lightening of the stones.

Interestingly, research conducted on natural blue sapphires (Häger, 1992, 1993, 2001; Emmett and Douthit, 1993) shows that there is little or no correlation between the concentrations of iron and titanium and the saturation of blue colouration. This proves that the interaction of the impurities is often just as important as the presence of the impurities.

Golden yellow sapphires are produced by heating pale yellow or near colourless sapphires at temperatures in the region of 1000 to 1450 degrees Celsius in an oxidized (oxygen-rich) environment. This causes the ferrous iron oxide (Fe^{2+}) to convert to ferric iron oxide (Fe^{3+}).

Pink beryl also contains ferric iron oxide (Fe^{3+}), which gives the stones an orangey to apricot colour due to the yellowish colour component. Like aquamarine this can be removed by heating the stones to 350 degrees Celsius in a reducing (oxygen-free) environment using an electrical furnace, which converts the ferric iron oxide (Fe^{3+}) to ferrous iron oxide (Fe^{2+}) and turns the stones pink.

Through exposure to gamma rays, it is possible to impart a deep orangey-yellow colour in pale yellow sapphires. This causes the ferric iron oxide (Fe^{3+}) to convert to ferrous iron oxide (Fe^{2+}) (Nassau 1984). This treatment however is unstable and must be disclosed since stones will fade when exposed to strong sunlight or when heat is applied.

A spectroscopic analysis will reveal that the 450nm absorption line is absent in irradiated stones, however since this is very faint in untreated stones, conclusive testing can only be done using a spectrophotometer. Suspected stones could be subjected to a fade test although this must always be approved by the client prior to any tests being conducted.

Pink sapphire can be transformed into padparadscha sapphire when subjected to radiation. Similar to irradiated yellow sapphire this causes the ferric iron oxide (Fe^{3+}) to convert to ferrous iron oxide (Fe^{2+}) when chromium is present (Nassau 1984). This treatment is also unstable and must be disclosed since stones will fade when exposed to strong sunlight or when heat is applied.

Interestingly in order to give lab-created emeralds a more ‘realistic appearance’, manufacturers such as Chatham are adding iron oxides, which subdue their red fluorescence, will cause them to be a less distinct red under the Chelsea filter, and less transparent under short wave UV light. It also causes some stones to exhibit anomalous double refraction (ADR) under crossed polars, similar to the ‘tabby extinction’ seen in flame fusion spinel.

In the case of peridot, the majority of stones are optically positive, however if excessive amounts of iron are present, the stone will be optically negative. This can be confusing because if we look at the chart below, we can see that the physical and optical properties of peridot and sinhalite are almost identical except for their optical sign and the presence of an additional absorption band at 463nm. Changing the optical sign places sole reliance on locating the additional absorption band and this can be particularly difficult especially in certain stones.

Gemstone	R.I.	D.R.	Dispersion	O/S	S.G.	Hardness	Absorption Bands
Peridot	1.650 – 1.703	0.036	0.020	B+	3.34 – 3.48	6 ½ - 7	493,473,453
Sinhalite	1.665 – 1.712	0.036	0.018	B-	3.46 – 3.50	6 ½ - 7	493,475,463,450

How does this affect Value?

Since this is an article about gemstone economics, the obvious question is how does the amount of iron and the valence state of the iron affect the value of a gemstone.

The answer really depends on what gemstone we are talking about. In the case of amethyst quartz, peridot, green sapphire and almandine garnet, we know that too much iron will have an inhibiting effect on the overall colour.

In the 1.00 carat to 2.99 carat weight range, an amethyst that is considered 'Extra Fine' according to GemGuide will sell for 525% more than one graded 'Commerical 4'. In the 5.00 carat to 9.99 carat weight range, the percentage is almost identical (500%).

For peridot, a stone in the 1.00 carat to 4.99 carat weight range that is graded 'Extra Fine' will sell for 358% more than a 'Commercial 4', while the percentage difference is again similar in the 5.00 carat to 19.99 carat weight range (361%).

A green sapphire graded 'Extra Fine' in the 3.00 carat to 4.99 carat weight range will sell for 741% more than a 'Commercial 4', while in the 5.00 carat to 9.99 carat weight range, the difference is 980%.

An almandine garnet graded 'Extra Fine' in the 1.00 carat to 4.99 carat weight range will sell for 462% more than a 'Commercial 4' while in the 5.00 carat to 9.99 carat weight range it will sell for 400% more.

While I am a fan of natural unheat-treated aquamarine, I am sure I am in the minority. Most consumers like blue aquamarine and are prepared to pay substantially more for it. In this case an 'Extra Fine' aquamarine in the 3.00 carat to 4.99 carat weight range will sell for 795% more than a 'Commercial 4' while in the 5.00 carat to 9.99 carat weight range, the percentage difference is 852%. Clearly we can see why aquamarines are subjected to heat and what motivates treaters to treat them.

The same is true of pink sapphires that are irradiated to produce padparadscha sapphires. Even in the 'Commercial 4' grade, a 5.00 carat treated padparadscha sapphire will sell for 76% more than a similarly graded pink sapphire. In a 'Good 6' grade, the percentage jumps to 177%. Even though the resulting stones are unstable, unscrupulous treaters only care about the 'bottom' line and in this case, there would be almost a $ 14,000 USD difference in the price at wholesale. If you have ever wondered why people treat stones (even ones where the colour is unstable), this should answer that question; money, money and more money!

The same is true of unstable orangey-yellow sapphires produced by irradiating pale yellow sapphires. A 3.00 carat treated orange sapphire (Good 6) would sell for $ 600 USD more at wholesale than a similarly graded yellow sapphire.

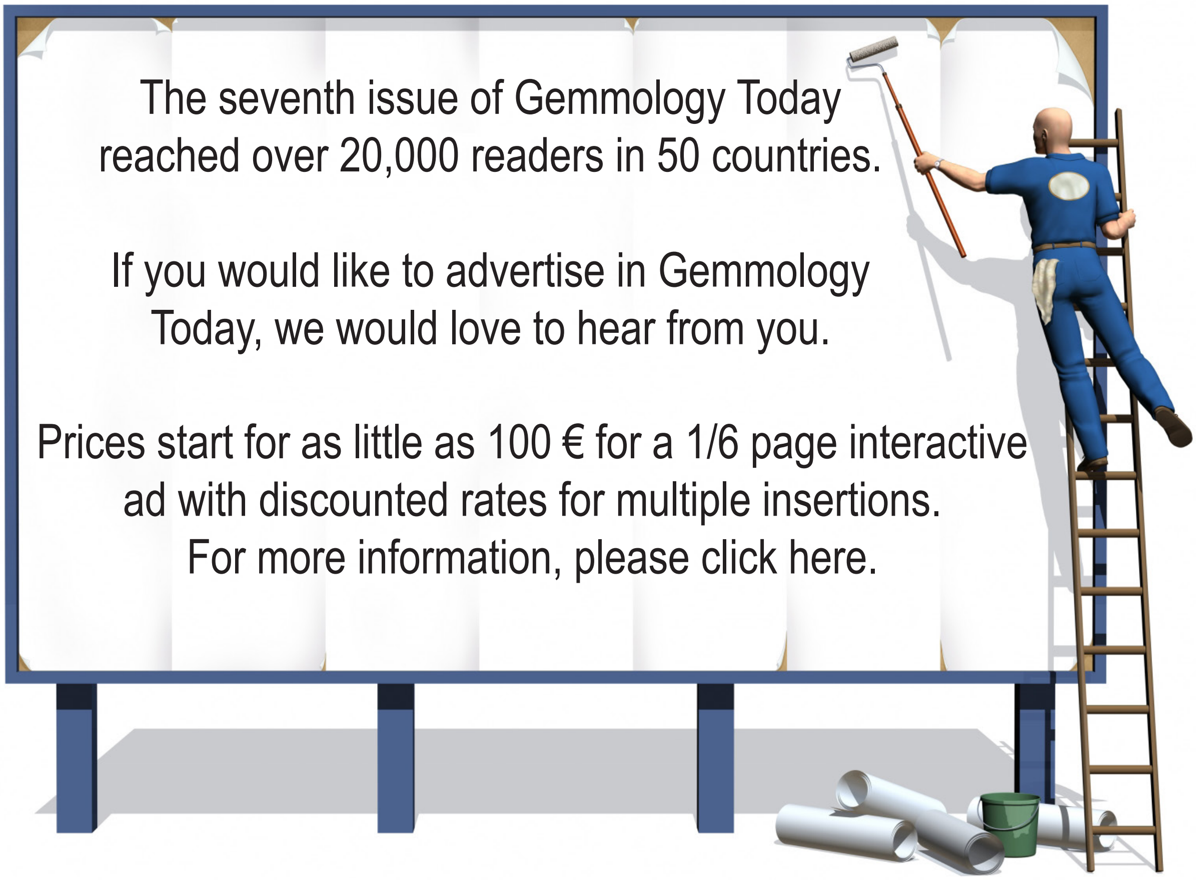
Converting ferrous oxide to ferric oxide in yellow sapphires by subjecting them to heat can be very profitable with a 5.00 carat yellow sapphire (Very Good 8) selling for 140% more than a Commercial 4. In terms of money, that is $ 3,500 USD more! Not bad for a few hours work!

Converting ferric oxide to ferrous oxide in pink beryl can be equally profitable with a 5.00 carat 'Extra Fine' selling for 225% or $ 1,125 USD more than one graded 'Good 6'.

Clearly we can see from these examples that iron can have a profound effect on the value of a gemstone both positively or negatively and why its presence is an attractive feature to treaters because of the relative ease in changing the valence state.

Who would have guessed?

Pink & Peach Coloured Beryl (Photo by Tino Hammid)



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The deadline for the next issue is

November 15th, 2018

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. Wherever possible please try to supply images from the same photographic source or at the very least are compatible with each other. This will ensure that the article is aesthetically pleasing as well as informative.
- We reserve the right to refuse articles

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The Fingerprint File
GEM IDENTIFICATION

From an identification standpoint, turquoise can be a tricky customer. With a host of natural and man-made imitations on the market plus a variety of treatments used to enhance and stabilize the material, all is sometimes not what it seems!

Turquoise - Persian Nights

Turquoise (Photo by Tino Hammid)

Turquoise occurs in arid conditions as incrustations, nodules, botryoidal groups, disseminated grains and veins filling cavities and fractures in highly altered volcanic rocks and is often associated with limonite and other iron oxides. These deposits formed by the action of acidic aqueous solutions that percolated through the earth during the weathering and oxidation of pre-existing minerals with the copper originating from primary copper sulfides such as chalcopyrite or from secondary carbonates such as malachite or azurite; aluminium from feldspar, and the phosphorus from apatite.

Historically the finest turquoise came from the District of Nishapur located 25 kilometres west of Mashhad in the Province of Khorassan in Iran at an elevation of just over 2,000 metres (Ali-Mersai). Other renowned sources include Magharah and Serabit el Khadim in the Sinai Peninsula on the coast of the Gulf of Suez in Egypt, the south-western area of the United States (Arizona, New Mexico, Nevada, California and Colorado), Uzbekistan, Chile and China (Yunxian and Zhushan in Hubei Province).

Esteemed for over 5,000 years in both the New and Old Worlds as a stone of good fortune, a talisman and a holy stone, the name turquoise is thought to be derived from the French word '*Pierre Turquoise*' or the old 16th century French term '*Tourques*' meaning '*Turkey Stone*' since it was believed that it entered the European markets via Turkey. Pliny the Great made reference to '*Callais*' or '*Callaina/ Callaica*' as being a pale blue stone and this may also have been turquoise.

Turquoise is almost exclusively found in crypto-crystalline aggregates with crystals so fine that they are virtually amorphous. Described as a hydrous phosphate of copper and aluminium, the chemical composition is $(CuAl_6(PO_4)_4(OH)_8 - 4H_2O$ with some of the alumina replaced by ferric oxide.

Unlike most gemstones, turquoise is idiochromatic (self-coloured) meaning that the metallic transition colouring element, in this case copper, is an essential part of the chemical make-up of the stone. It is often characterized by limonite inclusions that form a web-like matrix.

Lab-created turquoise was produced primarily by Gilson (1972) in two colours, a medium-blue sold under the name Cleopatra and a darker blue sold under the name Farah.

Turquoise is routinely dyed and coated with artificial resins, oils and paraffin wax to improve the colour and reduce the porosity.

Due to its porosity, turquoise is susceptible to light, perspiration, oils, cosmetics and household detergents. If subjected to heat in the region of 250 degrees Celsius, the colour will change from blue to a dull green due to dehydration. Turquoise from the United States is generally considered more porous than material from Persia and tends to fade more readily.

From an identification perspective, turquoise is imitated by many natural gemstones with the most convincing being odontolite, also called bone turquoise, which is either fossilized tooth or bone from prehistoric animals such as mastodon, mammoth or even dinosaur. The colour is derived from the iron phosphate vivianite and chrysocolla.

The identification of turquoise can be quite challenging with the porosity, opaqueness, and difficulty in obtaining a proper R.I. reading compounding the problem.

Under magnification, turquoise has a peculiar amorphous-looking pale blue background interspersed with tiny shreds and speckles of a whitish material along with the more common limonite veins. Comparison stones are always handy to have, especially if they have been obtained from the various localities that turquoise is found. Through the spectroscope, particularly if viewed through crossed filters, the prominent absorption line at 432nm is often visible as too is the weaker, less distinct line at 460nm. These are unique to turquoise and are not seen in any of the aforementioned imitators.

Turquoise Birds (Photo by Jeff Scovil)

Turquoise & Common Simulants

Gemstone	R.I. Range	D.R.	D	O/S	S.G. Range	H
Smithsonite	1.621 – 1.849	.228	.014	U-	4.00 – 4.65	5
Turquoise	1.610 – 1.650	.040	–	B+	2.31 – 2.84	5 – 6 ½
Gilson Turquoise	1.60	–	–	-	2.74	–
Stained Howlite	1.586 – 1.605	.019	–	B-	2.45 – 2.58	3 – 3 ½
Odontolite	1.570 – 1.630	–	–	–	3.00	5
Variscite	1.563 – 1.594	.031	–	B-	2.42 – 2.58	4 - 5
Serpentine	1.560 – 1.571	.008	–	B+	2.44 – 2.62	2 ½ – 5 ½
Amazonite	1.522 – 1.530	.008	–	B-	2.56 – 2.58	6 – 6 ½
Imitation Odontolite	–	–	–	–	1.80	–
Chrysocolla	1.460 – 1.570	.023 – .040	–	B-	2.00 – 2.40	2 – 4

Multi-Stone Brooch with Turquoise (Photo by Tino Hammid)

While the refractive indices of turquoise, smithsonite, odontolite, lazulite, and to a lesser extent variscite are similar, there are marked differences in their specific gravities. Turquoise from the Sinai Peninsula and Iran (Persia) will have an S.G. of approximately 2.80 to 2.81, whereas turquoise from other localities, most notably from the southern United States, will tend to have an S.G. of between 2.65 and 2.75. Amazonite, chrysocolla, variscite, and serpentine all have specific gravities below 2.65, while odontolite, hemimorphite, lazulite, and smithsonite all have S.G.'s higher than turquoise.

Chrysocolla, variscite and serpentine, in the lower range, all have marked differences in their hardness compared to turquoise.

Gilson turquoise tends to have an unnatural appearance compared to natural turquoise although it is a more convincing imitation when compared to the extra fine quality 'robin's egg' blue turquoise.

Imitation odontolite made by calcining contemporary ivory and staining it blue with copper sulphate can be identified, if unset, by its low specific gravity of 1.80, and by its diamagnetic response when floated.

Stained howlite, a hydrated boro-silicate, can often be mistaken for turquoise; however, it is considerably softer, has a lower refractive index and specific gravity, and due to the dye used, will have a broad absorption band in the green with no bands in the blue or violet. Due to their copper content and possibly also iron content, natural turquoise exhibits weak to strong magnetic attraction when floated, and can be distinguished from stained howlite, stained magnesite, and stained blue ceramics, polymers and plastics, all of which show no magnetic attraction.


Turquoise (Photo by Tino Hammid)

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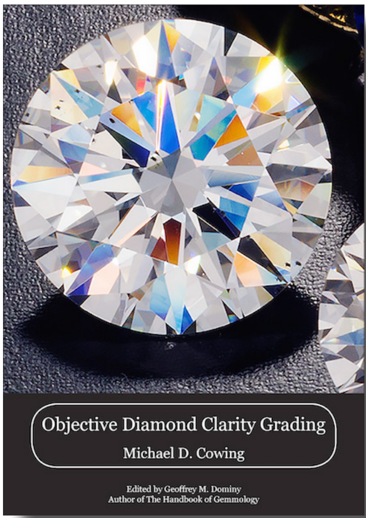

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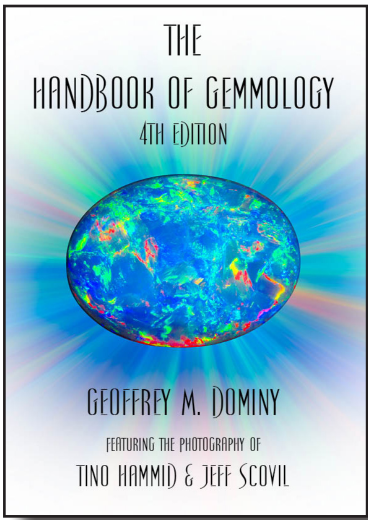

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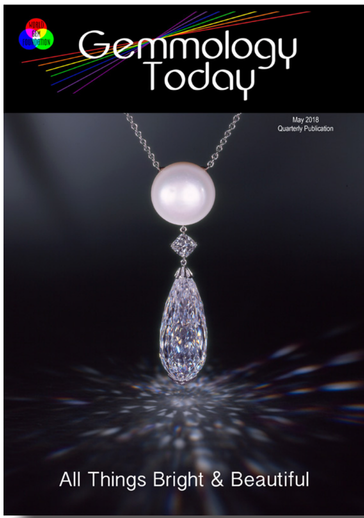

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The Ideal Brilliant Cut: From its Beginnings to Today

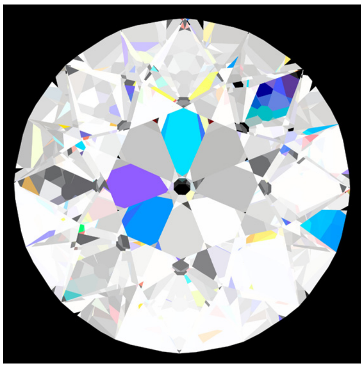

Figure 1. Face-up view of the Ideal Cut at its beginning in the 1860's time frame.

Figure 2. 20° Tilt from face-up view of the early Ideal Cut.

Figure 3. 20° Tilt forward from the side view of the early Ideal Cut.

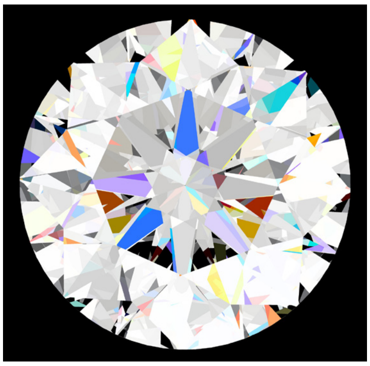

Figure 4. Face-up view of today's Ideal Cut having identical pavilion and crown main angles.

Figure 5. 20° tilt from face-up view of today's Ideal Cut.

Figure 6. 20° tilt forward from the side view of today's Ideal Cut.

Introduction

Since its beginnings in the early 20th century all the way to the present day, much confusion and misunderstanding has frequently surrounded the use and often misuse of the term 'Ideal Brilliant Cut' and its defining properties. Some have even gone so far as to advocate eliminating its use altogether. Through the examination of the Ideal Cut's history and evolution, this article endeavors to clear all this up, and in the process dispel the misunderstanding and mythology surrounding this most popular of diamond cuts.

The computer-generated, photorealistic images in Figures 1-3 provide a preview of the Ideal Brilliant Cut's beginning in the 1860's fashioned with '35 degrees for the top angle and 41 degrees for the back angle[1]', and known in Europe around the turn of the 19th century as the American Cut. The Ideal's appearance is transformed in Figures 4-6 with today's proportions, that retain fundamentally the same key crown and pavilion main angles. (Both sets of three diamond images are under identical simulated illumination).

The Ideal's beginning with the American Cut

With apologies to Shakespeare, 'the Ideal Cut by any other name would sparkle as brilliantly.' The beginning, in the 1860's time frame, of today's Ideal Round Brilliant Cut was the design attributed to Henry Morse and his diamond cutting firm. Morse was credited with this 'finely made' brilliant cut in Frank Wade's 1916 book, 'Diamonds', and by others including Dr. Herbert Whitlock in 'The Jewelers' Circular-Weekly', 1917 . Morse's design was first called the ideal brilliant in print in Whitlock’s writing[3] on ‘The Evolution of the Brilliant Cut Diamond[2]’. There he concluded: ‘The final stage in the evolution of an ideal brilliant cut takes the form of the American Cut brilliant’. By the early 1900’s, in addition to the Morse design being called Ideal, other terms were used including ‘Scientific Cut’, ‘Perfect Cut’ and ‘American Cut’.

Quoting Wade: ‘A calculation made by the writer gives us about the best angles for a diamond, [those attributed to Morse], 35 degrees for the top angle and 41 degrees for the back angle. Within two years of Wade’s book we have Herbert Whitlock[2] echoing Wade’s writing: ‘Calculations ... have led to the assumption of the ideal proportions of the brilliant cutting for diamond to be close to the following: Top angle, 35°; back angle, 41°’. In the 1915-1917 time frame Wade, Whitlock and others called these design angles Ideal. In the early 1900’s, cutting houses in London and Europe, who were polishing diamond’s for the relatively large and burgeoning American market, were cutting to the lower crown and pavilion angles of what they knew as the American Cut of Morse. Leviticus and Polak, the Belgian authors of a 1908 Dutch encyclopedia on diamonds gave credit to Morse and his shop foreman Field for their work in diamond cutting advancements, in particular the invention of an adjustable gauge for measuring cutting angles. Wallis Cattelle in his 1903 book ‘Precious Stones: A Book of Reference for Jewellers’ explained, ‘The public, seeing its superiority, began to insist upon having stones cut and proportioned after his [Morse’s] method, and European cutters were gradually obliged to conform more and more to it. The result is that the proportions of the American brilliant have been generally adopted[5]’.

The Triple-Cut Brilliant, 58 Facet Predecessor of the Ideal Cut

With the advantage of hindsight, rather than Morse’s American Cut being the final evolutionary stage of the Ideal brilliant as Whitlock stated in 1917, we see that this was actually the Ideal’s beginning. From David Jeffries in his publication: ‘Treatise on Diamonds and Pearls’ in 1750 we know that the 58 facet brilliant existed going back at least to the mid-18th century. It was referred to as the ‘triple cut’ brilliant. This 58 facet design was most often fashioned as a square/cushion shape. However, we see from Jeffries drawings, Figure 7, that it was also fashioned at that time as a round brilliant.

For over a century from Jeffries’ time and John Mawe’s in 1813 until Morse, the best main angles were said to be 45° for both crown and pavilion, Figure 8.

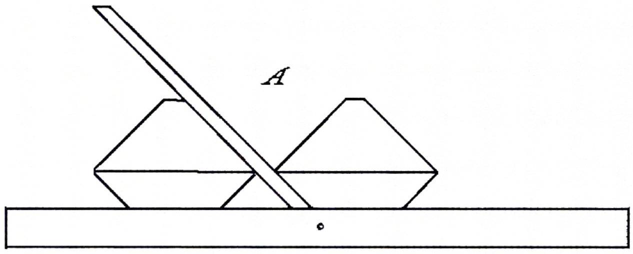

Figure 8. John Mawe’s 1813 drawing showing the compass used to make sure both crown angles and pavilion angles were at 45° [7]

Over that time however, the brilliant was typically cut with greater depth and steeper angles than the prescribed 45° crown and pavilion mains. The steeper, octahedral angles of the diamond crystal ‘rough’, Figure 9, were more often followed for maximum weight retention[8], as diagramed by Whitlock in Figures 10, 11 and 12.

Figure 9. Image revealing the much steeper than 45° angles of octahedral diamond ‘rough’. Photo by Robison McMurtry.

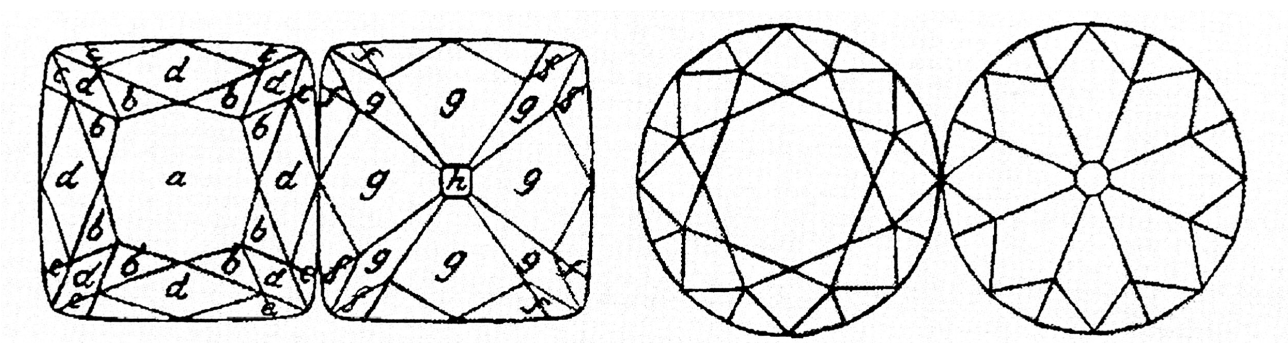

Figure 7. Jeffries’ 1750 drawings of the triple-cut brilliant both square and round versions. The 58 facet round triple-cut was the precursor of the Ideal Brilliant Cut.

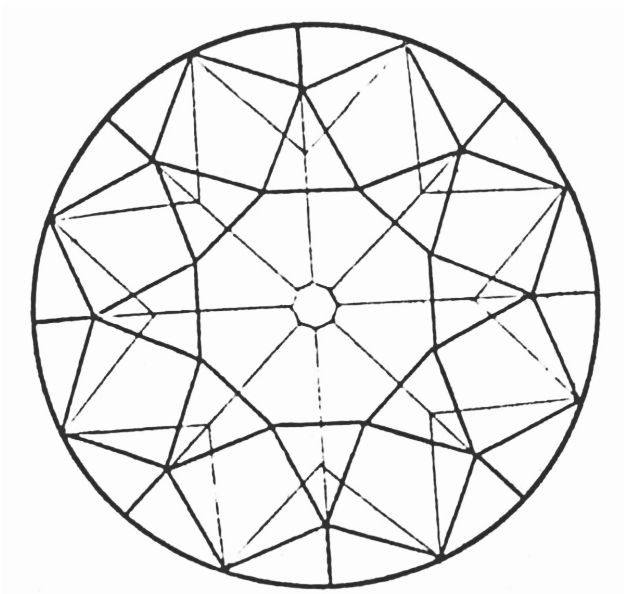

Figure 10. 58 facet face-up diagram of triple-cut brilliant, the Ideal's forerunner. Diagrams by Whitlock

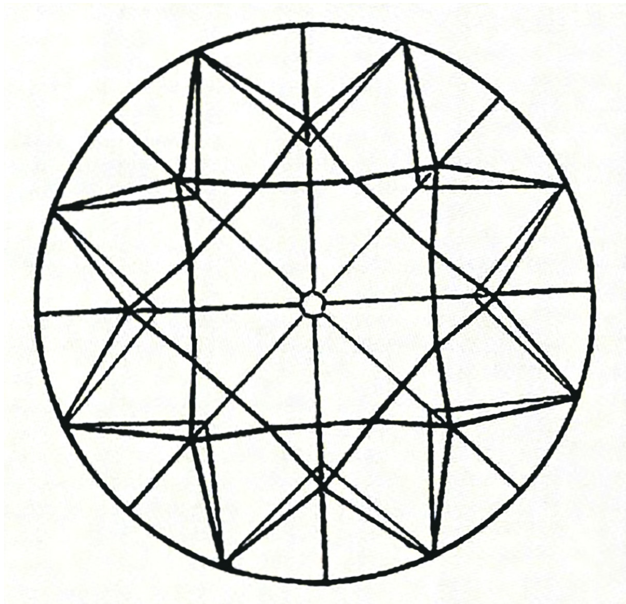

Figure 13. Top View of American Cut attributed to Morse. Diagrams by Whitlock

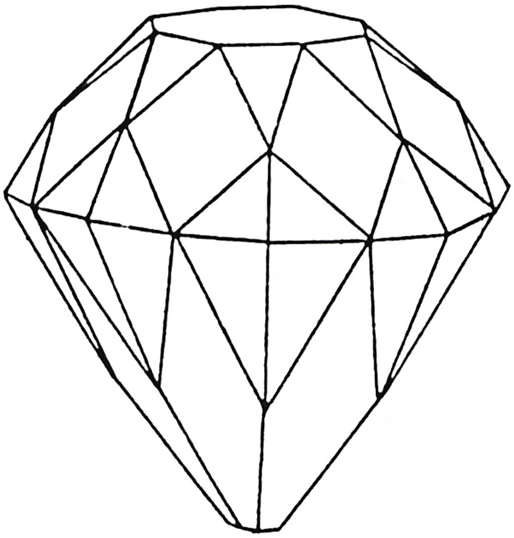

Figure 11. Tilted view of the mid-18th Century triple-cut with octahedral angles.

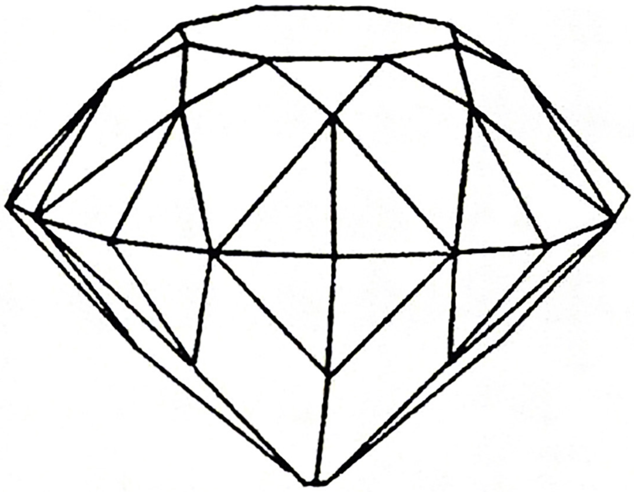

Figure 14. Tilted View of American Cut.

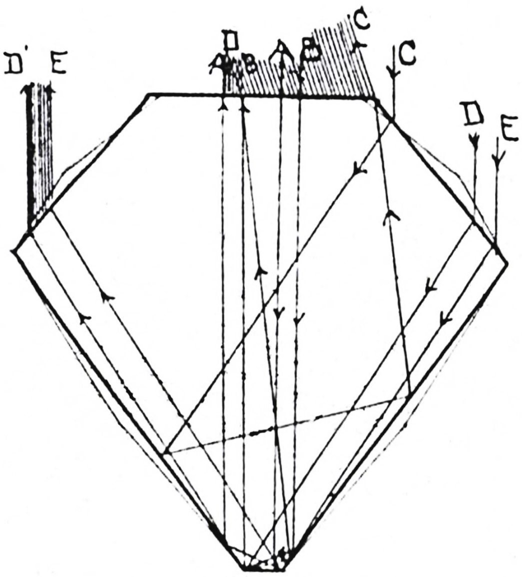

Figure 12. Ray tracing by Whitlock in side view of 58 facet triple-cut brilliant following diamond's 54.7° octahedral angles[8]

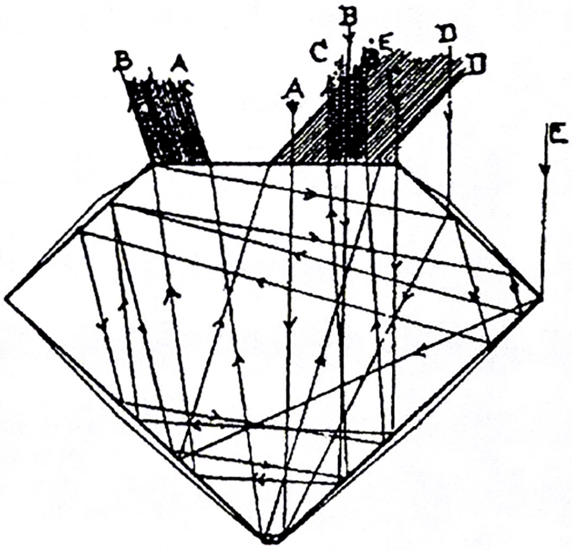

Figure 15. Ray tracing by Whitlock in side view of 58 facet American Cut brilliant.

The American Cut design attributed to Morse was the same round 58 facet triple-cut design, but with 41° pavilion main angles and close to 35° crown main angles, Figures 13, 14 and 15. The magic of Morse's design was the change to these angles from the 45° angles said to be the best by Jeffries from 1750 and Mawe in 1813.

Tolkowsky's Theoretical Validation of the Ideal Crown and Pavilion Main Angles

The Ideal brilliant design and angles that began with Morse got its largest boost in popularity in 1919 with the publication by a young University of London graduate engineering student, Marcel Tolkowsky, and his publication, 'Diamond Design'. He was a member of a prominent diamond cutting family, and related to another (the Kaplans). Tolkowsky presented mathematical calculations for what he called the high class brilliant (40.75° pavilion angle, 34.5° crown angle and a 53% table). As Tolkowsky's writing suggests, he, his father and their cutting firm were aware of and were at that time cutting to the main angles of the American Cut, as he declared: 'that in the present-day well-cut brilliant, perfection is practically reached: the high-class brilliant is [currently] cut as near the theoretic values as is possible in practice, and gives a magnificent brilliancy to the diamond'.

Referring to the gradual shrinking-in of the corners of an old-cut (square/cushion shape) brilliant, Tolkowsky notes 'Some American writers [likely referring to Wade, Cattelle and Whitlock] claim that this change from the thick cut to that of maximum brilliancy was made by an American cutter, Henry D. Morse. It was, however, as explained, necessitated by the absolute roundness of the new cut.[9]'

Aware that Tolkowsky's calculations validated Morse's American Cut angles and design, Wade immediately switched to emphasizing the importance of Tolkowsky's work: 'Knowledge of the exact proportions required for the greatest brilliancy should also be helpful to diamond dealers and should make them more exacting in their requirements'. Wade later wrote that Tolkowsky's father had already been cutting to these proportions, and that 'Tolkowsky Junior found out why that shape did its work so well'.

Tolkowsky's Implied Range of Angles Possessing 'The Liveliest Fire and the Greatest Brilliancy'

In large part due to Wade's influence on trade understanding of diamond cut quality and later on GIA's support and diamond course teaching[3], Tolkowsky's work has had far reaching influence in the trade. His exact theoretical angles, 40.75° pavilion mains, and 34.5° crown mains remain well known today. Because of today's understanding that there is a small range of angle combinations, not a single combination like Tolkowsky's that possess ideal light performance, it is essential to know that the range of angles of the five diamonds, which Tolkowsky offered as empirical proof of his calculations, varied substantially from his theoretical ones[3]. They provide a range of angles and proportions that Tolkowsky saw as best. He describes the five diamonds as 'all cut regardless of loss of weight, the only aim being to obtain the liveliest fire and the greatest brilliancy[9]'.

Figure 16 is a photorealistic computer image analysis of the light performance of Tolkowsky's five examples of diamonds all cut 'to obtain the liveliest fire and the greatest brilliancy[9]' Each of these diamonds was identically illuminated in a computer generated (by DiamCalc) representation of jewelry store lighting consisting of diffuse overhead illumination coupled with numerous spot lights. To reveal and emphasize any loss of brilliance from 'light leakage' or observer obstruction due to 'retro-reflection', a black background and black area in the vicinity of the observer's head was utilized.

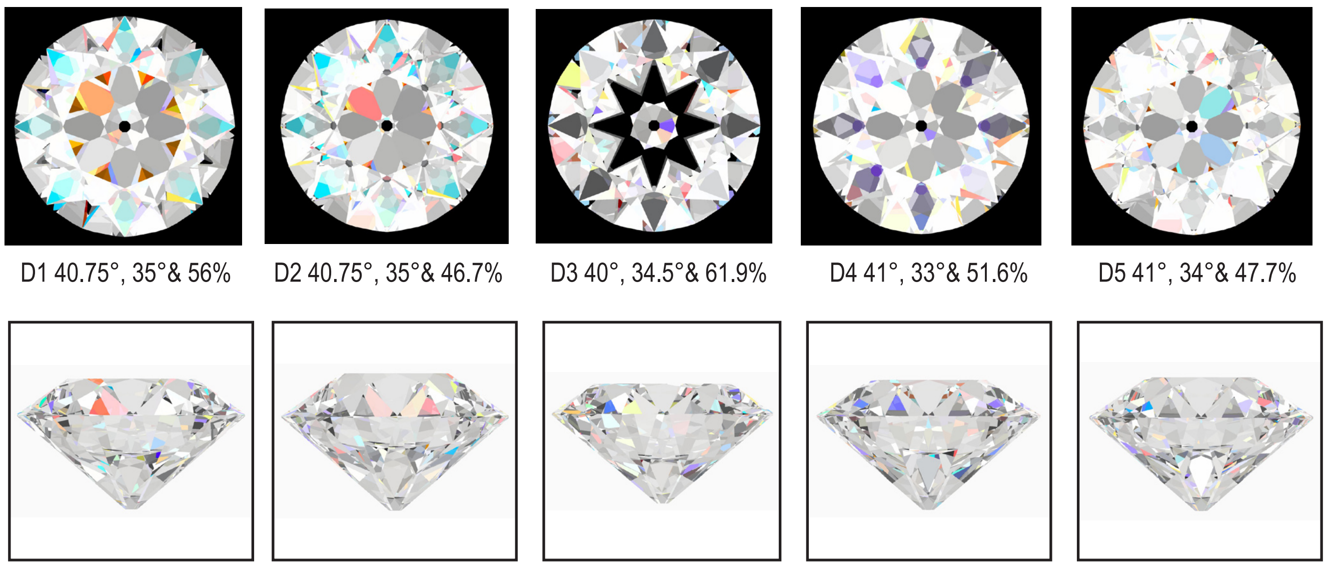

Figure 16. Tolkowsky's five example diamonds cut to give 'the liveliest fire and the greatest brilliancy[9]'

	D1	D2	D3	D4	D5
Pavilion Angle	40.75	40.75	40.00	41.00	41.00
Crown Angle	35.00	35.00	34.50	33.00	34.00
Table %	55.9	46.7	61.9	51.6	47.7
Lower Half %	60.0	60.0	60.0	60.0	60.0
Star Length %	40.0	40.0	40.0	40.0	40.0
Culet %	6.0	6.0	6.0	6.0	6.0

Today's Range of Angles with Ideal Light Performance

To put Tolkowsky's top performance diamond examples in today's context, we address the more exacting range of angles and proportions today found to constitute Ideal in round brilliant diamond cutting. This tighter range was investigated by the author and reported in the research study, Accordance in Round Brilliant Diamond Cutting[13] and in the subsequent article, The Central Ideal[14]. This study explored the range in the top grade of both the cut grading systems of the Gemological Institute of America (GIA), and the American Gem Society (AGS). Both define their top grades, GIA Excellent and AGS 0 Ideal, to be in a narrow range of angle combinations and proportions. They differ from each other in some respects, but surprisingly and significantly are found to have a common geometric center. The Graph for a table size of 56% in Figure 17 shows the range of pavilion and crown angle combinations that today constitute the Ideal 0 of AGS (blue + green), and the Excellent grade of GIA (yellow + green). The angle combinations in common (green) is the narrow range considered both Ideal and Excellent. Their common geometric center is the combination of Morse's 41° pavilion angle, a 34° crown angle and a 56% table, Figure 17. For reference purposes this combination is termed the central Ideal[14]. Unlike Tolkowsky's single theoretical peak in light performance at 40.75° pavilion, 34.5° crown and 53% table, the central Ideal is simply the center of the narrow ranges of angle combinations that today are graded Ideal or Excellent.

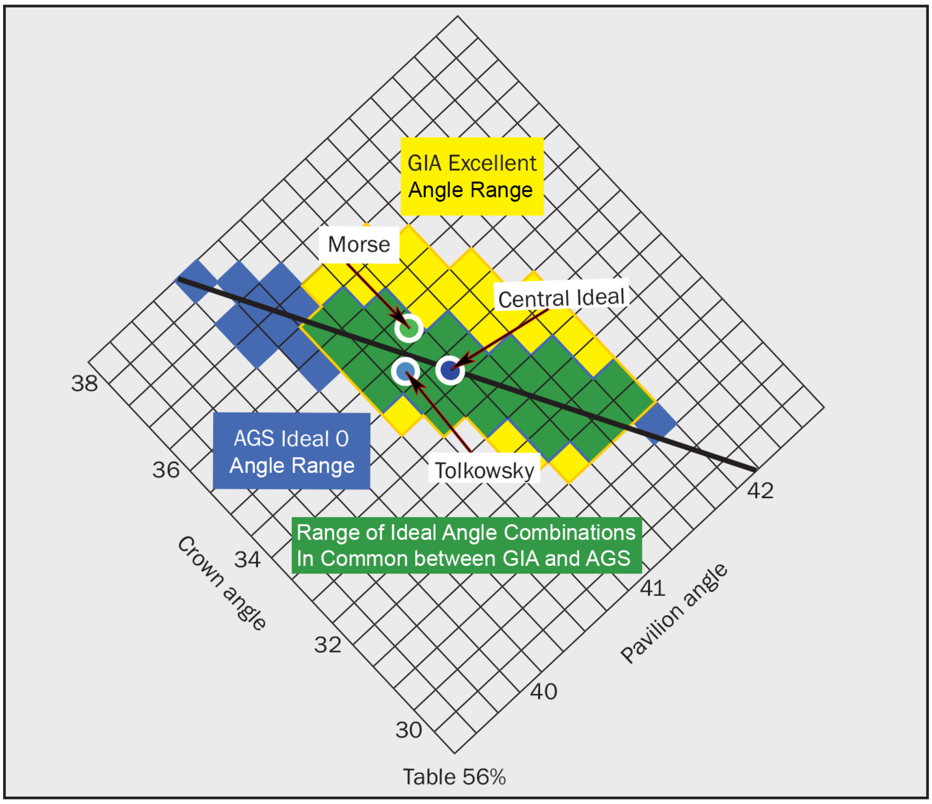

Figure 17. Graph of the ranges of the angle combinations graded Ideal 0 by AGS (Blue + Green), and Excellent by GIA (Yellow + Green). The angle combinations in common (Green) is the narrow range considered both Ideal and Excellent. Also shown are the positions of the Morse American Cut, the Tolkowsky theoretical angles, and the central Ideal angle combination, that is the geometric center both ranges have in common. (The -4:1 slope 'Ideal line' in black indicates that a small change in pavilion angle is best coupled with about a four times change in the opposite direction in crown angle to best maintain top light performance.)

Also shown in Figure 17 are the positions of the Morse American Cut, the Tolkowsky theoretical angles, and the central Ideal angle combination, which is the geometric center both ranges have in common. An additional important aspect in this graph is the 'ideal line', called the 'cutter's line' by AGS. Many cutters have long been aware that deviations from Morse's 41° pavilion angle are best compensated by about a four times change in crown angle in the opposite direction. Cutting to angle combinations on or near the ideal line best retains top light performance within the ideal range. This -4:1 sloped 'Ideal line' is drawn in black in Figure 17.

Photorealistic Comparative Analysis of Tolkowsky's Five Diamond Examples

Returning to the photorealistic digital image analysis of Tolkowsky's five examples of diamonds all cut 'to obtain the liveliest fire and the greatest brilliancy[9]', and armed with the advantage of this graph of the range in common between today's Ideal and Excellent, we see that of Tolkowsky's five examples of diamonds with the liveliest fire and the greatest brilliancy[9], the third, Figure 16-D3 is the only one falling outside the top ranges of both GIA and AGS. The reason is a too shallow 40° pavilion main angle. This has resulted in the reflections from the main facets retroreflecting from the relatively dark vicinity of the observer's head. This darkness in the mains is apparent in the face-up view in Figure 16-D3. The author adds: Having closely observed similar diamonds possessing slightly shallow pavilion angles and or lower than 34° crown angles compared to diamonds with Ideal angles, it was observed that not only are the main reflections darker, but the entire crown typically had inferior brightness. This is due to the greater head obstruction brought about by close viewing (roughly ten inches), which further adversely impacts the light performance of these slightly shallower than ideal diamond cuts.

Research Study Findings from 'Accordance in Round Brilliant Diamond Cutting'

This example supports the Round Brilliant Study[13] findings, the first of which is the importance of cutting the Ideal's pavilion mains within a narrow range of the original 41° of Morse. The center of the range of AGS 0 Ideal and GIA Excellent angle combinations for the round brilliant cut is Morse's 41° for pavilion angle and closer to Tolkowsky's crown angle of 34.5° at 34°. Both 41° and 34° are very close to both the angles of Morse and Tolkowsky. In proper combination with the other five parameters defining the round brilliant cut, this central ideal combination of 41° and 34° along with the angle combinations of Morse and Tolkowsky are all in the narrow range having ideal light performance and beauty[13].

The central Ideal combination of 41° and 34° is in accord with the author's study findings, and with the teaching of diamond cutters and diamond cutting institutions. From the 1970s the Institute for Technical Training in Antwerp, Belgium, taught Ideal angle combinations of 41° and 34° - 34.2° (pers. comm., D. Verbiest). In the same time frame, but a continent away in Johannesburg, South Africa, the Katz Diamond Cutting Factory was teaching its apprentices to cut the Ideal round brilliant to a 41° pavilion main angle and 33° to 35° crown main angle (pers. comm., P. Van Emmenis). Basil Watermeyer , the renowned South African diamantaire, and the author of 'Diamond Cutting' , the 'only one of its kind' guide to diamond processing, gives the angles for 'the fully-proportioned Modern Ideal Cut [as] 32 - 34° crown, 41° base'.

Photorealistic Comparative Analysis of Morse's American Cut brilliant, Today's Ideal Brilliant Cut, and the Two Precursor Triple-cut Brilliants

We conclude with a comparative analysis of the light performance of Morse's American Cut brilliant, today's Ideal Brilliant Cut, and the two precursor triple-cut brilliants. It will become apparent that much can be learned from this analysis, which utilizes computer software systems, in particular Octonus' DiamCalc[16], to provide photorealistic computer aided design (CAD) renderings of a diamond's light performance in diagnostic, simulated illumination and viewing circumstances. As before, each of these four diamonds was identically illuminated in a representation of jewelry store lighting with diffuse overhead illumination coupled with numerous spot lights. A black background and black area in the vicinity of the observer's head is utilized to emphasize any loss of brilliance from 'light leakage' or 'retroreflection' from the observer's head.

The three viewing angles of these four round brilliant cuts are 1. the face-up view looking perpendicular to the diamonds' table, 2. face-up view tilted away by 20°, and 3. side view tilted forward 20°.

Of these 12 images (see next page), what stands out is the total lack of light return in the table area in the face-up view, Figure 19, of the triple-cut brilliant with 45° crown and pavilion angles. It is particularly surprising, since these angles were promoted by Jeffries and Mawe and said for over a century before the time of Morse to be perfect. With today's knowledge, and the evidence in Figure 19, we now recognize that a diamond cut with 45° pavilion angles, when viewed face-up, retroreflects rays in the table from the vicinity of the viewer's eyes and head resulting in the dark table appearance known today as a 'nailhead'. The dark table nailhead appearance is the reason the 45° pavilion angle is one of the poorest angles to cut the round brilliant pavilion (see article Let There Be Light[12] for further discussion of retroreflection and the poor cutting called the nailhead.)

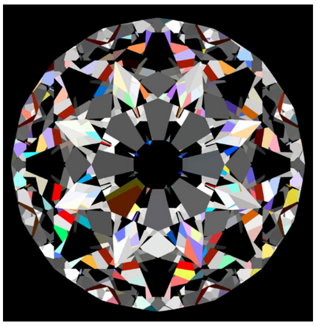

Figure 18. 54.7°, 54.7°, 45%
Triple-Cut, Face-Up

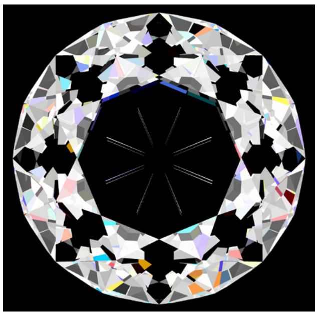

Figure 19. 45°, 45°, 56 %
Triple-Cut, Face-Up

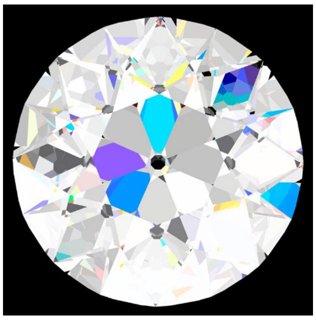

Figure 20. 41°, 35°, 45%
American Cut, Face-Up

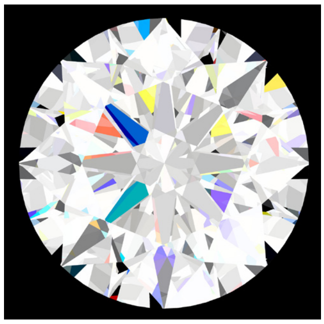

Figure 21. 41°, 34°, 56%
Center of Today's Ideal, Face-Up

Figure 22. 54.7°, 54.7°, 45%
Triple-Cut, Tilted Away 20°

Figure 23. 45°, 45°, 56 %
Triple-Cut, Tilted Away 20°

Figure 24. 41°, 35°, 45%
American Cut, Tilted Away 20°

Figure 25. 41°, 34°, 56%
Center of Today's Ideal, Tilted Away 20°

Figure 26. 54.7°, 54.7°, 45%
Triple-Cut, Side View Tilted Forward 20°

Figure 27. 45°, 45°, 56 %
Triple-Cut, Side View Tilted Forward 20°

Figure 28. 41°, 35°, 45%
American Cut, Side View Tilted Forward 20°

Figure 29. 41°, 34°, 56%
Center of Today's Ideal, Side View Tilted Forward 20°

	Whitlocks Drawing 54.7 Degree Triple-Cut	Jeffries'/ Mawe's 45 Degree Triple-Cut	Morse Ideal	Today's Central Ideal
Pavilion Angle	54,7	45	41	41
Crown Angle	54,7	45	35	34
Table %	45	56	45	56
Lower Half %	40	30	60	77
Star Length %	60	50	40	55
Culet %	10	10	5	0
Girdle Tickness %	0	0	0	3

Figure 30. Angles and Proportions of the Ideal's Beginning, Today's Ideal, and two Ideal forerunners.

Notice in Figure 23 that the 45° triple-cut of Jeffries brightens in the table when sufficiently tilted from the face-up view, in this instance by 20°, but it still has less fire than the much steeper triple-cut in Figure 18 and 22. It exhibits far less brilliance whether face-up or tilted than does the early Ideal in Figures 20 and 24 or the equally brilliant modern Ideal in Figures 21 and 25. (A lot more can be learned from this comparative analysis.)

Ideal Cut Diamond (Photo by Michael D. Cowing)

Conclusion

Whether cut with the smaller table, larger pavilion main and shorter half facets of the early Ideal (Morse's American Cut), or fashioned with the larger table, slimmer mains and longer halves of today's Ideal, the images, Figures 20, 21, 24 and 25 reveal the superior light performance of fire and brilliance that characterize the Ideal Brilliant Cut.

The other angles and proportions of the Ideal brilliant, most importantly, table percent and lower half facet angle (or length) have changed. However, Morse's combination 41° pavilion angle, and 35° crown angle remains in the narrow range of angle combinations today considered Ideal. Morse's crown and pavilion main angles have stood the test of time. It is a narrow range and, as we saw with Tolkowsky's example diamond, Figure 16-D3, any significant deviation from this angle combination, or the central Ideal combination 41° pavilion, and 34° crown results in diminished light performance.

The narrow range of angles around the central Ideal that today are graded both Ideal and Excellent includes both Tolkowsky's theoretical angles, and the Morse American Cut angles that in the early 20th century were first called Ideal.

Acknowledgments

The outstanding research by Al Gilbertson over a six year period is beautifully organized and presented in his book, American Cut - The First 100 Years. Without the aid of this conscientious and comprehensive endeavor, and access to the book's extensive source Bibliography and detailed Index, this study article would lack the historical authority and validity made possible by a study of his book. Everyone is encouraged to further pursue this legacy of the Ideal Brilliant and its beginning as the American Cut by availing themselves of a free online copy of his book.

https://archive.org/stream/AmericanCut--theFirst100YearsTheEvolutionOfTheAmericanCutDiamond/Gilbertson-americanCut-2007_djvu.txt

OctoNus' DiamCalc software system is the resource and tool essential to production of the photorealistic renderings of diamond light performance that illustrate this study and its findings. It is a one of a kind capability that the author finds is critically important to research in diamond cut design and light performance.

See http://www.octonus.com/oct/products/3dcalc/standard

Footnotes

1. Wade , F. (1916), 'Diamonds - A Study of the Factors that Govern their Value', G.P. Putnam's Sons, New York and The Knickerbocker Press, London.

2. Whitlock, H. (1917a), 'The Evolution of the Brilliant Cut Diamond', The Jewelers' Circular-Weekly, Vol. 74, No. 1, pp. 115-121

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8. Whitlock, H. (1917a), 'The Evolution of the Brilliant Cut Diamond', The Jewelers' Circular-Weekly, Vol. 74, No. 1, pp. 115-121

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15. Watermeyer, B. (1982), 'Diamond Cutting, A complete Guide to Diamond Processing', Centaur Publishers, Johannesburg, p. 166.

16. DiamCalc, Octonus Software, http://www.octonus.com/oct/products/3dcalc/standard

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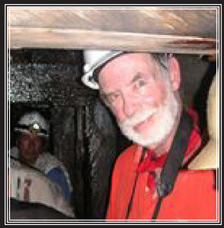
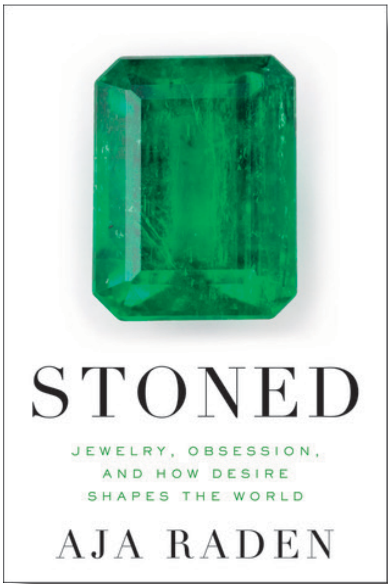
In this issue Richard W. Wise looks at 'Stoned: Jewelry, Obsession, and How Desire Shapes the World' by Aja Raden





In her best-selling book, Stoned, Jewelry, Obsession, and How Desires Shapes the World, Aja Raden provides a well-organized and stimulating account of the psychology of desire as it relates to gemstones. A gemstone has no nutritional value, it will not keep off the rain or keep you warm in winter, yet gems have been objects of desire since the beginnings of civilization. Ultimately, the author tells us, it is not beauty, but rarity, that drives gem value. The fact that you own something no one (or at least very few others can) own. 'The history of the world,' Ms. Raden says, 'is the history of desire' and it can be broken down to just three verbs: want, take and have. It is those three terms that define her narrative.

Beginning with tulip-mania, Raden marshals a number of historical examples to illustrate her point. She does a good job of debunking the myth of diamond rarity, recounting the familiar history of the DeBeers cartel, and she notes that it is not rarity but cultural necessity (that fact that all brides must have a diamond engagement ring) that is the primary driver of diamond demand. 'Value works like an economic syllogism: Everyone has to have it because everyone has to have it.' The more appropriate term would be tautology, a syllogism being simply a form of logical argument. Does this statement contradict her thesis? Not exactly, she goes on to clarify, she is talking about perceived rarity, not actual rarity. Esse is certainly percipi! If a tree falls in the forest and no one markets it, does it really make a noise? De Beers promotional efforts clearly made a major noise!

Raden makes the further point that diamonds from the newer sources, Brazil and South Africa, discovered after the so-called 'Golconda'" mines of India and exhausted at the end of the fifteenth century, were so inferior in transparency that GIA was forced to change the grading terminology abandoning the old term, water, which referred to the Golconda stone's exceptional transparency.

Shipley had outlined the GIA diamond grading system by the early 1930s (not the 1960s as Raden contends), but he did pointedly abandon transparency as a grading criterion, but Raden misunderstands the term's meaning. Water refers to a combination of color and transparency (see GIA dictionary) and was and is a characteristic of all transparent gemstones. The ultra-transparent diamonds to which Raden refers are known as type IIa. Some Indian stones were of this type, no one knows what percentage, but type IIa diamonds have been found at the Premier Mine and other mines around the world. Type IIa stones lack measurable Nitrogen, the cause of the yellow tint. They exhibit both high color, what is sometimes called 'super-D' and 'whiter than white' together with exceptional transparency. Raden's statement that 'South African diamonds just don't have 'water' is simply false. All diamonds have 'water' as do all transparent gemstones including emeralds and pearls.

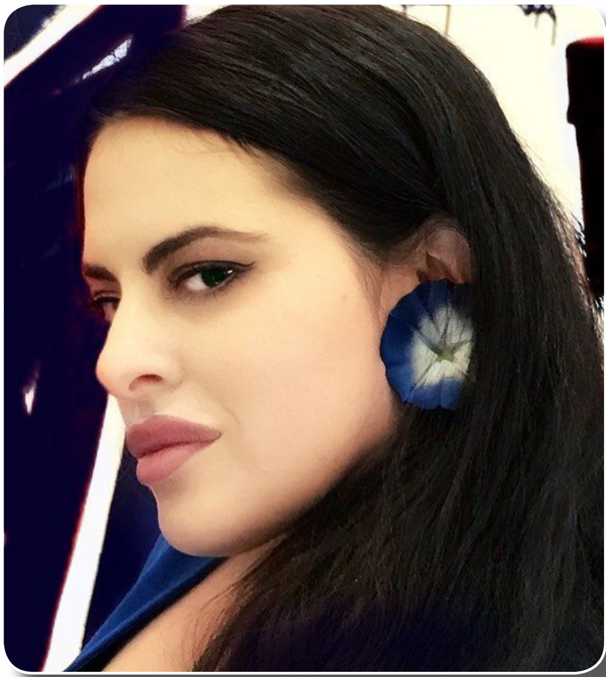
Raden makes the curious claim that in the early Medieval period, prior to the development of modern diamond cutting, emeralds, not diamonds, were the most precious and desired gemstones. Before the Columbian discoveries in the sixteenth century, true emeralds had but one ancient source, the fabled 'Cleopatra's Mines' at Marsa Alam in the Sinai desert. These mines were actively exploited beginning about 500 BC and stopped producing sometime between 500 and 1400 AD depending upon who you ask. Production was never great and most was of inferior quality opaque to semi-translucent gems. She is correct that few diamonds found their way from India to the west during that period. However, if we survey museum collections, we find that garnet, specifically red garnet, is by far the most represented gem in jewelry of this period.

Raden tells a great story. She tells us that the famous Affair of the Necklace, an attempt to get Marie Antoinette to buy what was arguably the gaudiest piece of diamond jewelry ever created, caused the French Revolution though she graciously admits that famine, corruption and the ideas of the Enlightenment may have played a roll. She also presents us with a fascinating account of how Armand Hammer, serving as Stalin's sales agent, liquidated the Russian royal treasures which in turn (she tells us) financed the Cold War.

Raden writes that there are two sorts of envy, benign - people just wish they had what you have and malicious - people want and will take what you've got. Desire! The lust for the rare and the beautiful with addition of malice is, indeed, one way of viewing world history.

In this glib, fast paced narrative, the author dishes up a lot of food for thought. In the final analysis, however, she falls into the old philosophical trap, the attempt to reduce all things to one thing, in this case greed and desire, and in her attempt to do so, she occasionally stumbles into absurdity. The idea that the gemstone market is fueled by beauty and desire is not precisely a new one, but Raden's take on it is particularly entertaining and has made her book a bestseller. She is possessed of a facile mind and serves up some interesting facts and some profound and entertaining insights that are well worth contemplation.

Stoned: Jewelry, Obsession, and How Desire Shapes The World. is available in both hard and soft cover and as a Kindle edition as well. ISBN: 9780062334695 $ 27.99 USD



Author Aja Raden

Studying Gemmology with the World Gem Foundation

There's an expression 'different strokes for different folks' and this is certainly true in the case of gemmology. We are fortunate to work in an extremely diverse industry; one that provides unlimited opportunities in a broad range of disciplines.

Some people want to become a professional gemmologist; to forge a career for themselves working with gemstones. At the World Gem Foundation, gemmology is not just a job, it's a profession. This is why we opted for the 'Career Gemmologist' designation. We not only want to raise the level of consciousness with consumers but also within our industry. An awareness that gemmology is a science that demands a high level of theoretical knowledge and practical experience.

At the same token, we also understand that not everyone wants to become a fully fledged gemmologist. Many choose to specialise in a particular area, such as diamonds or coloured gemstones. To recognise this, we have introduced two new 'Diploma' programs (Diamond Professional and Coloured Gemstone Professional) for 2018.

But what about gemmologists who may have completed their studies five, ten, fifteen or twenty years ago? Since gemmology is constantly evolving, it is important to continually upgrade your knowledge. You simply cannot afford to become complacent. One minute you may be 'up to speed', the next completely 'out of sync'. Each year brings new treatments and enhancements, new lab-created gemstones and new techniques to identify them. It is not the certificate that hangs on your wall that defines who you are as a gemmologist but the knowledge you possess. Our courses can be taken collectively or independent of each other, allowing our students to customise their own personal development programs based on their own specific needs.

Finally, there are many people who share a passion for gemstones but don't necessarily want to enrol in a gemmological program, they simply want to augment their existing knowledge and upgrade their level of understanding.

Regardless of your motivation to expand your knowledge, the World Gem Foundation has a variety of courses and programs that can help you reach your goal.

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For students wishing to pursue a career in gemmology, our 'Career Gemmologist' program has been especially designed to give you the knowledge and experience required to work as a professional gemmologist. The World Gem Foundation and our affiliated gem academies offer you two options to earn your Career Gemmologist Diploma with our Gemmology Seven/ Eleven programs.

Gemmology Seven

This option allows you to complete the entire theoretical requirements by enrolling in our Career Gemmology course (78 lessons) and completing the five practical workshops (Gem Identification #1, Gem Identification #2, Diamond Grading and Lab-created Diamonds, Coloured Gemstone Grading #1 and Lab-created and Treated Gems) and our 100 hour online Coloured Gemstone Grading course.

The theoretical component covers the chemical nature of gemstones, their 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.

From there we move into the most challenging and fluid areas of gemmology; imitation and composite gemstones, lab-created gemstones and the treatment and enhancement of gems.

In the lessons pertaining to lab-created gemstones you will not only learn about the various methods used to manufacture lab-created gemstones (including Verneuil Flame-Fusion, Czochralski Pulling Method, Flux Melt Method, the Hydrothermal Method, Skull Crucible, Zone Melt, Horizontally Oriented Crystallization, the Sublimation Method, and the Modified Stober Method) but also the unique identifying features that allow us to separate them from their natural counterparts.

The use of treatments and enhancements is both demanding and depending on who you talk to, highly controversial. Here we look at not only the techniques used to treat and enhance gemstones (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 and irradiation) but also how they can be detected. We also look at the advanced gem testing techniques that are often needed to identify many of these treatments.

The course then takes a slightly different direction, focusing on the identification of gemstones including the tests that are commonly used to identify them and an in-depth look at each of the ten gemstone groupings based on colour and transparency (colourless or white, red, pink, orange, yellow, blue, green, violet or purple, brown, black or grey). These lessons include the 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 green tourmaline, diamond and lab-created moissanite) or gemstones that have physical and optical properties that are similar (i.e amethyst quartz and purple scapolite) to each other. This section also includes gemstones that either exhibit optical phenomena (i.e. asterism or chatoyancy) or are unusual by nature.

The next section looks specifically at diamonds, their physical properties, geology, localities, principle mines, crystal system, chemical composition and classification. You will also find lessons dedicated to fancy coloured diamonds, the causes of colour, absorption spectra, inclusions, fluorescence, mining, gem identification, methods of synthesis (including HPHT, CVD, Detonation and Ultrasonic Cavitation), common treatments and enhancements and a comprehensive examination of the 4 C's (colour, clarity, cut and carat weight) and how they are measured and assessed. The lesson on 'Cut' compares some of the most important and recognized 'Cut' grading systems used today including those pioneered by the Gemological Institute of America (GIA), the American Gem Society (AGS), Hoge Raad voor Diamant (HRD), the International Gemological Institute (IGI), the European Gemological Laboratory (EGL) and the Accredited Gem Appraisers (AGA).

The final twenty-nine lessons (29) are devoted to coloured gemstones and covers their 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 include corundum, beryl, chrysoberyl, spinel, zircon, topaz, tourmaline, peridot, quartz, garnet, tanzanite, lapis lazuli, turquoise, spodumene, feldspars, iolite, andalusite, diopside, apatite, and organic gems (pearls, coral, jet, ivory, and amber). You will also learn about the various colour grading systems currently used (GIA, Gemewizard, GemDialogue and the World of Color) including how to accurately describe colour based on hue, tone and saturation, the clarity classification of gemstones, how cut is assessed, opal, jadeite and pearl grading, and how to estimate the weight of 'mounted' stones.

The study of gemmology simply would not be complete without a comprehensive program of practical instruction. This involves five practical workshops (Gem Identification #1 & #2, Diamond Grading and Lab-created Diamonds, Lab-created and Treated Gems and Coloured Gemstone Grading #1) totalling twenty-eight days of in-class instruction and a 100 hour online Coloured Gemstone Grading course where you will work with the Gemewizard Colour Grading system.

Gemmology Eleven

While the information is the same, the theoretical portion of this program is divided into five free-standing courses (Basic Gemmology, Advanced Gemmology, Gem Identification, Diamonds and Coloured Gemstones). This option allows you to take each course separately giving you greater flexibility in terms of time and how you can pay for the courses.

Like the 'Gemmology Seven' program, there are five practical workshops and one 100 hour online course.

Diamond Professional Program

Designed specifically for those engaged in the diamond trade, this program covers the same theoretical information covered in our 'Diamonds' course plus our eight-day Diamond Grading and Lab-created Workshop.

Coloured Gemstone Professional Program

If your area of expertise is coloured gemstones, this program is ideally suited for you. The CGP program involves the completion of four theoretical courses (Basic Gemmology, Advanced Gemmology, Gem Identification and Coloured Gemstones) plus our two five-day practical Gem Identification workshops, our five-day Coloured Gemstone Grading #1 workshop, our five-day Lab-created and Treated Gems workshop plus our 100 hour online Coloured Gemstone Grading #2 course.

Courses in Other Languages

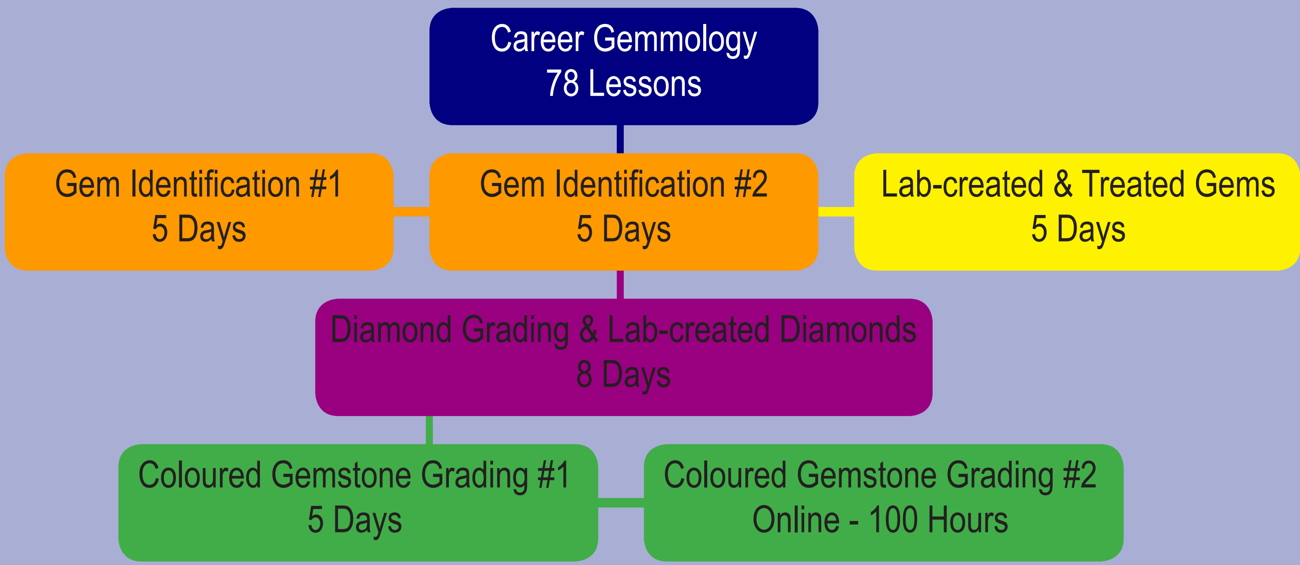
We are currently translating all of our 'Diploma' program courses into Spanish and Chinese to meet the needs of our Spanish and Chinese speaking students.

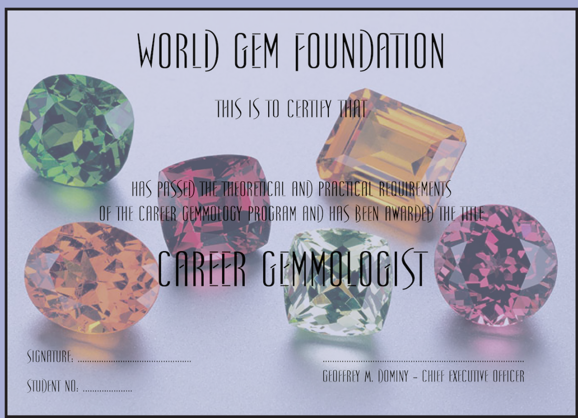
Currently our Gemología Básica (Basic Gemmology) is available in Spanish in both digital and print and also online.

General Interest Courses

For those interested in gemstones but not wishing to take our 'Diploma' programs, all of our theory courses can be taken independently without prerequisites. In addition to the six theoretical courses (Career Gemmology, Basic Gemmology, Advanced Gemmology, Gem Identification, Diamonds and Coloured Gemstones) that make up our Career Gemmologist, Diamond Professional and Coloured Gemstone Professional 'Diploma' programs, we also offer three 'General Interest' courses (Rubies, Sapphires and Emeralds, Opals and Jade and Organic Gems).

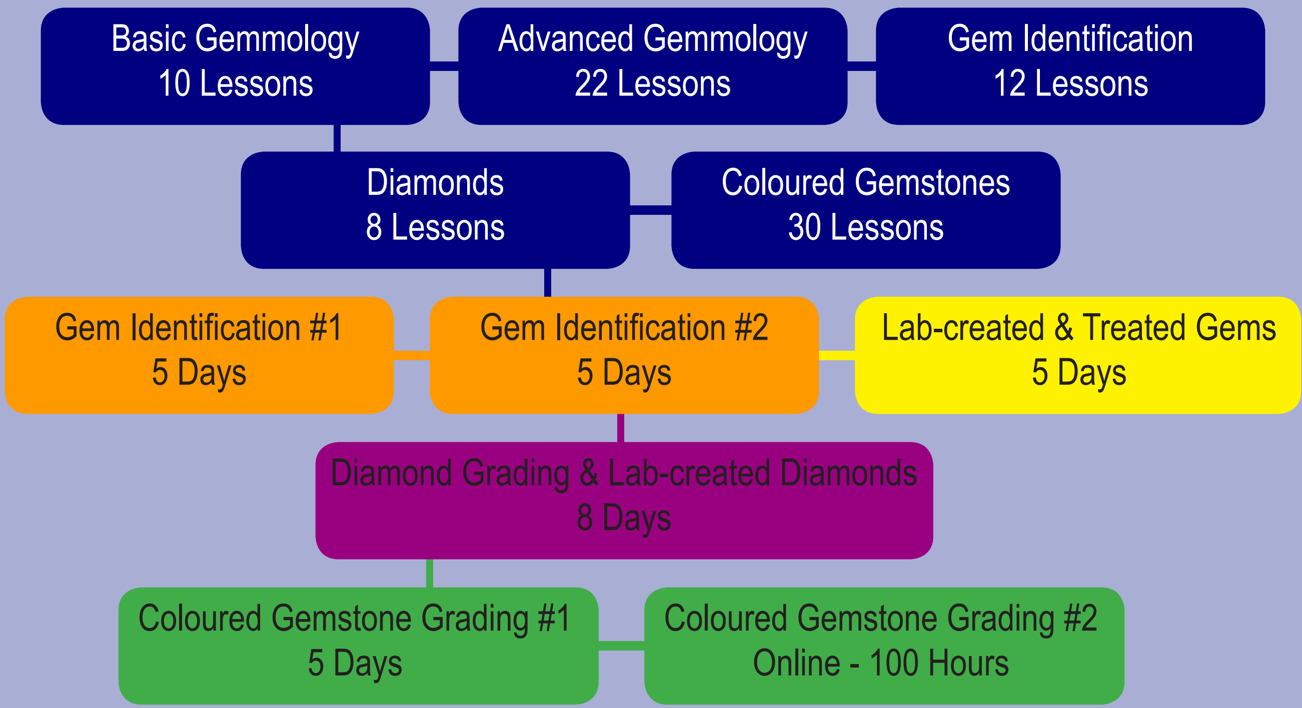
GEMMOLOGY SEVEN PROGRAM





Career Gemmology Seven	Digital Fees			Printed Fees		
Course Name	**Euros**	**Pounds Sterling**	**USD**	**Euros**	**Pounds Sterling**	**USD**
Career Gemmology (Theory)	1400	1100	1600	1570	1235	1795
Gem Identification #1	500	400	550	500	400	550
Gem Identification #2	500	400	550	500	400	550
Coloured Gemstone Grading #1	500	400	550	500	400	550
Coloured Gemstone Grading #2	1000	800	1150	1000	800	1150
Diamond Grading/Lab-created Diamonds	1750	1400	2000	1750	1400	2000
Lab-created & Treated Gems	500	400	550	500	400	550
Examinations Fees (Final Exam)	250	200	280	250	200	280
Total Cost	6400	5100	7230	6570	5235	7425

GEMMOLOGY ELEVEN PROGRAM

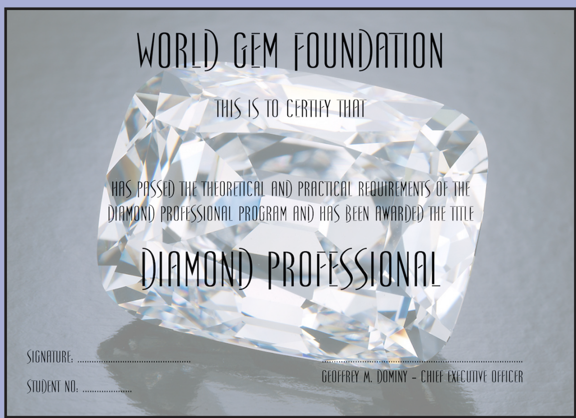


Career Gemmology Eleven	Digital Fees			Printed Fees		
Course Name	**Euros**	**Pounds Sterling**	**USD**	**Euros**	**Pounds Sterling**	**USD**
Basic Gemmology (Theory)	200	150	225	235	180	265
Advanced Gemmology (Theory)	400	300	450	430	325	485
Gem Identification (Theory)	225	175	250	255	200	285
Diamonds (Theory)	225	175	250	255	200	285
Coloured Gemstones (Theory)	500	400	550	565	450	625
Gem Identification #1	500	400	550	500	400	550
Gem Identification #2	500	400	550	500	400	550
Coloured Gemstone Grading #1	500	400	550	500	400	550
Coloured Gemstone Grading #2	1000	800	1150	1000	800	1150
Diamond Grading/Lab-created Diamonds	1750	1400	2000	1750	1400	2000
Lab-created & Treated Gems	500	400	550	500	400	550
Examinations Fees (Final Exam)	250	200	280	250	200	280
Total Cost	6550	5200	7355	6740	5355	7575

DIAMOND PROFESSIONAL

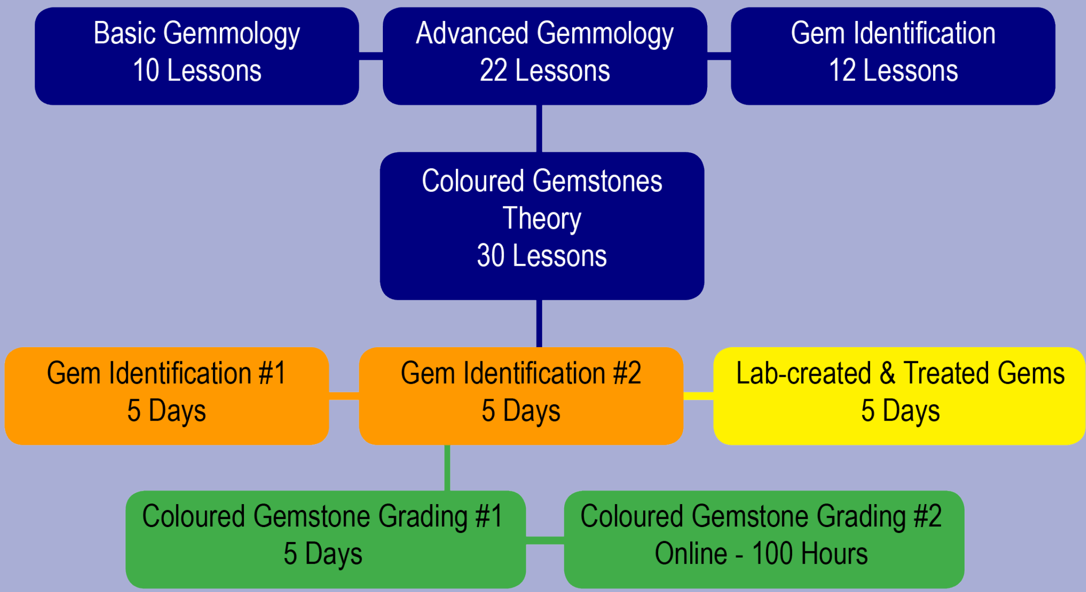
Diamonds
Theory
8 Lessons

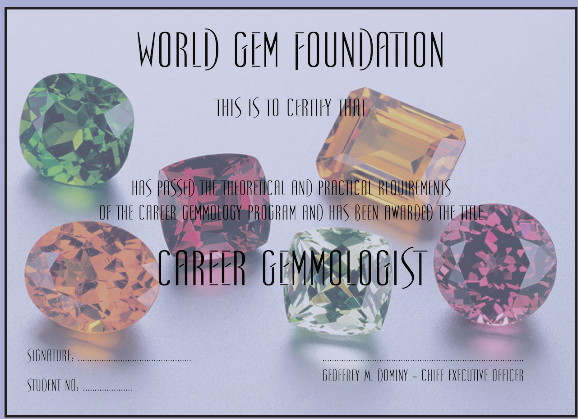
Diamond Grading & Lab-created Diamonds
Practical Workshop
8 Days



Diamond Professional	Digital Fees			Printed Fees		
Course Name	**Euros**	**Pounds Sterling**	**USD**	**Euros**	**Pounds Sterling**	**USD**
Diamonds (Theory)	225	175	250	255	200	285
Diamond Grading/Lab-created Diamonds	1750	1400	2000	1750	1400	2000
Examinations Fees (Final Exam)	250	200	280	250	200	280
Total Cost	2225	1775	2530	2255	1800	2565

COLOURED GEMSTONE PROFESSIONAL





Coloured Gemstone Professional	**Digital Fees**			**Printed Fees**		
Course Name	**Euros**	**Pounds Sterling**	**USD**	**Euros**	**Pounds Sterling**	**USD**
Basic Gemmology (Theory)	200	150	225	235	180	265
Advanced Gemmology (Theory)	400	300	450	430	325	485
Gem Identification (Theory)	225	175	250	255	200	285
Coloured Gemstones (Theory)	500	400	550	565	450	625
Gem Identification #1	500	400	550	500	400	550
Gem Identification #2	500	400	550	500	400	550
Coloured Gemstone Grading #1	500	400	550	500	400	550
Coloured Gemstone Grading #2	1000	800	1150	1000	800	1150
Lab-created & Treated Gems	500	400	550	500	400	550
Examinations Fees (Final Exam)	250	200	280	250	200	280
Total Cost	4575	3625	5105	4735	3755	5290

Rubies, Sapphires & Emeralds

This course focuses on three coloured gemstones (rubies, sapphires and emeralds) that individually and collectively are considered the cornerstones of the coloured gemstone trade. Lessons include a complete overview of their physical and optical properties, principal sources, mining, how they can be identified from gemstones that can be deceptively similar in appearance and their lab-created counterparts, common treatments and enhancements, pricing guidelines, what constitutes the best quality and how to properly care for them.

Opals and Jade

This course looks at two of the most fascinating and complex gemstones in the science of gemmology. The lessons on opal cover their physical and optical properties, their geology, localities, crystal system, chemical composition and classification, varieties, cause of colour, absorption spectra and pleochroism, inclusions, fluorescence, principal mines, opal mining in Australia, opal grading, synthesis of opal, gem identification, common treatments and enhancements, opal doublets and triplets, cleaning and care and pricing.

The section on jade follows a similar format with lessons covering their physical and optical properties, their geology, localities, crystal system, chemical composition, absorption spectra and pleochroism, inclusions, fluorescence, mining, principal mines, evaluating the rough, jadeite cutting, jadeite nomenclature, grading jadeite, synthesis of jadeite, gem identification, common treatments and enhancements, cleaning and care and pricing.

Organic Gems

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. Lessons cover their physical and optical properties, geological formation, crystal systems, chemical composition, varieties and classification, causes 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.

Online Tutoring

While clearly the ideal way to learn a particular subject is with one-on-one tutoring, we appreciate that this is difficult when you enrol in a long distance study program.

Fortunately, new distance learning technologies are changing. Now teachers can connect with their students virtually using a variety of virtual tutoring tools, such as Skype.

The chart below outlines the number of online tutoring hours that are included in your course price. If you require more online instructional tutoring, please contact your education coordinator to discuss availability and pricing.

Course Name	Hours
Basic Gemmology - Theory	2
Advanced Gemmology - Theory	4
Gem Identification - Theory	2
Diamonds - Theory	2
Coloured Gemstones - Theory	5
Career Gemmology - Theory	14

We strongly suggest that you contact your instructor beforehand by email with your questions so that you will derive maximum benefit from your online session. Please remember that these sessions are designed to provide you with 'coaching' rather than direct instruction.

Course Fees

Fees charged by the individual gem academies are charged in the prevailing currency for that particular area (i.e. Euros in Europe, Pounds Sterling in Britain). Please note that shipping charges apply to any courses provided in print.

Practical Workshops

Dates & Venues: TBA

Course Cost € 500

Reserve Your Place Now

Gem Identification #1

This five day (30 hour) practical workshop focuses on the study and identification of six colour groupings (colourless/white, red, pink, orange, yellow and green) and basic crystallography. Gemstones covered in this workshop include:

Natural Diamond, Natural Ruby, Natural Sapphire, Emerald, Beryl, Garnets (Spessartite, Almandite Rhodolite, Pyrope, Colour Change, Hessonite, Demantoid, Tsavorite and Grossular), Spinel, Tourmaline, Topaz, Beryl, Quartz, Zircon, Alexandrite, Chrysoberyl, Apatite, Kunzite, Sunstone, Sphalerite, Sphene, Phenakite, Brazilianite, Scapolite, Hiddenite, Danburite, Benitoite, Diaspore, Epidote, Kyanite, Idocrase, Sinhalite, Diopside, Kornerupine, Enstatite, Euclase, Andalusite, Ekanite, Idocrase, Moldavite, Obsidian, Chrome Chalcedony, Amazonite, Jadeite, Nephrite, Chalcedony, Dyed Jasper, Chrysoprase, Maw-Sit Sit, Rhodonite, Rhodochrosite, Amber, Coral, Fire Opal, Lab-created Moissanite, Cubic Zirconia, GGG, YAG, Lab-created Rutile, Strontium Titanate, Lithium Niobate, Lab-created Spinel, Glass, Lab-created Alexandrite, Garnet-topped Doublet, Spinel Triplet, Copal Resin, Bakelite and Imitation Coral.

Prerequisites: Basic Gemmology or Equivalent

Dates & Venues: TBA

Course Cost € 500

Reserve Your Place Now

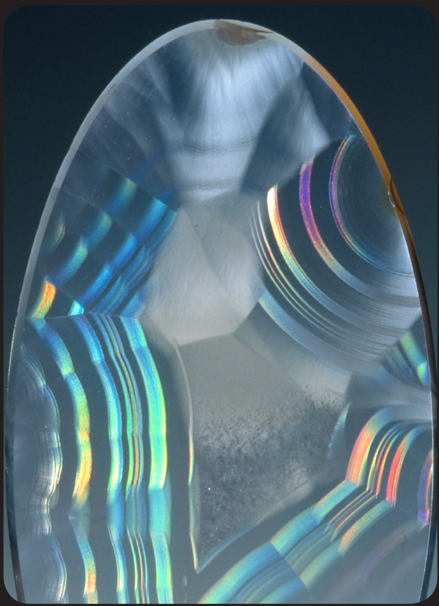
Gem Identification #2

This five day (30 hour) practical workshop focuses on the study and identification of four colour groupings (blue, violet/purple, brown and black) plus unusual and phenomenal gemstones. Gemstones covered in this workshop include:

Sapphire, Benitoite, Spinel, Tanzanite, Apatite, Tourmaline, Topaz, Aquamarine, Quartz, Iolite, Zircon, Scapolite, Garnet (Grape, Rhodolite and Hessonite), Chrysoberyl, Taafeite, Idocrase, Ekanite, Sinhalite, Kornerupine, Andalusite, Kyanite, Euclase, Smithsonite, Sugilite, Charoite, Lapis Lazuli, Sodalite, Turquoise, Odontolite, Serpentine, Chrysocolla, Petrified Wood, Hematite, Marcasite, Pyrite, Jadeite, Jet, Chalcedony, Jasper, Coral, Obsidian, Cubic Zirconia, Bakelite, Dyed Jasper, Lab-created Forsterite, Lab-created Spinel, Lab-created Quartz, Glass, Gilson Lapis Lazuli, Gilson Turquoise, Stained Howlite, Star Sapphire, Star Ruby, Star Almandite Garnet, Star Diopside, Cat's Eye Chrysoberyl, Cat's Eye Tourmaline, Cat's-Eye Quartz, Hawk's Eye Quartz, Tiger's-Eye Quartz, Bi-Colour Tanzanite, Bi-Colour Tourmaline, Ametrine Quartz, Watermelon Tourmaline, Usambara Tourmaline, Trapiche Emerald, Labradorite, Moonstone, Bloodstone, Tortoiseshell, Shell Cameo, Hardstone Cameo, Lava Cameo, Ammolite, Fire Agate, Black Opal, Crystal Opal, Semi-Crystal Opal, Larimar, Malachite, Lab-created Cat's Eye Chrysoberyl and Imitation Cameo.

Prerequisites: Gem Identification #1 or Equivalent

Practical Workshops



Dates & Venues: TBA

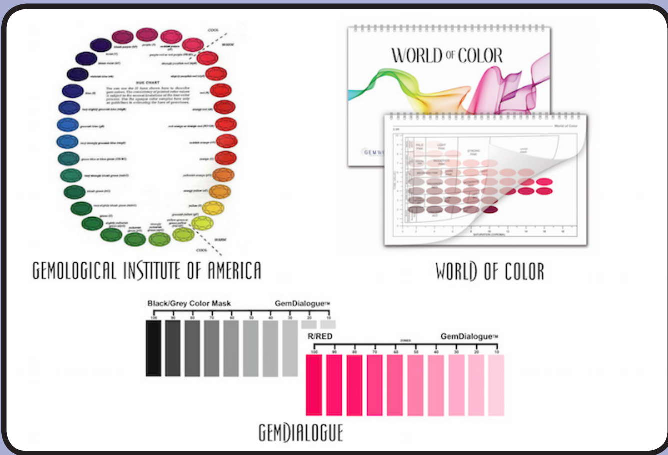
Course Cost € 500

Reserve Your Place Now

Coloured Gemstone Grading #1

This five-day (30 hours) workshop includes practical instruction on how to access the hue, tone and saturation of coloured gemstones using three popular colour grading systems (Gemological Institute of America, GemDialogue and World of Color) and how to grade pearls, jadeite and opals.

Prerequisites: None



Online Course

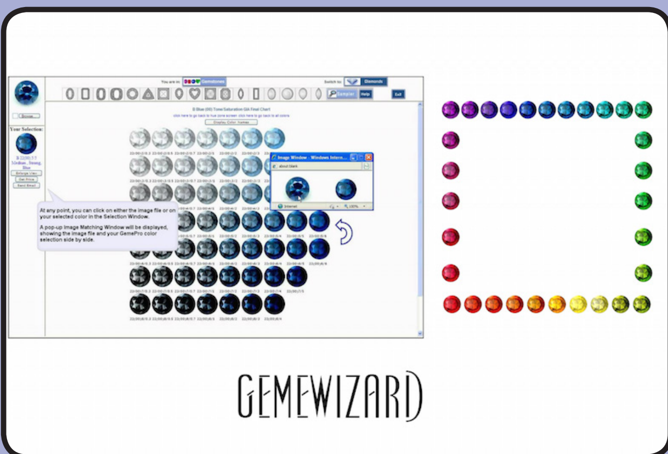
Course Cost € 1000

Reserve Your Place Now

Coloured Gemstone Grading #2

This 100 hour online course consists of a comprehensive overview of the GemeWizard Colour Grading System including colour theory (hue, tone and saturation), how they impact on the value of gemstones, practical exercises that are completed online, and a six month subscription to the Gemewizard program.

Prerequisites: None



Practical Workshops

Dates & Venues: TBA

Course Cost € 500

Reserve Your Place Now

Lab-created & Treated Gems

This five day (30 hour) practical workshop focuses on lab-created gemstones (specifically rubies, sapphires and emeralds) and the many treatments and enhancements that are used to improve the appearance and/or value of gemstones, including:

- Heat treatment
- Surface and Sub-surface Diffusion
- Irradiation
- Fracture Filling
- HPHT Treatment
- Oiling
- Waxes & Dyes
- Sugar/Acid & Smoke Inhalation
- Quench-crackling with Dyes
- Coating & Foil Backs
- Laser Drilling

Prerequisites: Advanced Gemmology or Equivalent

Dates & Venues: TBA

Course Cost € 1750

Reserve Your Place Now

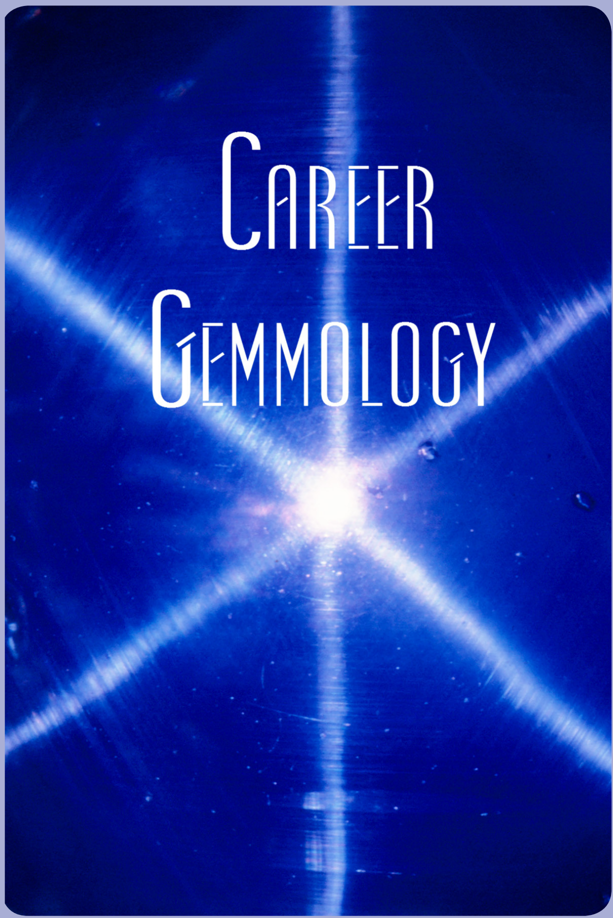
Diamond Grading & Lab-created Diamonds

This eight day (48 hour) practical workshop focuses on the clarity and colour grading of diamonds, how to measure the proportions and how ro distinguish natural from HPHT and CVD diamonds.

Topics covered include:

- Clarity Grading
- Colour Grading
- Calculating Table Percentage
- Calculating Crown Angle
- Calculating Pavilion Percentage
- Estimating Girdle Thickness
- Assessing Symmetry & Polish
- Lab-Created Diamonds
- Practical Review

Prerequisites: Diamonds or Equivalent



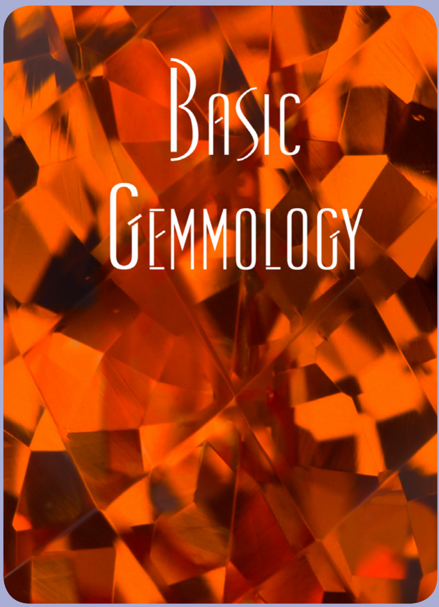
Course Content

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.

Course Cost: € 1400

Prerequisites: None

Please Note: This course includes all the information contained in the Basic Gemmology, Advanced Gemmology, Gem Identification, Diamonds and Coloured Gemstones courses.

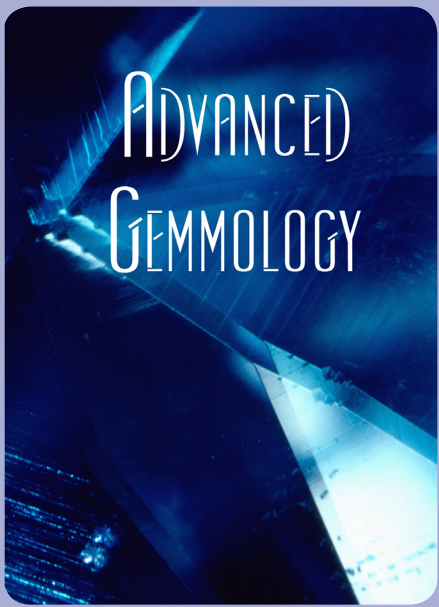


Course Content

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.

Course Cost: € 200

Prerequisites: None

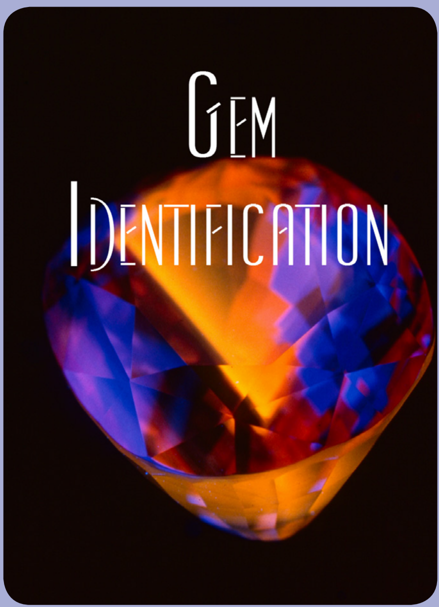


Course Content

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.

Course Cost: € 400

Prerequisites: Basic Gemmology or Equivalent

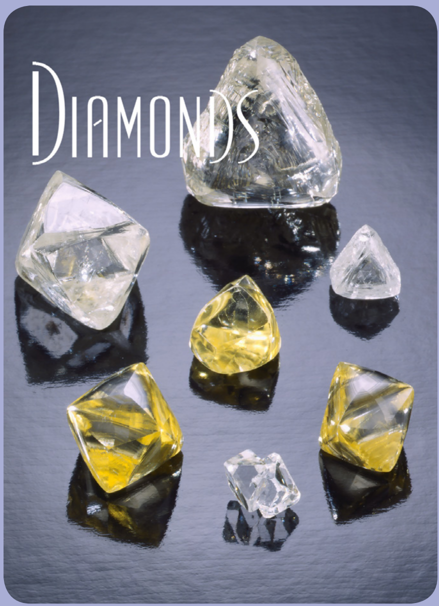


Course Content

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.

Course Cost: € 225

Prerequisites: Basic & Advanced Gemmology or Equivalent

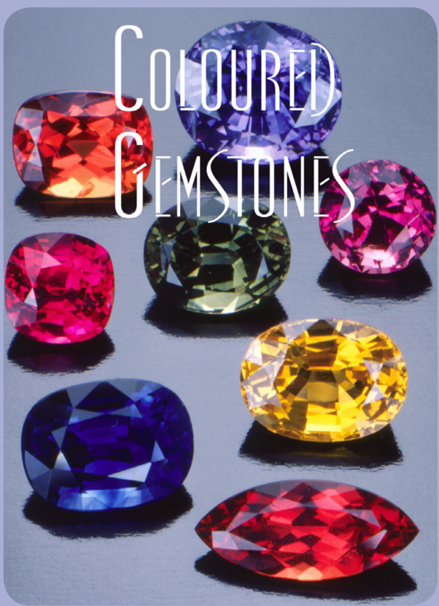


Course Content

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. 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.

Course Cost: € 225

Prerequisites: None

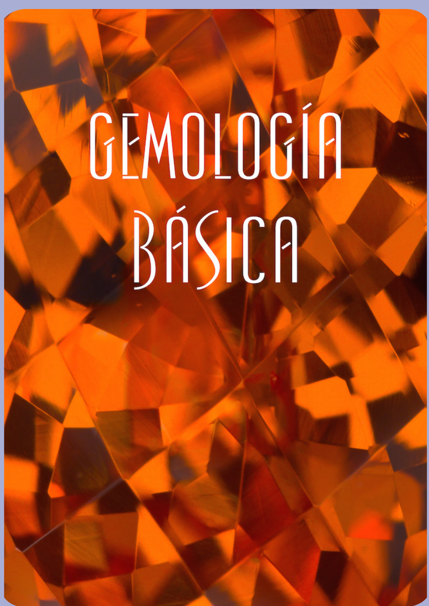


Course Content

Physical properties, geology, localities, crystal system, chemical composition and causes of colour, varieties, absorption spectra, pleochroism, inclusions, fluorescence, gem identification, synthesis, treatments and enhancements, and care guidelines. Gemstones covered in this course include rubies and sapphires, emeralds, aquamarines and other precious beryls, alexandrite and other chrysoberyls, spinel, zircon, topaz, tourmaline, peridot, quartz, garnet, tanzanite, lapis lazuli, turquoise, kunzite, hiddenite, feldspars, iolite, andalusite, diopside, apatite, pearls, coral, jet, ivory, and amber. You will learn how to accurately describe colour, the various colour grading systems currently used by professionals, the clarity classification of gemstones based on their geological environments, how cut is assessed, and how to grade opals, jadeite and pearls.

Course Cost: € 500

Prerequisites: None

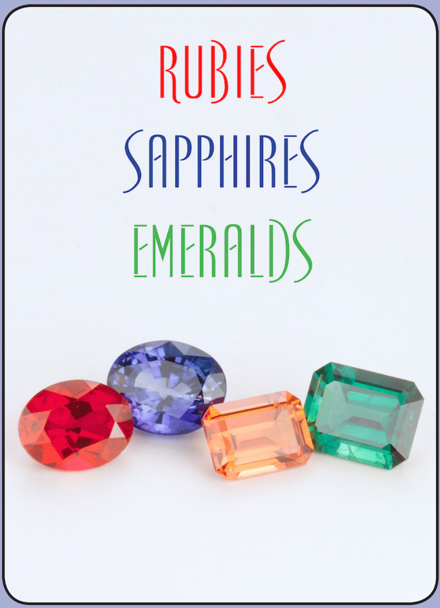


Contenido del curso

La naturaleza química de las piedras preciosas, las propiedades físicas y ópticas, la cristalografía básica, la absorción de la luz, el espectroscopio, la refracción y la reflexión, el refractómetro, el carácter óptico y el signo, la dispersión, los medidores de reflectividad, la luz polarizada, el polariscopio, el pleocroísmo, el dicroscopio filtros de color, gravedad específica, luminiscencia, aumento y conductividad térmica.

Costo del Curso: € 200

Requisitos Previos: Ninguna



Course Content

Topics covered include a complete overview of their physical and optical properties, principal sources, mining, how they can be identified from gemstones that can be deceptively similar in appearance and their lab-created counterparts, common treatments and enhancements, pricing guidelines, what constitutes the best quality and how to properly care for them.

Course Cost: € 95

Prerequisites: None

Course Content

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.

Course Cost: € 75

Prerequisites: None

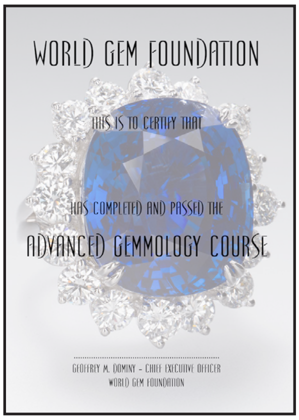
Course Content

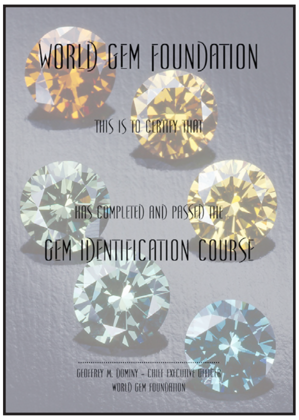
Topics covered include their physical and optical properties, geological formation, crystal systems, chemical composition, varieties and classification, cause of colour, common inclusions and internal characteristics, fluorescence, pearl grading criteria, methods of synthesis, gem identification, common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

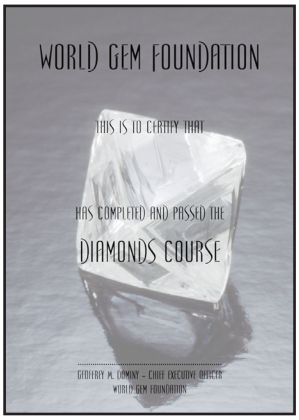
Course Cost: € 50

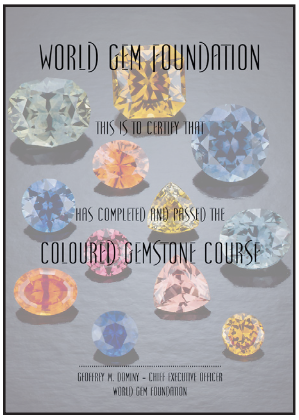
Prerequisites: None

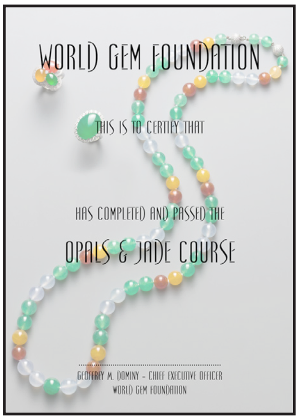
Theory Courses - Letters of Completion

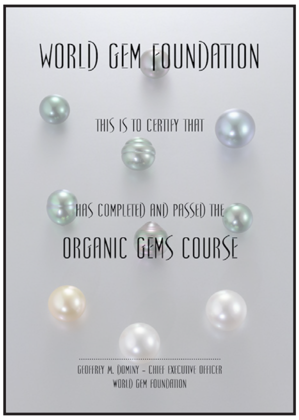




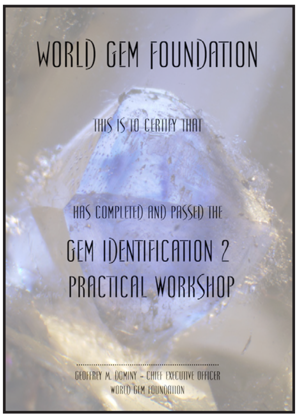


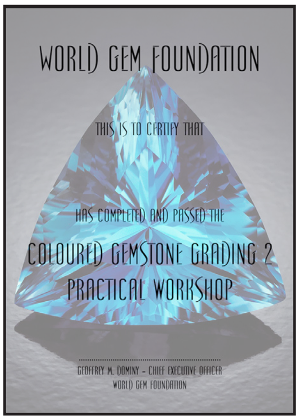


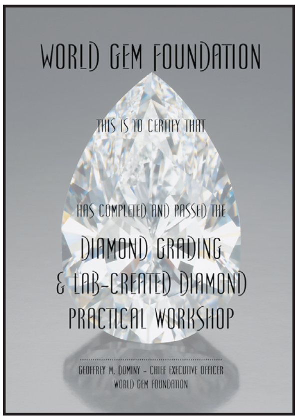




Practical Workshop - Letters of Completion





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STUDIO SPECTOR

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 fourth 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 has just released a 5th Anniversary Printed Edition (Two Volumes).

He currently lives in Palma, 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 lead 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.

Deborah Mazza
British Gem Academy

Deborah Mazza is half Italian and half British, and started her journey through the world of gemstones in Germany in 1984, where she studied at the Deutsche Gemmologische Gesellschaft attaining her gemmology and diamond diploma; she subsequently gained her FGA in 1986.

Deborah then went to work for the trade in Idar-Oberstein, buying and selling wholesale gems and diamonds, working as a gemmologist and teaching gemmology at the DGemG, this lead on to carrying out jewellery valuations for an insurance company in Germany. She later got a Bachelor in Business in Germany, and returned to the UK in 2010, where she became a tutor for the Gem-A's online courses. Deborah, keen to add to her knowledge, started to study again and passed the NAJ/IRV's CAT jewellery valuation diploma, and is now studying History of Art at Goldsmiths University. Deborah has her own valuation business and works part-time for an online auction house. She contributed several written pieces for Yavorskyy's new book, Terra Connoisseur: Gemstones. She is currently the Director of Education for the British Gem Academy.

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

Jan Asplund
Scandinavian Gem Academy

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 (Gemological 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.

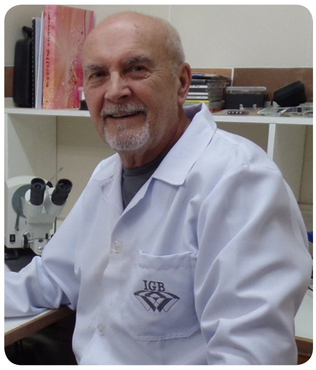
Leroy Bakelmun
Gem Academy of Canada

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.

Gérard Raphaël Quintin was born in Paris France where he studied Art and Design and graduated from Ecole Boulle. His taste for the diamond world may have been inherited from an uncle who worked in the diamond business.



Gérard Raphaël Quintin
South American Gem Academy

In 1978 he took the gemology colored stone and diamond course with GIA while he was mining diamonds in the Sewa River in Sierra Leone and where he started the first diamond cutting center in West Africa.

In Abidjan Côte d'Ivoire in 1992 Gérard founded the diamond cutting formation center with a gemological laboratory 'Hardy's', followed by the installation of the colored stone and diamond cutting facilities in the jewelry school EIBMA.

Continuing his tour in the world of gemstones, Gérard went to Madagascar as an expert for a French Government project to develop the organization and skill of the gems sector.

Professor of Gemology in the Jean Guehenno Jewelry School in Saint-Amand-Montrond France, he then moved to Bolivia to fund and manage the 'Instituto Gemologico Boliviano' where students learn gemology and the art of gem cutting.

Since 1997 Gérard has been a member of the Organisation Internationale des Experts based in Geneva, Switzerland.

Cristina Rzepka de Lombas
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 Central American and Caribbean Gem Academies.

Kyalo Kiilu
Kenyan Gem Academy

Kyalo Kiilu is a fellow of the Gemmological Association of Great Britain (Gem-A) and an Alumnus of Birmingham City University where he obtained his BSc with honours in Gemmology and Jewellery Studies in 2017.

His passion for gemstones can be traced back forty years to his late grandmother's village in rural Kenya and the prospecting trench dug by the first British gemstone explorers in the early part of the 20th Century.

While pursuing his pharmaceutical studies, his interest in gemstones never diminished. Unfortunately in 2003 there were no colleges in Kenya offering gemmological courses so he decided to relocate to England and enrolled in Gem-A's Diamond Diploma program in 2004; the start of his gemmological journey.

Kyalo is a licenced gemstone prospector in Kenya and in 2015 made a discovery of a very unique sapphire, resembling another Kenyan sapphire marketed as 'Goldsheen Sapphire' that he will hopefully share with the gemmological community very soon.

He comes to the World Gem Foundation and specifically the Kenyan Gem Academy with a strong desire and ambition to share his knowledge of gemstones with his fellow Kenyans, particularly those involved in the production of gemstones, gemstone lovers and aspiring gemmologists, to provide support and encouragement that was so lacking in the industry when he was growing up in Kenya.

Salomon Lutumba
Gem Academy of DR Congo

Salomon Lutumba is an alumnus of Birmingham City University where he graduated with a Bachelor in Science with honours in Gemmology and Jewellery studies in 2016. He also holds a Diamond Diploma and Gemmology certificate from Gem-A. He is originally from the Democratic Republic of Congo.

In 2002 he relocated to England where, ten years later, he found the opportunity to fulfil his dream of studying gemmology at the Birmingham City University. In 2012, he started his High National Diploma in Gemmology combined with Gem-A's Diamond and Gemmology program which led to a degree program, introduced for the first time in 2015, at the BCU.

Today, by embracing the World Gem Foundation's concept and philosophy of gemmological education, and through the Gem Academy of DR Congo, he would like to share his passion and knowledge of gems with his fellow Congolese; particularly jewellers, aspiring gemmologist and gemstone lovers.

His personal goal is to promote the science of gemmology in his country, by providing information and support to empower people in the jewellery business and those trading in stones.

Jack Ghazalian
American Gem Academy
Director of Corporate & Career Development

Jack Ghazalian has thirty-eight years of experience in the jewelry industry. He is a graduate gemologist through the Gemological Institute of America (1992), was an instructor for GIA (1993) and was officially Certified-by-the-State of California Education Code 94311(a) to teach Gemology & Jewelry Manufacturing-Arts (1993).

In October 2015, he was honored by the International Distinguished Scholars – Academic Honor Society as an 'International Distinguished Scholar' and in 2017 was granted membership in Kappa Delta Pi. He is currently the owner of Isometric Gemological Appraisal Services in Southern California: IsometricGems.com, speaks five languages and is passionate about education.

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.

A terrific addition to your gemmological library.
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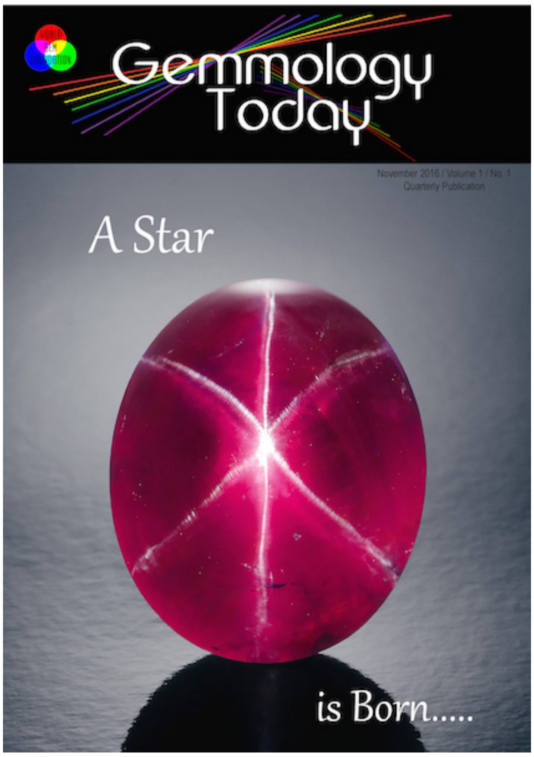
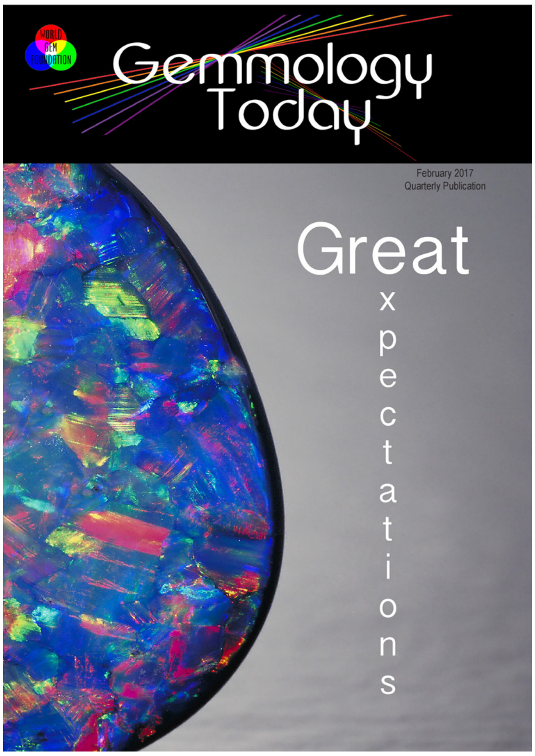
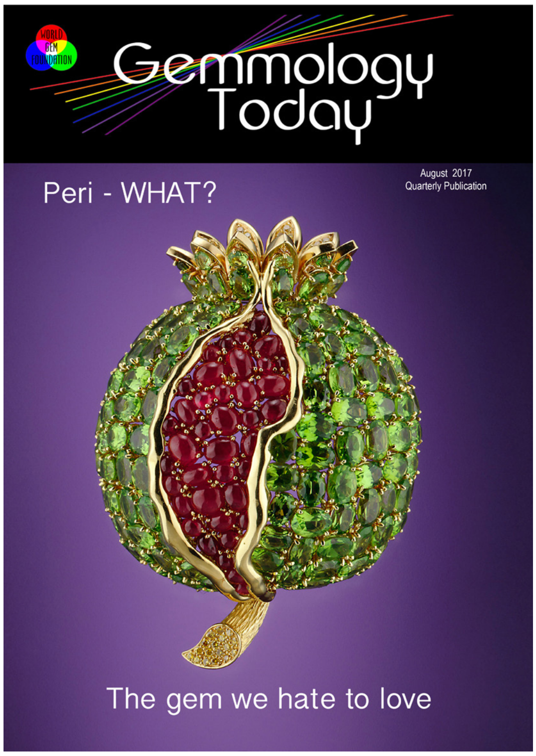
Gemmology Today in Print?







We are delighted to offer as a 'set' the first four issues of Gemmology Today in print; each individually bound.

To order your set, please click on the 'Order Today' button below. The price is € 89 (Holland), € 95 (European Union) and € 105 (Outside Europe). All prices include postage and handling.

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Tino Hammid Memorial Gemmological Scholarship

The World Gem Foundation is delighted to offer five more scholarships this year. These scholarships cover the theoretical components of our Career Gemmology Diploma Program.

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 2019, the World Gem Foundation will award five more scholarships allowing deserving students to take the World Gem Foundation theoretical 'Career Gemmology' course.

The deadline for submitting your application is December 31st, 2018. 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:

WORLD GEM FOUNDATION Scholarship Application PDF

KYALO KIILU is the Director of Education for our Kenyan Gem Academy. He received his BSc with honours in Gemmology and Jewellery Studies in 2017 from Birmingham City University and is passionate about Kenya, gemmology and education.

Inclusions In Corundum – From A Curse To A Blessing

Gold Sheen Sapphire

The corundum family of gemstones, whose members include ruby, blue sapphire, padparadscha sapphire and many other colours is one of the best known and appreciated groups of gemstones.

Pure corundum (Aluminium Oxide) is colourless, and it is the presence of one or more of the transition elements that causes the various colours seen in this family of gemstones. Chromium is responsible for the red colour in ruby, while the presence of both iron and titanium are responsible for the blue colour in blue sapphire.

As corundum forms naturally, inclusions are expected and some of the most noted ones include zircon, spinel, calcite, rutile needles, apatite, almandine, boehmite plus healed fractures and feathers that will usually accompany these solid inclusions.

These inclusions are often used by well-equipped laboratories to determine the origin of corundum and invariably will have a bearing on the gemstone's value.

In the valuation of gemstones, particularly faceted stones, clarity is a very important parameter, the cleaner the material the higher the value and the converse.

Corundum cut as cabochons is normally translucent to opaque and these stones may exhibit asterism (star effect) or chatoyancy (Cat's eye). Both properties are associated with the presence and alignment of rutile or hematite inclusions in the rough material.

Almost 9 years ago, opaque corundum mined in Kenya was sold to a gemstone dealer in Bangkok who saw the potential in the material. The stones had a metallic gold sheen, a feature that was quite unusual in corundum.

The gold or metallic sheen in this corundum can be viewed along the C axis, while along any other orientation, stones simply look opaque and of little value.

Laboratory tests have shown that the metallic sheen in this corundum is brought about by inclusions of hematite, ilmenite, magnetite, lepidocrocite and rutile in such a large amount that, they render the material opaque.

Apart from rutile (TiO_2), all the other inclusions are compounds of iron (Fe) either on its own or with titanium (Ti). Hematite is iron oxide (Fe_2O_3), ilmenite is iron titanium oxide ($FeTiO_3$), magnesite is ferrous-ferric oxide (Fe_3O_4) while lepidocrocite is an iron oxide/ hydroxide (FeO(OH)).

Ordinarily, the presence of a few inclusions of these minerals in an otherwise transparent stone would lead to a low value of the material, but here we have inclusions in a large concentration that produces a hitherto before unseen property in corundum!

The presence of both iron (Fe) and titanium (Ti) in this corundum might explain the blue colour that is seen in this material in addition to the metallic sheen.

On first sight, one is sometimes left wondering whether they are staring at a stone or a piece of metal. On a lighter note, some people have referred to this material as a cross between a stone and metal!

The material is not cut for transparency, asterism or chatoyancy but more for its lustre and beautiful patterns not to mention the varied colours that have been seen in this material.

The beauty of this corundum has been compared to that of other opaque stones such as opal, and labradorite, amongst many others, thanks to the presence of the inclusions.

The hematite inclusions are noted for their beautiful hexagonal patterns that are often seen in the cut stones. The black areas in the stone are associated with the presence of magnetite.

Reputable gemstone testing laboratories have recognised this material as a new variety of corundum and the names 'Gold Sheen' sapphire and 'Zawadi' sapphire can be used interchangeably for the material.

The writer of this article, a licenced prospector in Kenya has found another location also in Kenya that produces a similar sapphire and interestingly a small number of stones from this location are showing very prominent 'Trapiche' characteristics. Some of the stones from the new locality show a pronounced colour change under different light sources.

Kyalo (foreground) digging in the dirt

Gold Sheen Sapphire (Courtesy of Primagem)

Of particular note, this new location is rich in iron ore and whether this can be associated with the iron inclusions in this corundum will be discussed in a later article.

For lovers of natural untreated gemstones, 'Gold Sheen' sapphire might provide the solution. Experiments have shown that, heat treatment of gold sheen sapphire diminishes the metallic sheen in the material.

To many, the mere mention of sapphire recalls a transparent faceted gemstone, occurring in an array of colours or a cabochon cut stone displaying asterism. 'Gold sheen' sapphire on the other hand, with its metallic sheen, is unique and different and will hopefully find its rightful place among the 'Corundum' family of gemstones in the future.

Currently, 'Gold Sheen' sapphire is selling online for between \$100 and \$300 USD/ carat with some exceptional stones selling for higher prices.

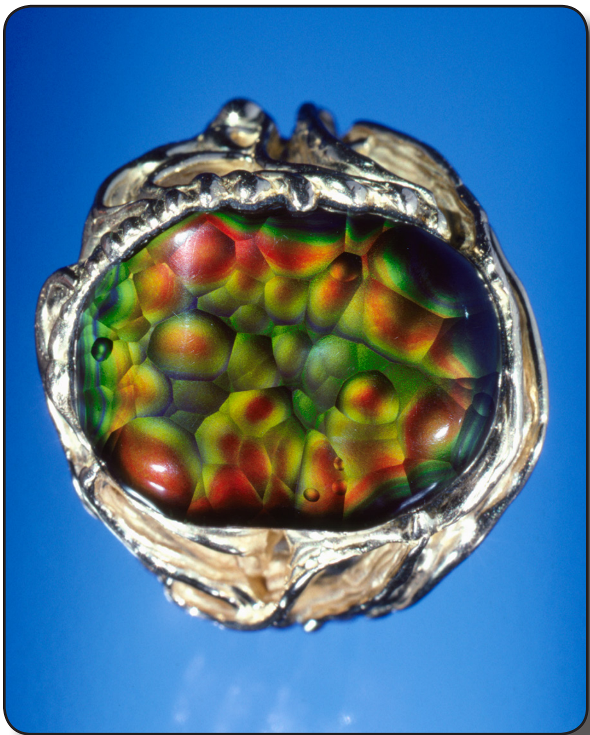
As the industry becomes more familiar with this material, will it remain unique to Kenya or will miners and other players in the gem industry discover it in other locations around the world?

While this remains to be seen, we look forward to seeing this new variety of sapphire discussed in future gemmological publications and text books.

The Spice of Life
Coloured Gemstones

LEONE LANGESLAG is the CEO of the Dutch Gem Academy and owner of Sole Leone. She received her European Gemmologist (E.G.) diploma from the Federation for European Education in Gemmology (FEEG) in 2006.

Fire Agate: Don't Call the Fire Brigade!



Fire Agate (Photo by Tino Hammid)

Agate is a well-known variety of chalcedony (quartz, silicon dioxide) and is formed in layers that produce a wide variety of colours and textures. The most well known variety of agate is banded agate, recognizable by its beautiful multi coloured layers. A lesser-known variety of agate is 'Fire Agate', a unique internally layered translucent chalcedony with a beautiful iridescent effect.

History

Agate has a history that dates back more than 3000 years ago. The ancient Egyptians used agate as a gemstone but strangely enough fire agate has only been commercially produced since the 1950's.

Fire agate was formed through volcanic activity by the deposition of hot water saturated with silica and iron oxide in the cracks and crevices of the surrounding rocks during the Tertiary Period, between 24 and 36 million years ago.

Gem Deposits

This colourful natural gemstone is found in only a few locations around the world. The main sources are located in the Southwestern area of the USA and Mexico. Within the USA, the fire agate deposits are found in the areas between Kingman (Arizona) and Needles (California), as well as the surrounding areas of the Colorado River.

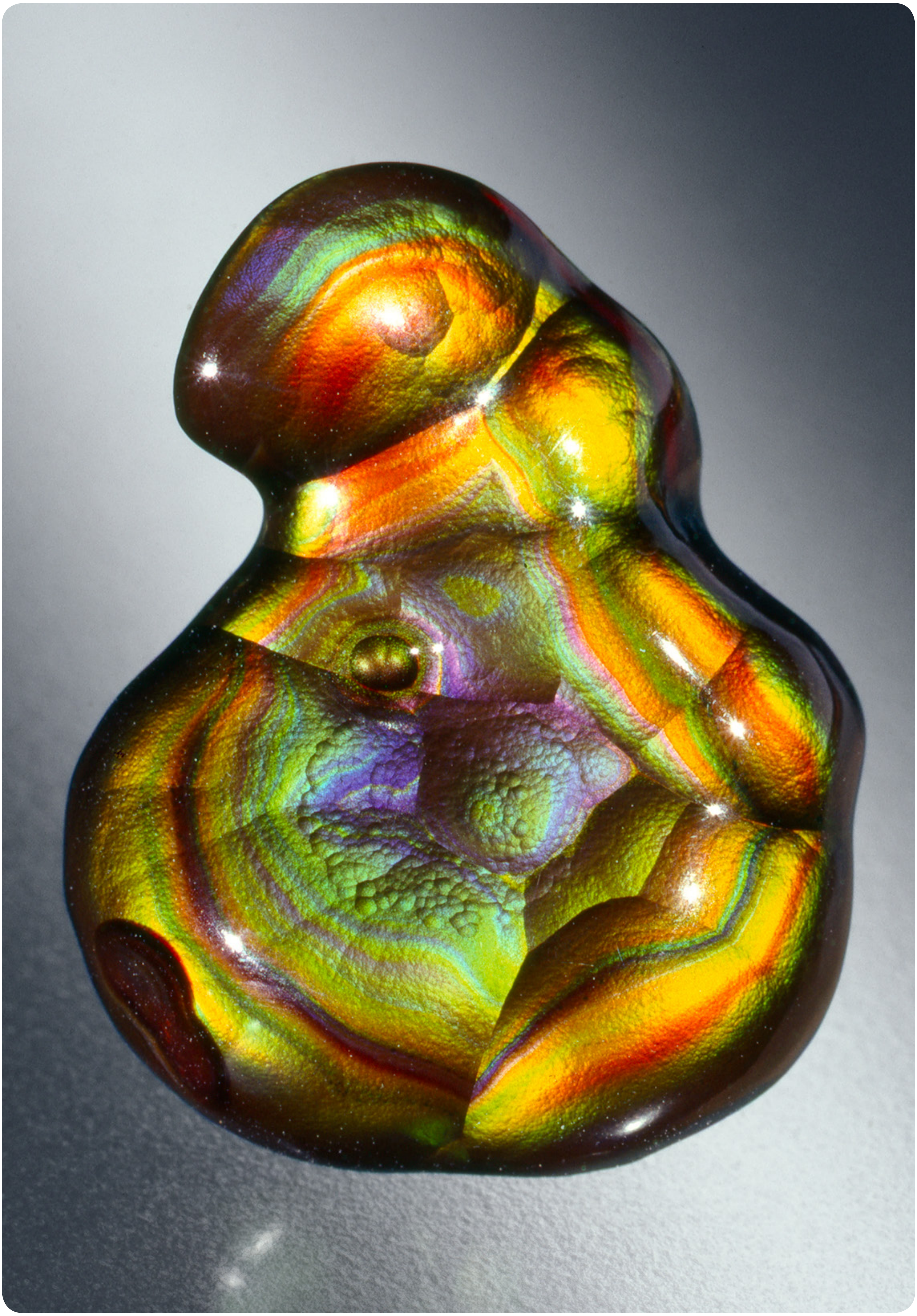
Mexican fire agate comes from numerous mines in Calvillo situated in the state of Aguascalientes, in San Luis Potosi and Chihuahua. The fire agate from San Luis Potosi shows only a golden fire; the most rare display rainbow-like colours due to their distinct mineral composition.

Characteristics

The body colour of fire agate ranges from brown to sometimes nearly black (similar in appearance to chocolate opal). This base colour is due to the iron oxide content. The alternating layers are composed of inclusions of limonite or goethite iron oxide and silica. It is this unique internally layered composition that distinguishes fire agate from any other variety of agate.

When you illuminate the stone, the fire agate breaks up the light to reveal a rainbow of beautiful colours, including red, gold, green, blue and occasionally, blue-violet. In this situation light passes through these different layers and will be separated into various spectral colors. This optical phenomenon is called iridescence (caused by light diffraction).

Fire agate is a typically translucent to opaque gemstone with translucent gems being the most desirable.



Fire Agate (Photo by Tino Hammid)

The determination of fire agate is quite straight-forward (see chart below).

Gemstone	R.I. Range	D.R.	S.G.	H
Fire Agate	1.530 – 1.540	.004	2.58 to 2.64	6 ½ – 7
Ammolite	1.520 - 1.680	.155	2.75 to 2.80	4
Opal	1.370 - 1.520	–	1.98 to 2.50	5 ½ – 6 ½

Gemstones similar to Fire Agate

Ammolite is often confused with fire agate. Consisting of 96% aragonite, it is formed from the fossilized remains of ancient ammonites that lived 71 million years ago. Black opal can also be confused with fire agate, since like ammolite, it can be found in a variety of unique and fascinating patterns. However, there is a huge price difference between black opal and fire agate. Identification is relatively straightforward using standard gemmological tests especially if one is familiar with the different materials.

Fire Agate Cut and Shape

The cutting of fire agate is challenging; firstly in order to maximize the iridescence and secondly to cut stones in calibrated sizes. Over cutting can totally destroy the unique fire patterns. Therefore fire agate is mainly cut into fancy cabochon shapes and slabs. These are used to produce impressive pendants, pins or brooches. Fire agate tends to have a slightly waxy lustre like all agates.

Fire Agate Treatment

Although we do know that chalcedony can be dyed easily it is not known if fire agate is treated or enhanced in any way.

High quality fire agate can be as impressive in its 'play of colour', similar to fine black opal, while providing a far more affordable and significantly more durable option to consumers.

Conclusion

As you can see from the images, Fire agate is a very interesting gemstone (pricewise and durability wise) that when cut correctly can reveal a kaleidoscope of colours, creating a 'one of a kind' gemstone that is bound to impress even your most discerning friends!

References

Handbook of Gemmology
Mindat.org and Gemdat.org
Gemselect.com

ANTOINETTE MATLINS, PG, FGA, is an internationally renowned gemologist and is the author of the best selling books Jewelry & Gems: The Buying Guide; Gem Identification Made Easy; Diamonds; Colored Gemstones and many other books about buying and enjoying jewelry and gems.

The Value Of Simple, Portable Instruments – Part 4
Ultraviolet Lamp

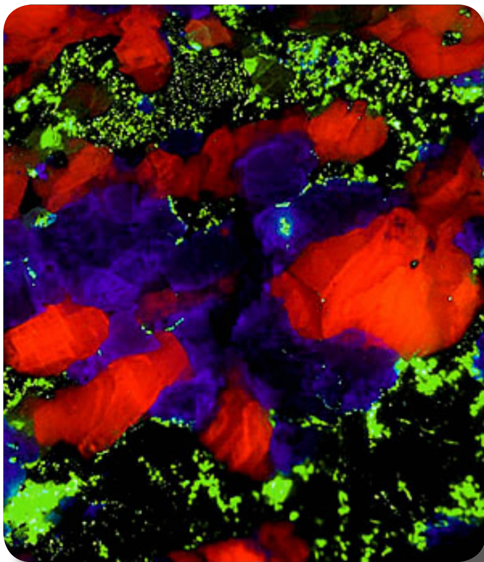
Editor's Note:

This is the final installment where Antoinette explores everyday tools available to gemmologists and how to truly push their limitations to achieve maximium mileage.

When buying diamonds and colored gems, the presence - or absence - of fluorescence can be a benefit, but it can also be a detriment! Yet, over the years, I've found that many people in the gem and jewelry field don't understand why it's important to test stones for fluorescence, and perhaps even when they do, they don't know how (or have forgotten) how to do it properly. So here, in this last of my series on easy-to-use, portable and affordable tools, let's examine fluorescence and the proper use of the ultraviolet light, in order to help identify and value gemstones.

If you have ever visited gem and mineral exhibits at natural science museums (such as the American Museum of Natural History in New York, The National Museum of the Smithsonian in Washington, DC, or the wonderful natural history museums in London, Paris, Barcelona, Madrid, and around the world), you will probably remember seeing a display of 'fluorescent rocks' which are typically common looking rocks in various shades of white, gray, black, etc., but which suddenly change into intense, psychedelic hues of red, orange, yellow, green, blue, and violet (depending on the museum, the rocks either change color on a preset timer or you are instructed to push a button).

When people 'see' color, they are seeing certain wavelengths of light that are in our 'visible spectrum' – which includes red, orange, yellow, green, blue, and violet. There are also wavelengths of light, however, that go beyond the visible spectrum of human beings, and thus, are invisible to us. For example, ultraviolet wavelengths are beyond the violet end of our visible spectrum, so while they exist, we can't see them. At the other end of our visible spectrum, there are infrared wavelengths that are beyond the red, and thus, are also invisible to us.



Fluorescing Green Willemite (Photo by Herb Yeates)

To young and old alike, what you are seeing in these museum exhibitions—or if you show them how their diamond or colored gemstone does the same thing—they react as if it's 'magic'…but it's simply that the wavelengths of the lighting in which they are seeing them has been changed from a 'normal' lighting environment to one in which there is a strong ultraviolet emission such as the emission from an ultraviolet lamp (also called a UV lamp) which changes the wavelengths of what we are looking at into wavelengths that are visible to humans. We call these 'fluorescent rocks' or 'fluorescent gems' and this phenomenon is referred to as fluorescence. Not all gems fluoresce, but when they do, it will only be when they are viewed under the ultraviolet emissions such as that produced by an ultraviolet lamp!

When viewed under a UV lamp, any stone that fluoresces will be 'excited' by the radiation, resulting in our seeing whatever colors the particular gem shows, then when the UV radiation is turned off or you move to normal lighting to look at them, they return to their 'stable' state – the colors normally seen when viewed in normal light, without any strong ultraviolet radiation. In some rare cases, the rock or gem may continue to glow for a short time; we call this continuous glow phosphorescence (some watches have phosphorescent dials, which 'glow in the dark' for a brief time when you go from light into dark). But I want to stress that the fluorescent or phosphorescent colors are seen only when exposed to ultraviolet radiation, which is what is produced when using an ultraviolet lamp.

Fluorescence and Gemstone Identification

Fluorescence is a fascinating property. Apart from usually causing people to gasp when they see it, whether or not a stone fluoresces or phosphoresces, the colors it fluoresces, the strength of the fluorescence seen can also be very useful in identifying gemstones or distinguishing one from another; it is also very useful as an indicator that something is wrong; checking for fluorescence is a quick and easy way to spot an imitation or to spot more than one type of gemstone mixed together in a parcel. For example, tanzanite does not fluoresce, but all of the tanzanite imitations in the market do fluoresce, so if you have a UV lamp and are buying a stone that's supposed to be tanzanite, or a parcel of tanzanite, and the UV lamp reveals that the stone (or any of the stones) show fluorescence, a simple UV lamp can quickly tell you what you don't have and enable you to spot the real tanzanite and separate them from those that are NOT tanzanite!

Using A UV Lamp For Gem-Testing

The first thing to understand is that for gemological purposes, you must have the right type of 'ultraviolet light source' (UV lamp) – one that emits two 'ultraviolet' wavelengths – shortwave UV (at about 254 nanometers) and longwave UV (at about 360 nanometers). You don't even have to understand what this is, but it will be indicated in the description of any UV lamp. In addition, I recommend a portable model such as the one produced by Cole-Palmer (see image) that emits both wavelengths because it fits in a jacket pocket or small case and you can take it everywhere and use it for rough or cut and polished material. After all, when you're at a conference or a gem show you are not likely to bring your 'laboratory equipment' with you, so portable tools are invaluable!

NOTE to those buying diamonds exclusively. I want to stress here that prior to the introduction of synthetic colorless diamonds, many diamond dealers believed that having a UV lamp that emits only longwave was sufficient (and these are more affordable than those that emit both wavelengths). **The proliferation of synthetic colorless diamonds in the market now has changed that reality and made it essential to have both wavelengths.**

Where synthetic colorless diamonds are concerned, many show no fluorescence under longwave and if natural, this would mean they would show none under shortwave. However, in today's market we also have synthetic colorless

Handheld Mini Ultraviolet Lamp (Courtesy of Cole-Palmer)

diamonds in sizes from tiny melee to stones over 10 carats, and their fluorescent reaction alone may be the first indicator that you do not have a naturally occurring diamond. With any colorless diamond being examined today, even if no fluorescence is excited under longwave, check the reaction under shortwave. Colorless synthetic diamonds may show no fluorescence under longwave – as is the case with about 50-60% of natural diamonds – but synthetic diamonds today **ALWAYS** show strong fluorescence under shortwave… the reverse of naturally occurring colorless diamonds! A colorless diamond with no reaction to longwave but showing a noticeable reaction to shortwave instantly tells you it is NOT a naturally occurring diamond.

Another important note re: fluorescence and diamonds – and one which might change the way consumers react to 'fluorescent diamonds' – is that the presence of blue fluorescence in a colorless diamond – typically stronger under longwave than shortwave – is also indicative of a natural diamond (at this time, we have not seen any synthetic diamonds that have exhibited blue fluorescence, but this needs to be checked continuously as diamond synthesis continues to evolve).

In the gemstone market now, it is important to test every gemstone under BOTH wavelengths and note their reactions to see if they are showing the correct reaction; if they don't, you must be sure to check them very carefully with all the other tools we've already discussed in prior articles.

Avoiding Major Mistakes When Using A UV Lamp … Mistakes That Can Be Very Costly!

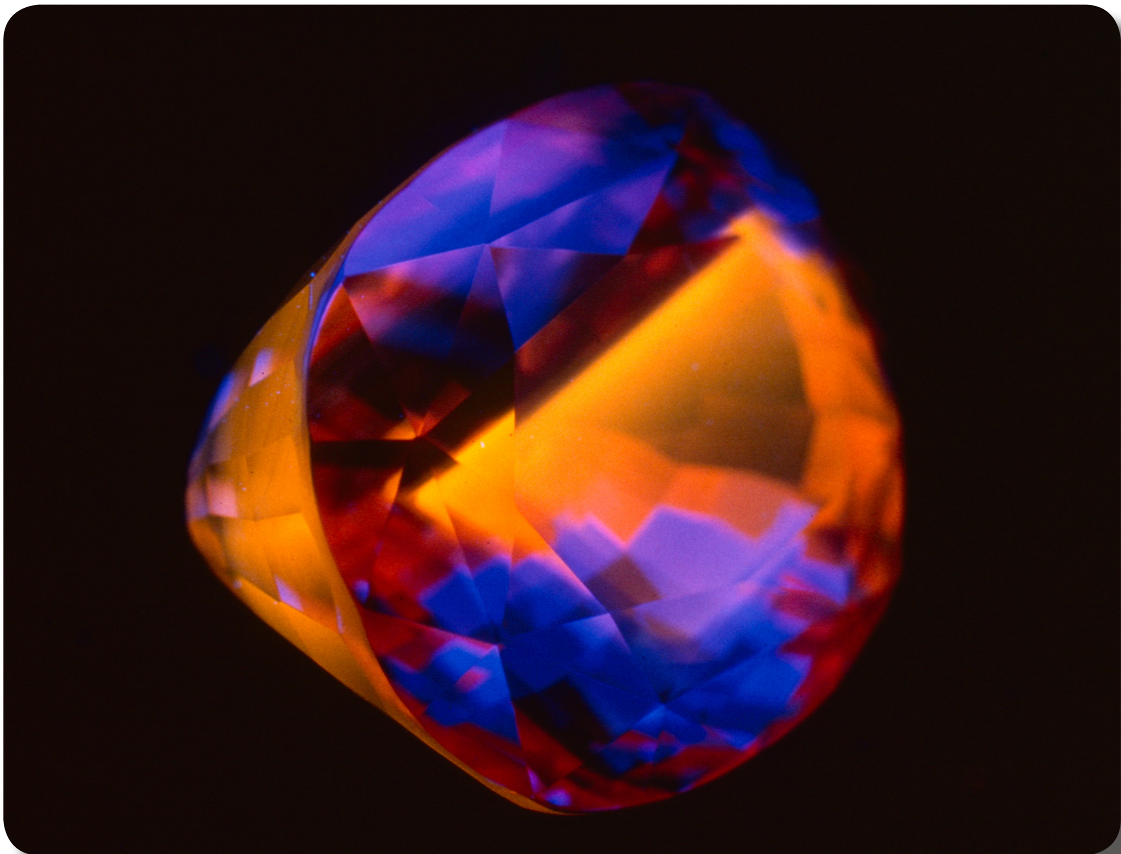
If you do not use the UV lamp properly, you will make costly mistakes. To use one properly, here are the steps you must follow to ensure you are doing it correctly and seeing important clues to identity, treatment, and synthesis:

- Examine the stone(s) or jewelry being tested in a **completely dark environment** or use a UV viewing cabinet and turn off the lights in the room when using it. A viewing cabinet is not necessary if you are in a dark room (I've been known to go into a closet and turn off the light so it is totally dark, or crawl under a table, using the 'drape' to block out the light)

- Give your eyes time to adjust to the dark.
- View whatever you're testing with the UV lamp against a **BLACK BACKGROUND**. The reason for this is twofold: 1) because the fluorescent reaction is seen most easily against black, and is often missed altogether if not on black; 2) to prevent shortwave UV from being reflected back to your eyes (since shortwave exposure can injure you eyes). Here again, after crawling under a table, I use the black lining of my jacket (most of the jackets I wear when working have black linings) or I use anything 'black' I can find – a black tray, a black napkin, etc).
- Hold the lamp over the piece being examined **for at least a couple of minutes – yes, minutes, NOT seconds!** This is essential to allow time for the excitation to become fully stimulated. Many gemologists make this mistake every time they use a UV lamp; while a few seconds may provide enough information in some cases, it will cause you to miss it altogether in other cases. This is the mistake most people make, putting the stone under the UV output for only a couple seconds, seeing nothing, and making the erroneous assumption it shows no fluorescence!
- Hold the lamp within a couple inches of the stone if you're using a portable model because the strength of the output is less than what is emitted from the desktop models
- Use this process first under longwave emission and NOTE THE REACTION; repeat the process under shortwave emission and note the reaction.
- Turn off the lamp and note whether or not there is any phosphorescence and if so, note how long it continues to phosphoresce.

Remember, you must determine not only whether or not the material fluoresces, but what colors it fluoresces and whether or not the color of the fluorescence changes depending on the wavelength in which it's viewed, and in cases where it does fluoresce under both wavelengths, note whether or not there is a change in the intensity of the fluorescence (faint, weak, moderate, strong, very strong) and if so, under which wavelength it reacts strongest.

Whether or not a stone fluoresces, and the specific colors it shows when its fluorescent reaction is 'excited' by exposure to ultraviolet radiation, can be an invaluable clue to identity and, perhaps even more important, an immediate indication that something is wrong. It can also have an impact on value, especially where diamonds are concerned (visit the Accredited Gemologists Association's website – www.AccreditedGemologists.com -- and read the findings of an important study that was conducted on fluorescence and color-grading D-Z diamonds) and can also be an important 'identifier' in case of theft or loss and subsequent recovery.



Sapphire under SW UV Light (Photo by Tino Hammid)

So knowing whether or not a stone fluoresces is not a matter of ‘good’ or ‘bad’ but simply provides another important fact related to the physical properties of a specific gem.

It’s also important to understand that fluorescence has also been the reason that some gems have been more coveted than others throughout history. This is one of the primary reasons that Burmese rubies, for example, have been preferred and more highly valued historically than those from other sources. This is because any ‘red stone’ will look ‘redder’ when viewed in warm lighting (such as candlelight and those warm-to-the-touch incandescent light bulbs) but this is not the case when exposed to outdoor lighting which has more wavelengths in the blue/violet end of the spectrum; many red gems, including rubies from other sources that do not fluoresce the way the Burmese do, will have a much less desirable color in outdoor daylight because the wavelengths of the outdoor lighting are so much higher in the blue/violet end of the spectrum, so the color becomes more purplish red in many cases. In the case of Burma rubies, however, its RED fluorescence excited by the UV radiation in outdoor lighting enables them to retain a beautiful red! Today this property is not unique to Burma rubies and can be seen in rubies from other sources such as Madagascar. The fluorescence of rubies from Madagascar, like those from Burma, results in them also showing a beautiful red in all lighting environments, making them highly desirable and sought-after. It is also interesting to note that the geological conditions of Madagascar and Burma are almost identical, supporting some interesting geological theories related to land shifts.

So let me stress that where colored gemstones are concerned, fluorescence is often a factor than enables them to retain a beautiful color in ALL lighting environments, and as we all know, the purer the color in all lights, the rarer, more desirable, and costlier the gemstone will be.

Fluorescence in colored gemstones can also be an important test in revealing the presence of fillers used to conceal fractures or fissures in colored gemstones. Examination with an ultraviolet light can indicate the presence of fillers that would otherwise be overlooked because many of the fillers used fluoresce, enabling the viewer to detect them when viewed with an ultraviolet lamp.

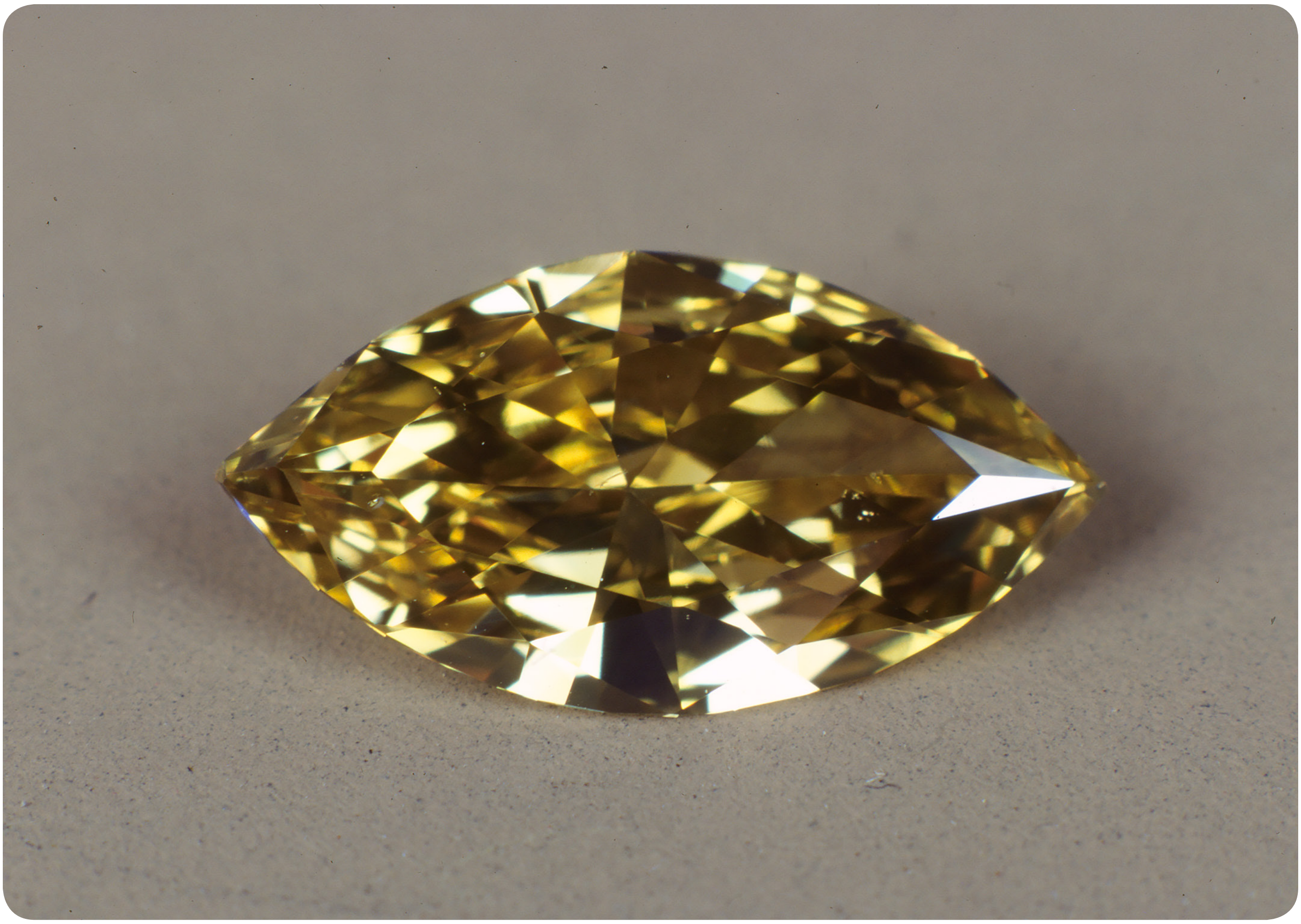
To sum up, knowing whether or not a stone fluoresces, and how it fluoresces, provides important information that can prevent you from making costly mistakes as well as information that can lead to exciting, profitable discoveries! And it’s a test that is easy to do, anywhere, with a very affordable and portable tool, and it takes only a couple minutes to use. With experience, you’ll become like me…and never leave home without your portable longwave/shortwave UV lamp!

There isn’t room here to list all of the reactions of the many gems now in the marketplace, but most textbooks on gemology include helpful charts and today there are also several wonderful books specifically dealing with fluorescence. My book ‘Gem Identification Made Easy’ (especially the last edition, the Fifth Edition) includes charts covering most gems currently in the marketplace, but whatever text you use, make sure you take time to check reactions when new gemstones are discovered, or new sources, and then make notes in your own books so you are able to keep up-to-date.

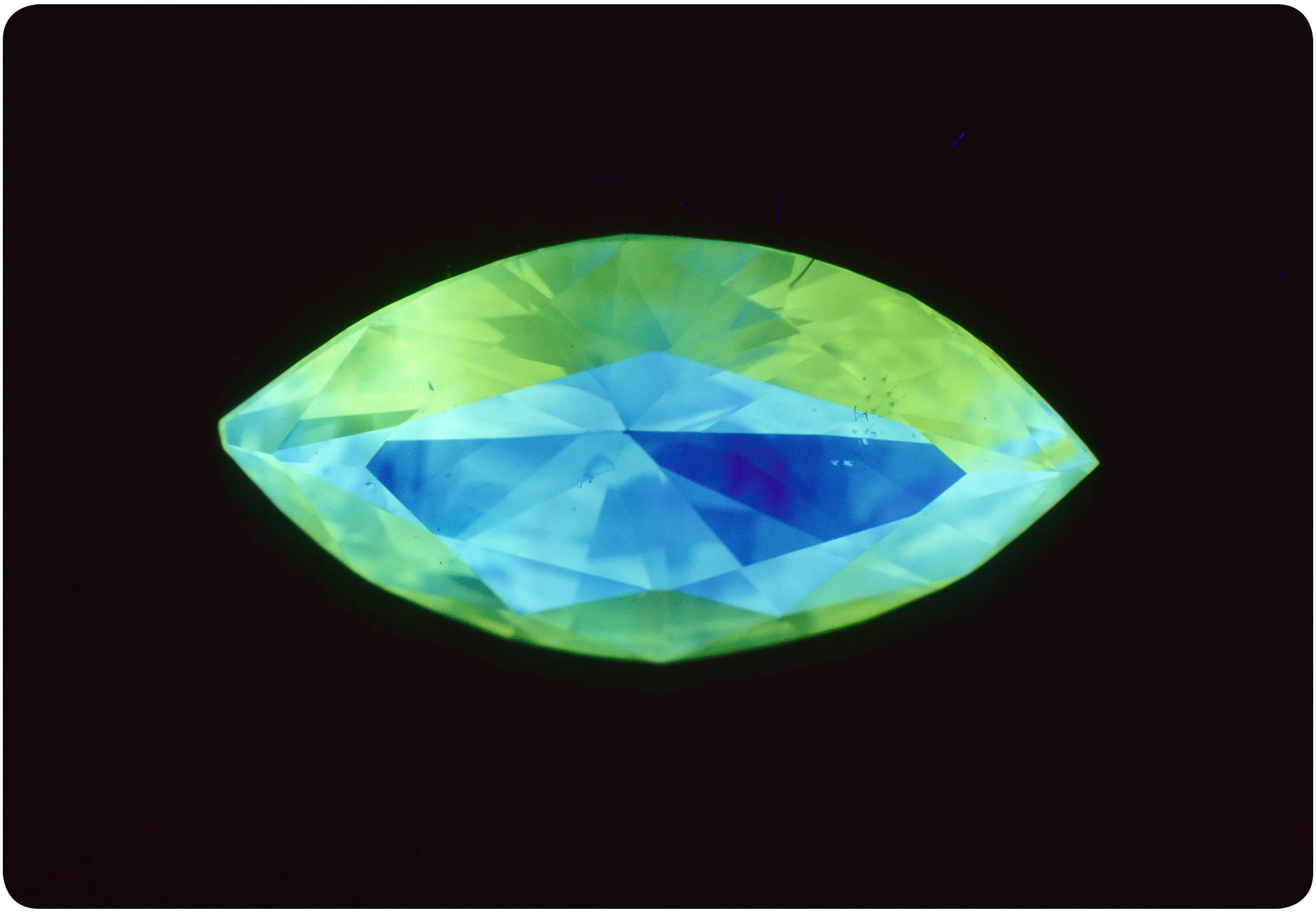
Also, remember that the UV output of your lamp can change over time, so you may want to send it to Gem-A or GIA or the vendor from which you have purchased it to have the output checked periodically. **ALSO, BEWARE OF CHEAP UV LAMPS BEING SOLD AND DESCRIBED AS HAVING THE PROPER OUTPUT**…I’ve found lamps on the internet that only provide longwave output even thought they indicate both, and I’ve found lamps that lacked the proper intensity of radiation, and worse. I highly recommend you obtain your lamp from a gemological institution, and they should be happy to check its output from time to time.

And now I’ll end with a story about one of the most challenging gem searches I ever undertook. A gemologist at a major museum gem collection called me to say he wanted to get a diamond anniversary band for his wife, with 5 stones, each approximately 1/5 carat (he and his wife had 3 children, and he wanted 5 ‘diamonds’ to symbolize each member of the family). THEN his request got much more complicated; he pointed out that since each of them was ‘unique’ he wanted each stone to fluoresce a different color! Now we know that natural colorless diamonds can fluoresce in a variety of colors, but when you must also match the shape, size, ‘personality’ of each stone as impacted by the cutting, it certainly makes it more challenging. But if he had confidence in my ability to do it, I decided it would be great fun. I was almost right, but it ended up being the most daunting project I ever undertook. After almost an entire year, I finally found five matching diamonds, each fluorescing a different color: blue, yellow, ‘white’, orange, and red! Every time I see his wife at any event, I look at her ring and feel a rush of excitement…and pride… in having been able to succeed in finally finding the stones. I know it is a one-of-a-kind ring, and just like each member of this family, they are each ‘one of a kind’!

I hope this has helped you understand the value of the UV lamp and better understand how to use it properly. If you have questions or need clarification, please don’t hesitate to email me at: AntoinetteMatlins@me.com.



Natural Yellow Diamond under Normal Light (Photo by Tino Hammid)



Natural Yellow Diamond under LW UV Light (Photo by Tino Hammid)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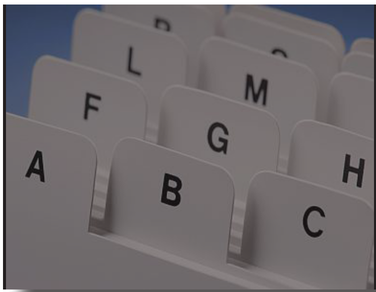

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